Botanical Assessment for a proposed dam at Sangasdrift 394, Portions 3 & 5, near Riviersonderend, Overberg, Western Cape Province

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Prepared for EnviroAfrica

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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 provide specialist botanical consulting services for the assessment of the area of a proposed dam (Hut Dam) at Sangasdrift 394, near Riviersonderend, Western Cape Province.

Details of Specialist

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Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 35 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, financial 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 make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

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

I David Jury McDonald, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014, as amended, and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 13 of GN No. R. 326.

Note: The terms of reference must be attached.

Signature of the specialist:

Bergwind Botanical Surveys & Tours CC

Name of company:

12 December 2017

Date:

CONTENTS

1. Introduction

EnviroAfrica CC has been appointed by the applicant to conduct the environmental assessment process for a dam on the farm Sangasdrift 394 Portions 3 and 5, near Riviersonderend in the Overberg of the Western Cape Province. The study is conducted in terms of the National Environmental Management Act (NEMA) (No.7 of 1998) as amended and the 2014 Environmental Regulations. Bergwind Botanical Surveys & Tours CC was appointed by EnviroAfrica on behalf of the applicant, to carry out a botanical assessment of the designated property to support the environmental impact assessment process. The purpose of the botanical impact assessment is to inform the environmental assessment on (a) the suitability of the site (and the alternative site) from a botanical viewpoint and (b) to determine any constraints that should be implemented to conserve the vegetation and flora (sensitivity analysis) while permitting the development to continue.

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).

2. Terms of Reference

The Terms of Reference are:

- Describe the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.
- In terms of biodiversity **pattern**, identify or describe:

Community and ecosystem level

a. The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
b. The types of plant communities that occur in the vicinity of the site
c. Threatened or vulnerable ecosystems

Species level

a. Red List species (give location if possible using GPS)

b. The viability of an estimated population size of the Red List species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)

c. The likelihood of other Red List species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Other pattern issues

a. Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.

b. The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).

c. The condition of the site in terms of current or previous land uses.

- In terms of biodiversity **process**, identify or describe:

  a. The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.

  b. Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)

  c. Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.

  d. Would the conservation of the site lead to greater viability of the adjacent ecosystem by securing any of the functional factors listed in the first bullet?

- Would the site or neighbouring properties potentially contribute to meeting regional conservation targets for both biodiversity pattern and ecological processes?

3. Study Area

3.1 Locality

The study area is on two portions of the farm Sangasdrift 394 namely Portions 3 and 5. They lie adjacent to each other on the south-facing foot-slopes of the Riviersonderend mountain range, approximately 5 km due west of Stormsvlei in the Overberg. The site is accessed along a district gravel road (DR1306) that runs through the valley north of the Riviersonderend river from the R317 near Stormsvlei westwards to the town of

Riviersonderend, in the Overberg Region (Overberg District Municipality) of the Western Cape Province (Figures 1—3a & b).

3.2 Topography and geology

The proposed Hut Dam (preferred) and the alternative dam sites are located on the undulating foothills of the south-facing slopes of the Riviersonderend mountain range. The soil is derived from a mix of Bokkeveld Group shale and sandstone colluvium that has washed down from the Ordovician sandstone of the slopes of the mountain.

The Hut Dam would straddle a stream (from which it would be fed) close to the cadastral boundary between Portion 5 and Portion 3 of Sangasdrift 394. The stream has resulted in convexo-concave slopes on either side. The alternative Dam site lies on more even, undulating slopes with little relief.

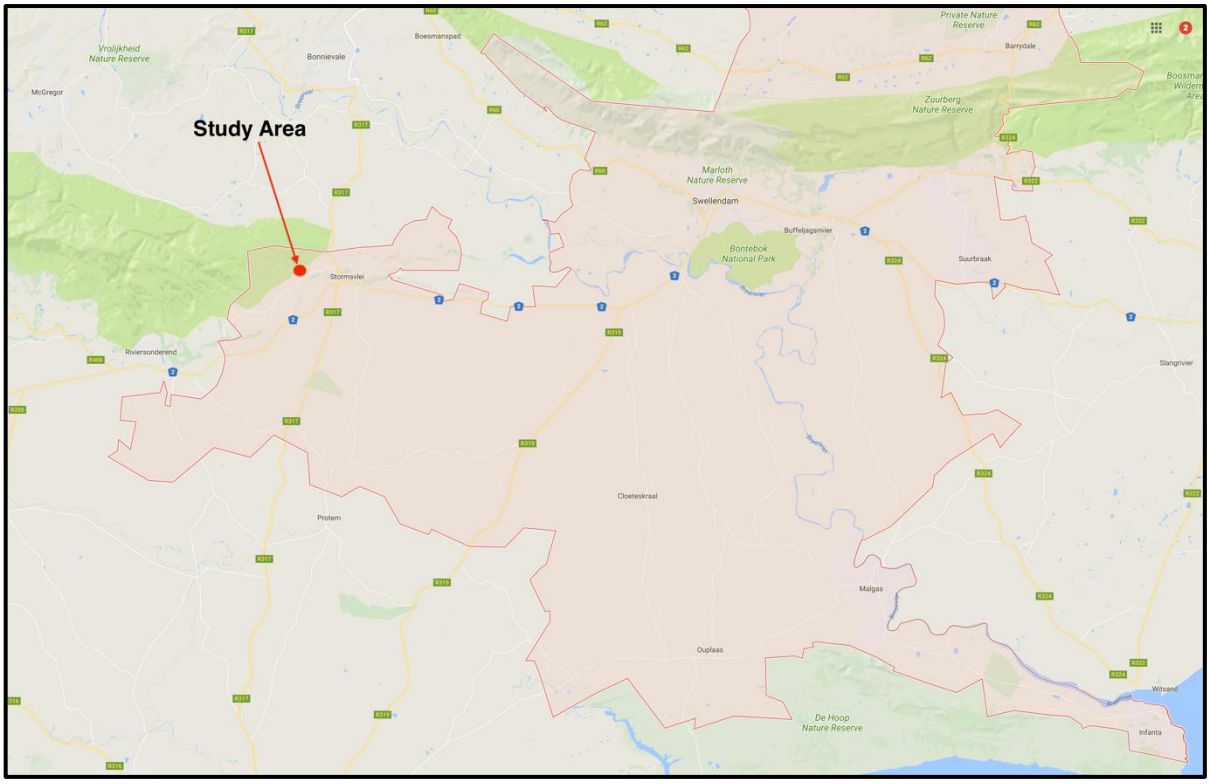

Figure 1. Location of the proposed Hut Dam (marked with a red dot 'Study Area') west of Stormsvlei in the western part of Swellendam Municipality (pink shading).

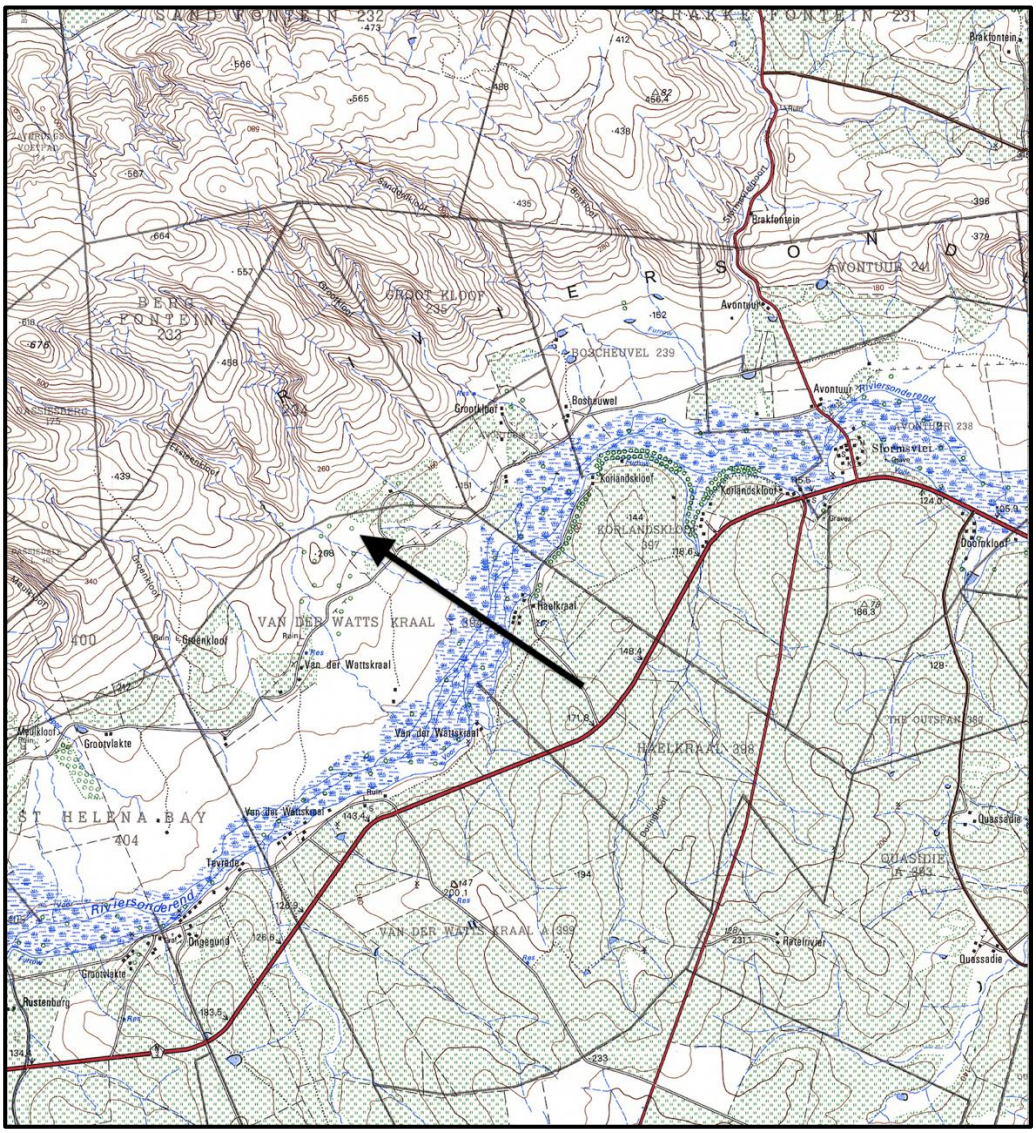

Figure 2. Topographic map indicating the location of the Hut Dam study site (black arrow). (Portion of 3420AA Stormsvlei 1: 50 000 topographic map – Chief-Director: National Geo-spatial Information).

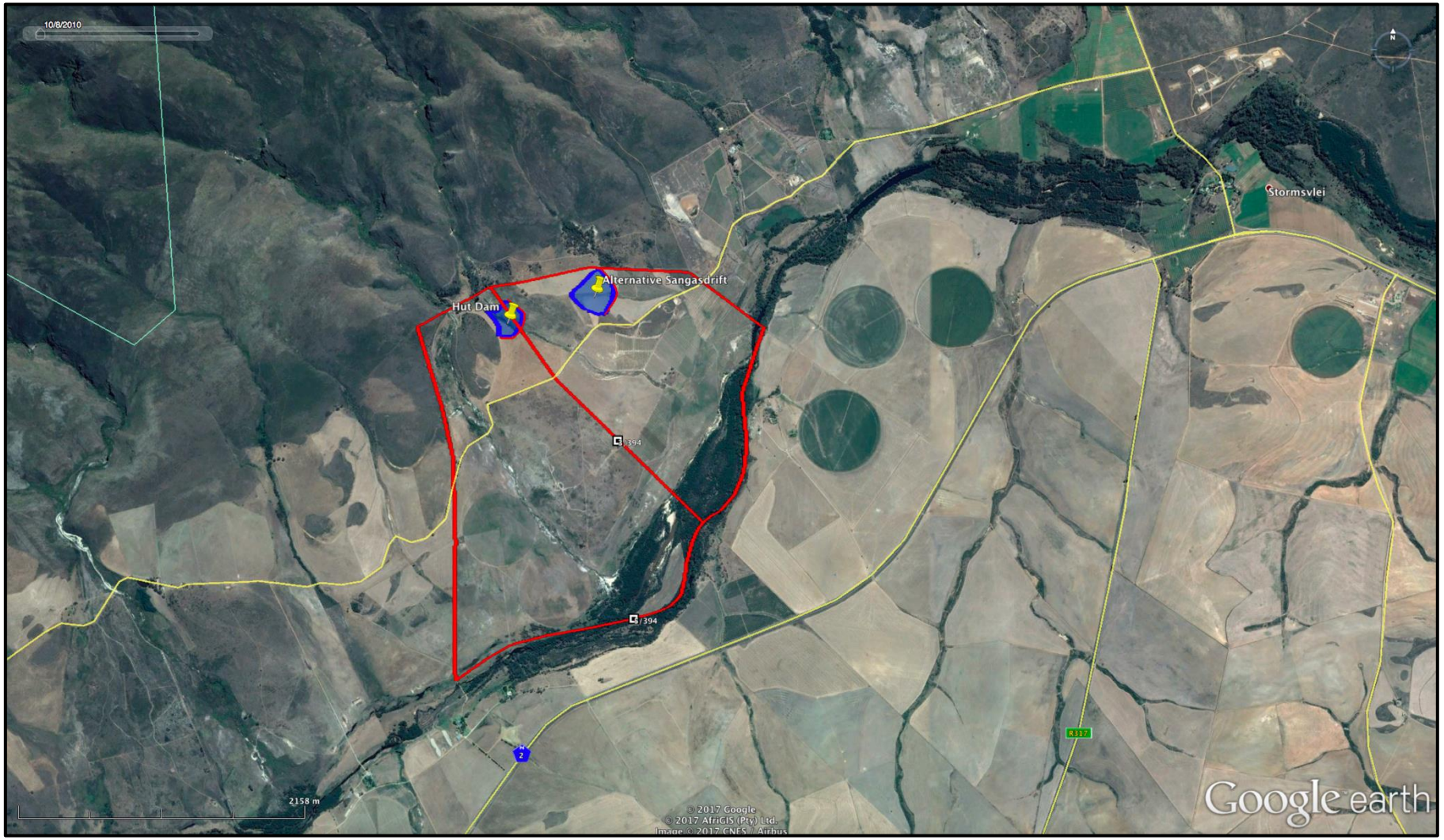

Figure 3a. Aerial image (Google Earth ™) of the study area indicating the location and footprint of the proposed Hut Dam (dark blue with yellow pin- west) and the alternative dam position at 'Alternative Sangasdrift' (dark blue with yellow pin – east). The red lines represent cadastral boundaries with Portion 3 of Sangasdrift 394 lying to the east and Portion 5 lying to the west.

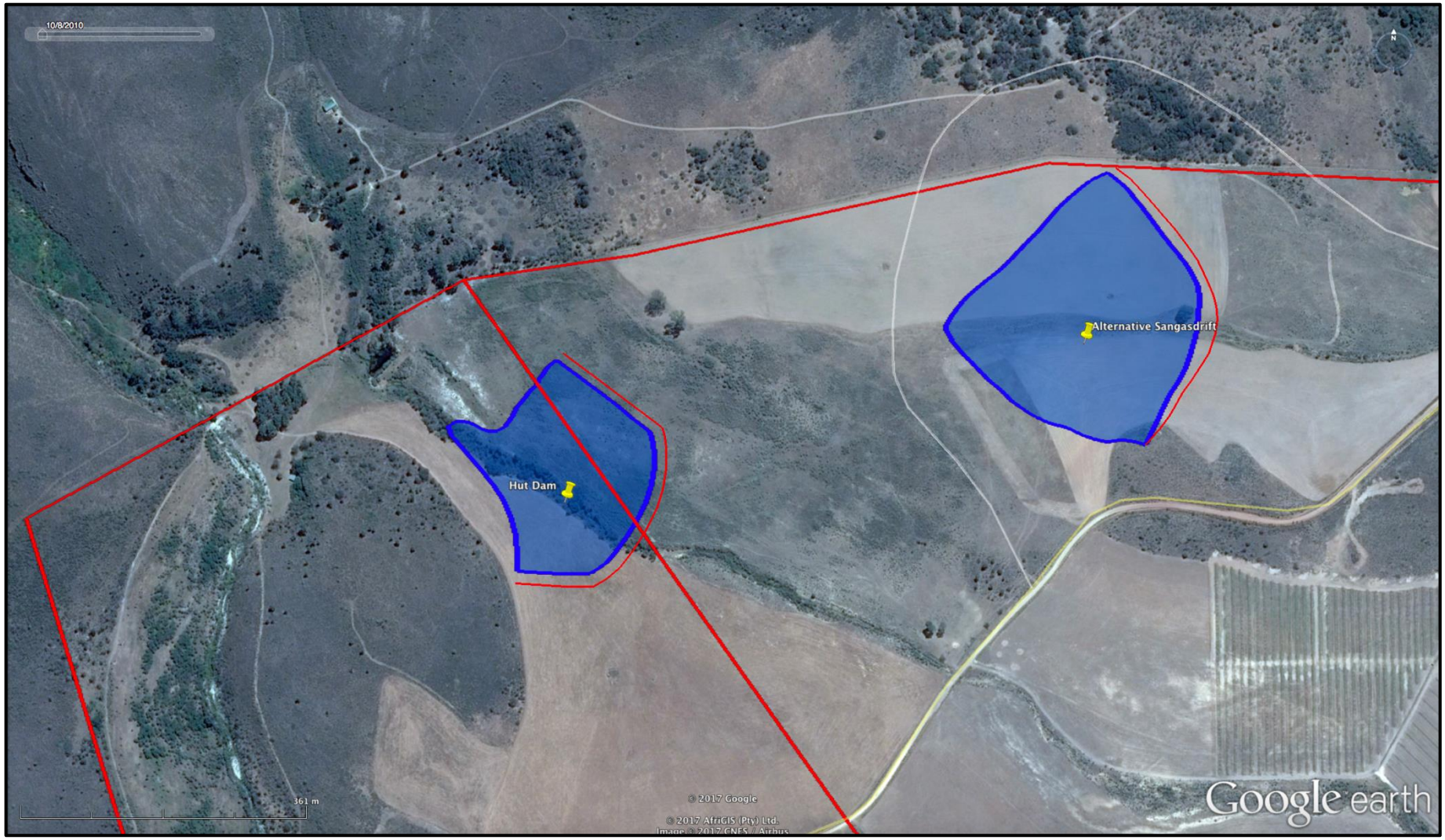

Figure 3b. Magnified aerial image (Google Earth ™) of the study area indicating the location and footprint of the proposed Hut Dam preferred alternative (dark blue with yellow pin- west) and the alternative dam position at 'Alternative Sangasdrift' (dark blue with yellow pin – east). The thick red lines represent cadastral boundaries with Portion 3 of Sangasdrift 394 lying to the east and Portion 5 lying to the west. The thin red lines indicate the proposed dam walls.

3.3 Climate

Sangasdrift 394 lies within a climate zone which is transitional between the winter-rainfall region of the extreme Western Cape and the non-seasonal rainfall region in the east. The climate of Van der Watts Kraal 394 is similar to that of Riviersonderend for which rainfall information is available (Figure 4). Rain occurs in low amounts throughout the year with a slight peak in April (autumn). Mean annual precipitation is in the order of 270 mm *per annum;* less than shown for Greyton Shale Fynbos in Figure 6.

Winter days are cool (7 --19°C) with the nights cold but seldom freezing. Summers are warm to hot with daytime temperatures mostly from 19 -- 30°C but occasionally exceeding 30°C (Figure 4).

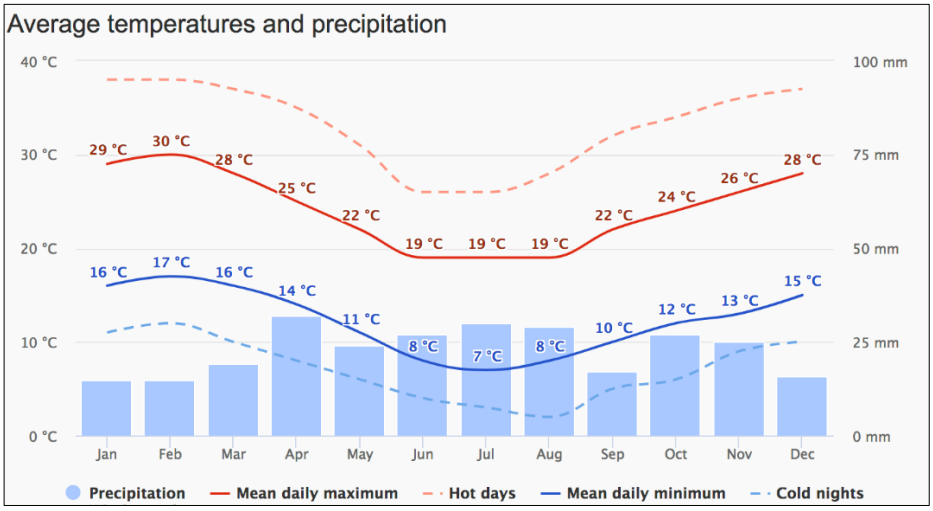

Figure 4. Average annual precipitation and temperatures for Riviersonderend. (Source: meteoblue).

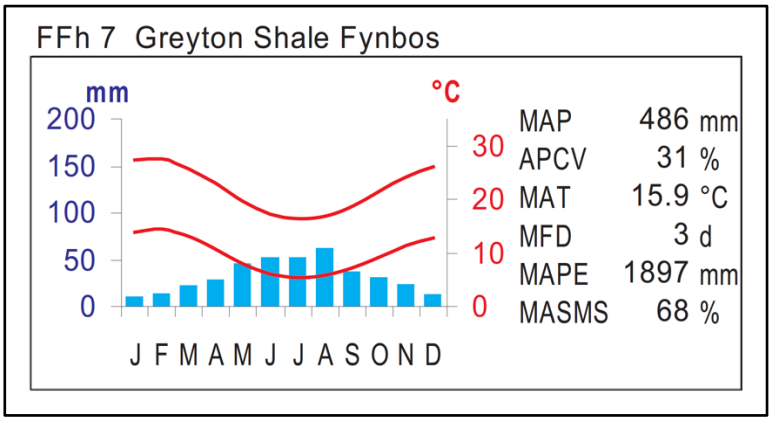

Figure 5. Climate diagram for Greyton Shale Fynbos (from Rebelo *et al.* 2006 in Mucina & Rutherford, 2006) showing MAP – Mean Annual Precipitation; ACPV = Annual Precipitation Coefficient of Variance; MAT = Mean Annual Temperature; MFD = Mean Frost Days; MAPE = Mean Annual Potential Evaporation; MASMA = Mean Annual Soil Moisture Stress.

4. Methods

4.1 Field Sampling

The field-work for the assessment of the preferred Hut Dam site and alternative site was carried out on 14 August 2017 and the foot-survey took approximately two hours. The site was accessed from farm roads and then on foot. A hand-held Garmin ® GPSMap 62S was used to obtain waypoints. Observations were made at the waypoints and recorded with photographs of the vegetation and selected plant species. As is standard practice, particular attention was given to the possibility of finding endemic and 'Red List' species.

The spring period was ideal for the study. The method used was a 'rapid-assessment technique' in which site observations and numerous photographs were taken at randomly distributed waypoints. This provided adequate information to characterize the vegetation / condition of the sites.

4.2 Desk-top analysis and reporting

The recorded waypoints were transferred to Google Earth ™ satellite aerial-photographs and together with the photographs obtained in the field as well as available literature, were used for description of the vegetation presented in this report. The National Vegetation Map (SANBI, 2012) (referred to as VEGMAP) was used as the 'base-map' to determine the principal original vegetation type.

5. Limitations and Assumptions

The study had no limitations. The only assumption that was made was that the original vegetation was Greyton Shale Fynbos at both the preferred site and the alternative site. This assumption was made based on the map in Figures 6 and 7 where the vegetation is mapped as Greyton Shale Fynbos (see below). None of the original vegetation persists at the proposed dam sites.

A small area of Greyton Shale Fynbos remains west of the Hut Dam site and this was used as a comparative reference for the type of vegetation that would have originally occurred at the preferred and alternative dam sites.

6. Disturbance regime

Sangasdrift 394 is typical of most farms in the region where as much land as possible has been transformed from the original natural indigenous vegetation to either grain-fields or pastures. Only areas on particularly steep or rocky terrain or where the soil is not at all suitable for cultivation, or where there are well-defined water-courses, have not been ploughed. In some places, even in areas where there is shallow rock or a thin cap of duricrust (hardpan) it has been removed and the underlying soil has been ploughed.

In addition to large tracts having been transformed by ploughing, a large area lying between the Hut Dam site and the alternative dam site on Portion 3 of Sangasdrift 394 is infested with alien invasive trees. The main invasive species is *Acacia saligna* (Port Jackson Willow). *Acacia mearnsii* (black wattle) is the principal species that has invaded the watercourses and is particularly prevalent in the watercourse that would feed the proposed Hut Dam.

7. The Vegetation

7.1 The vegetation in context

Only one vegetation type was originally found at the proposed Hut Dam and alternative dam sites, as mapped and classified in the national classification of the vegetation of South Africa (Rebelo *et al.* 2006 in Mucina & Rutherford, 2006) (VEGMAP). The vegetation would have been Greyton Shale Fynbos (FFh7) (Figure 7). Greyton Shale Fynbos falls within the Fynbos Biome and is species-rich. In addition, it has become increasing threatened due to the pressure from transformation to agriculture (Von Hase *et al.* 2003; Rebelo *et al.* 2006; Raimondo *et al.* 2009; Holness & Bradshaw, 2010; Pool-Stanvliet, 2017).

Rebelo *et al.* (2006) describe Greyton Shale Fynbos as a moderately tall and dense shrubland, dominated by Proteaceae and Asteraceae but also having some graminoid fynbos. It occurs on acidic, clay-loam colluvial soils as described above. Reference should be made to Rebelo *et al.* (2006) for plant species occurring in this vegetation type.

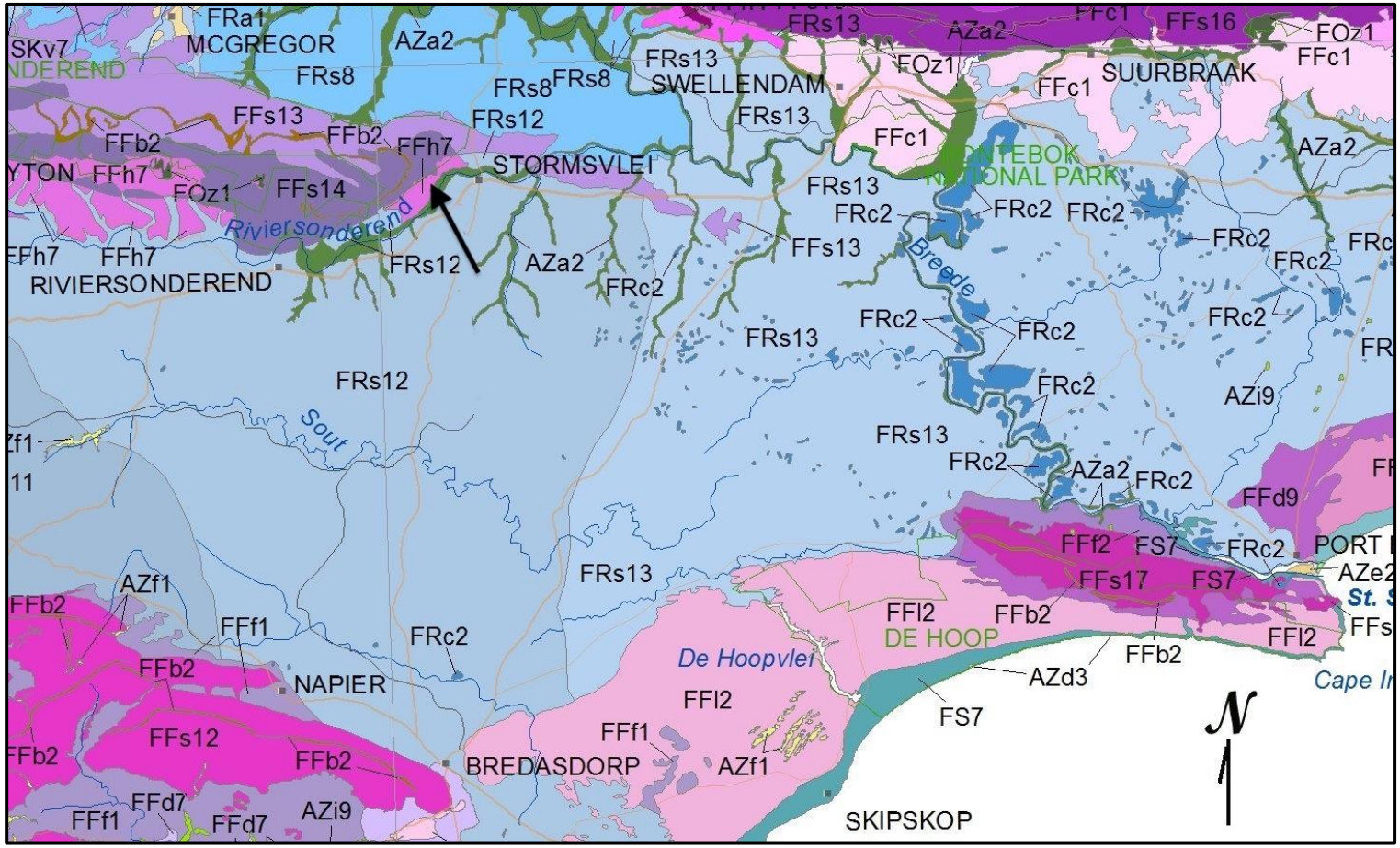

Figure 6. Portion of the *Vegetation map of South Africa, Lesotho, and Swaziland* (Mucina, Rutherford & Powrie 2005) with the study area indicated by a red dot and black arrow. The original vegetation type was Central Rûens Shale Renosterveld (light-blue: FRs12).

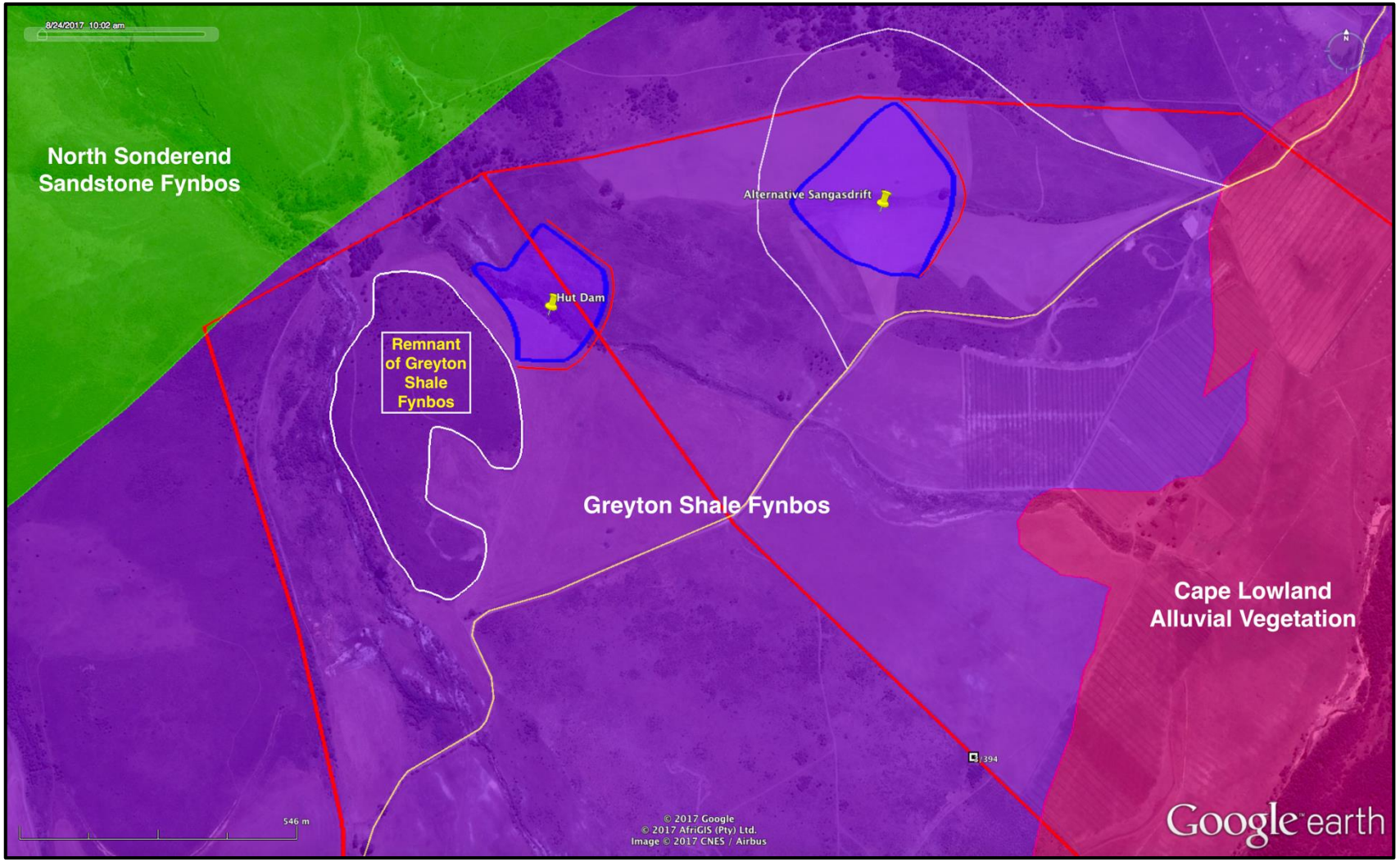

Figure 7. Portion of the *Vegetation map of South Africa, Lesotho, and Swaziland* (Mucina, Rutherford & Powrie 2005; SANBI, 2012) overlaid on a Google Earth ™ aerial image. The proposed (preferred) Hut Dam and the alternative dam (Alternative Sangasdrift) are indicated by blue outlines. They are both located in an area formerly with Greyton Shale Fynbos.

7.2 The vegetation of the Hut Dam and alternative dam sites

7.2.1 Hut Dam Site (preferred site)

Historical aerial images from Google Earth™ (2003 to 2016) (Figure 8, 9 & 10) provide a time sequence of land-use and disturbance in the area of the footprint of the proposed Hut Dam. In 2003 (Figure 8) the area east of the stream i.e. in the eastern part of Sangasdrift 394 Portion 5 was cleared of alien invasive trees, as was the west side of the stream that is now ploughed land and pasture. Immediately over the boundary between Sangasdrift 394 Portion 5 and Portion 3 i.e. on Portion 3, there were very sense stands of *Acacia saligna* (Port Jackson Willow) in 2003 (Figure 8).

Between 2008 and January 2011 a large amount of clearing of alien invasives took place on both Sangasdrift 394 Portions 5 and 3 as seen by the stacked rows of aliens on the aerial photo (Figure 9).

From 2011 when large areas of alien invasives were cleared to December 2016 (Figure 10), invasive *Acacia saligna* has re-established over significant areas in the eastern part of Sangasdrift 394 Portion 5 and the western part of Sangasdrift 394 Portion 3 that were cleared prior to January 2011.

The above sequence of events has strong bearing on the current condition of the vegetation on both sides of the stream that Hut Dam would straddle. The area on the west side of the stream has been completely transformed by cultivation and the establishment of pastures (Figures 10, 11, 12 & 13). Apart from the pasture grasses, *Athanasia trifurcata* (Klaaslouwsbos) that is known for indicating disturbance, is common. This area consequently has negligible botanical sensitivity. No Greyton Shale Fynbos remains here apart from an isolated remnant as shown in Figure 7. However, this remnant would not be affected by the dam at all since it lies west of the dam footprint.

The area east of the stream was historically significantly disturbed by invasion by *Acacia saligna*. The subsequent clearing of the invasive trees and more recently by re-establishment of *A. saligna* again added another layer of disturbance. The use of this area for livestock grazing has added further disturbance. Ultimately this has left the area east of the stream in the Hut Dam footprint (and outside!) in poor, degraded condition with low botanical sensitivity (Figures 10 & 14).

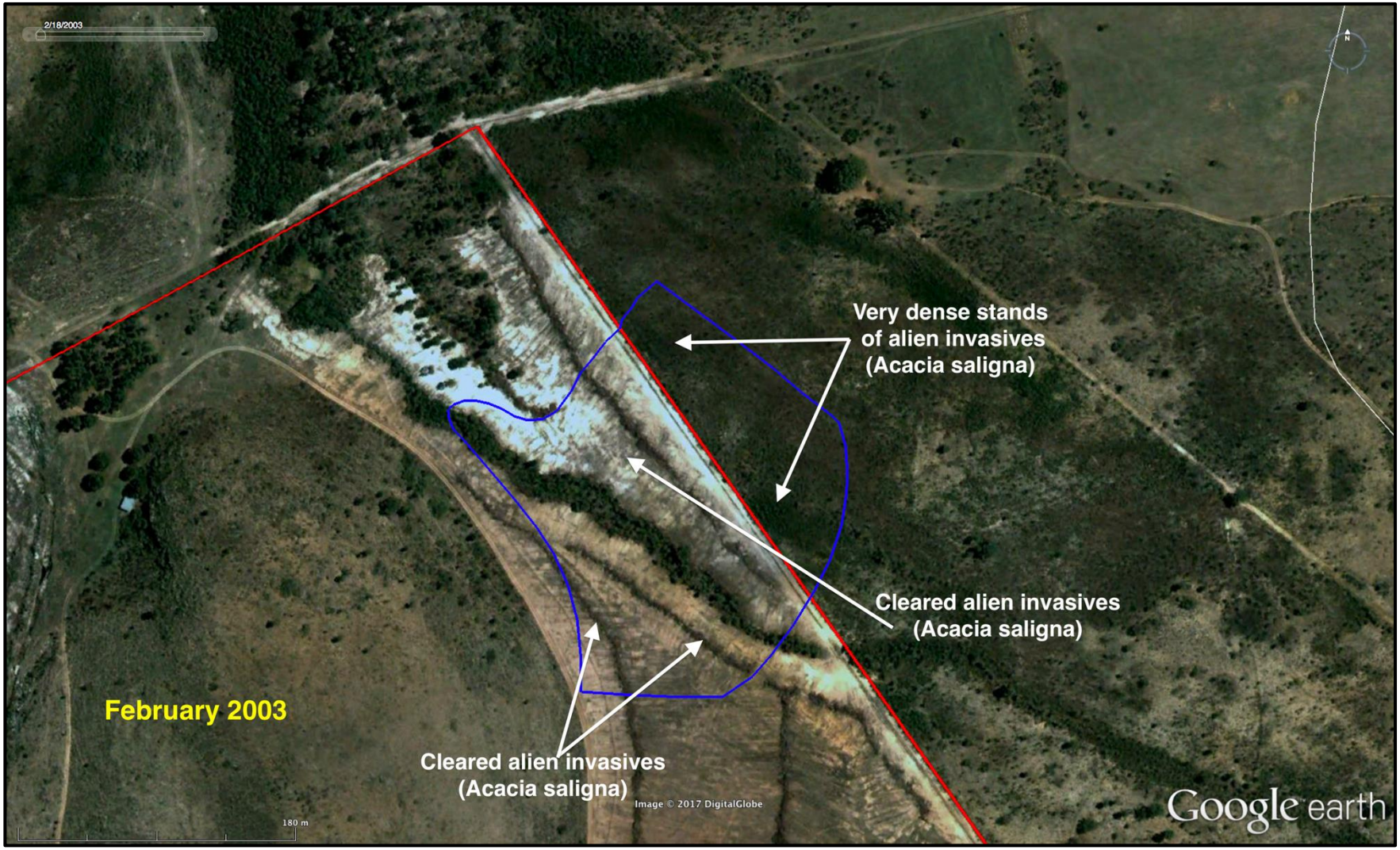

Figure 8. Aerial image (Google Earth ™) of the Hut Dam site (preferred site – blue outline) in 2003. The site at that time was already heavily disturbed.

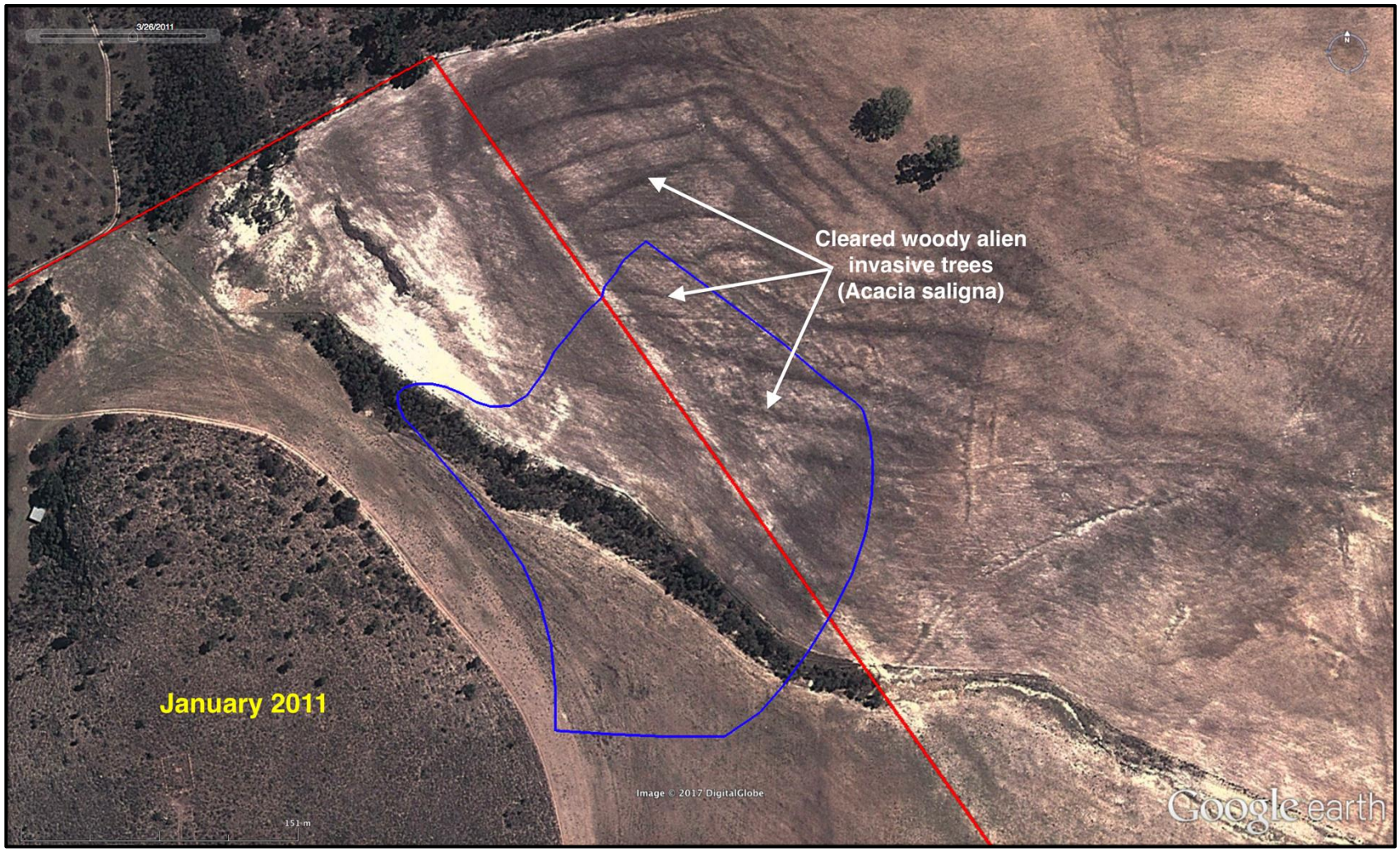

Figure 9. Aerial image (Google Earth ™) of the Hut Dam site (preferred site- blue outline) in 2011. The image shows the extreme level of disturbance from clearing of invasive alien trees and ploughing. Note the prominence of invasive alien *Acacia mearnsii* (black wattle) in the stream.

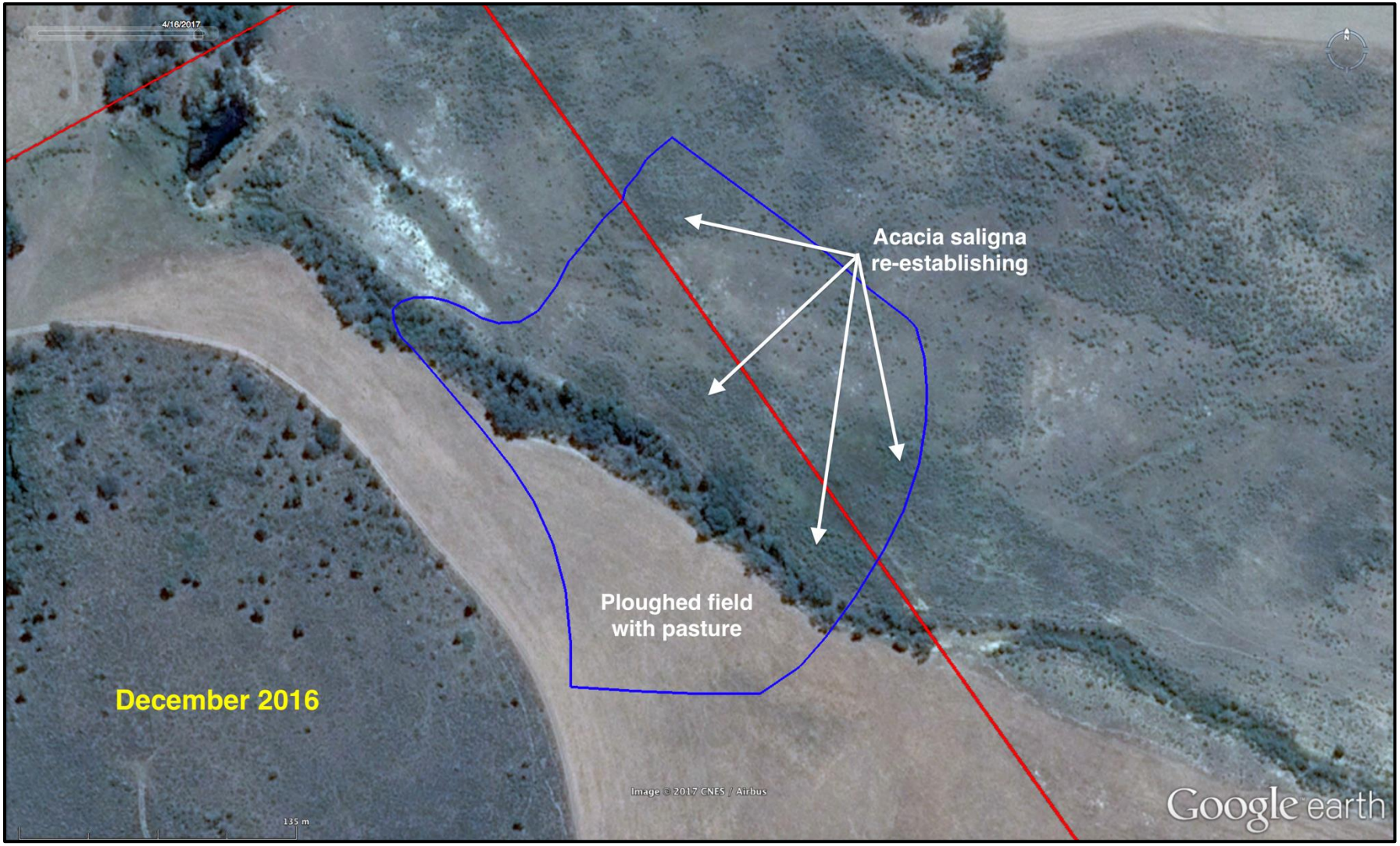

Figure 10. Aerial image (Google Earth ™) of the Hut Dam site (preferred site- blue outline) in 2016. The image shows the ploughed field with pasture to the south-west of the stream and the disturbed area to the north-east of the stream that is now becoming re-infested with alien *Acacia saligna*.

Figure 11. The Hut dam site with ploughed field in the foreground, stream heavily invaded by black wattle (*Acacia mearnsii*) and the area beyond the stream invaded by *Acacia saligna* (Port Jackson Willow)

Figure 12. The ploughed field on the south-west side of the stream no longer supports any Greyton Shale Fynbos, only planted pasture.

Figure13. Looking north-eastwards from the position of western end of the proposed Hut Dam wall.

Figure 14. The ploughed area (planted with pasture) on the north-east side of the stream, within the proposed hut Dam footprint. Note the stand of invasive *Acacia saligna* beyond the field.

7.2.2 The Alternative Dam Site

Examination of a sequence of aerial images from Google Earth™ (2003 to 2016) (Figure 16—18) reveals the land-use and disturbance in the area of the footprint of alternative dam at Sangasdrift. In 2003, part of the area (north of the degraded watercourse) within the dam footprint was ploughed (Figure 16). The area to the south of the degraded watercourse was apparently not ploughed but was disturbed and invaded by alien invader trees. At some point between 2003 and 2011 the entire area of the footprint of the alternative dam was ploughed (with the invasive aliens removed) and the watercourse that runs from west to east through the centre of the site became even more degraded (Figure 17).

By 2016 (Figure 18) the central watercourse was still degraded but not ploughed, with a few alien trees gaining a foothold. The southern and northern parts were, however, both actively ploughed.

The alternative dam site has clearly been subject to significant and ongoing disturbance over more than a decade and the site no longer supports any Greyton Shale Fynbos. It is highly degraded from a botanical viewpoint and has **negligible botanical sensitivity** even in the watercourse (Figure 15).

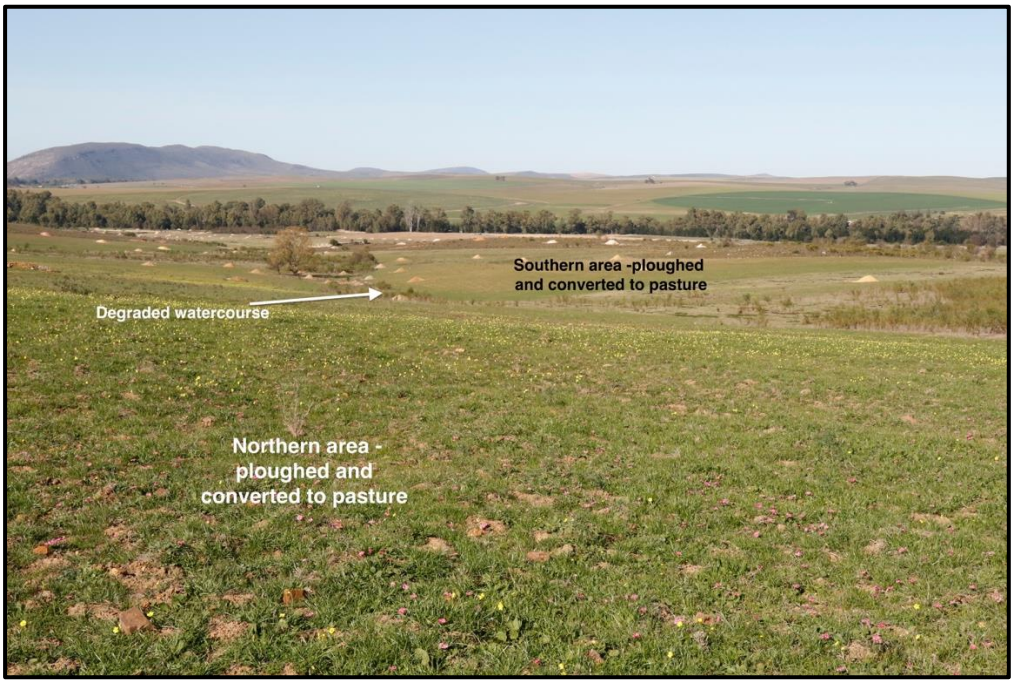

Figure 15. View south-east of the area where the 'alternative dam' would be constructed.

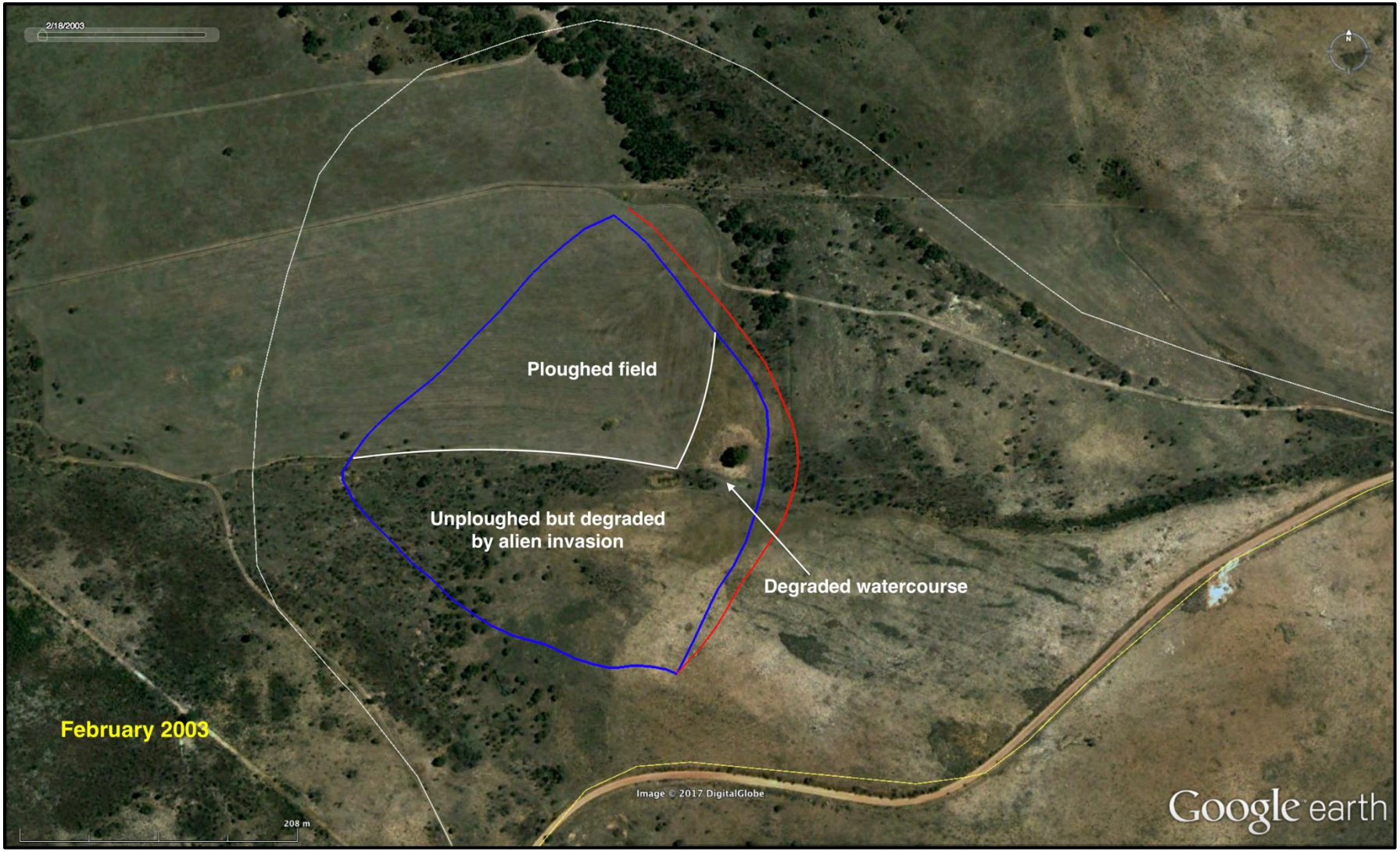

Figure 16. Aerial image (Google Earth ™) of the alternative dam site (blue outline) in 2003 with labels showing the ploughed area and area disturbed by alien invasion.

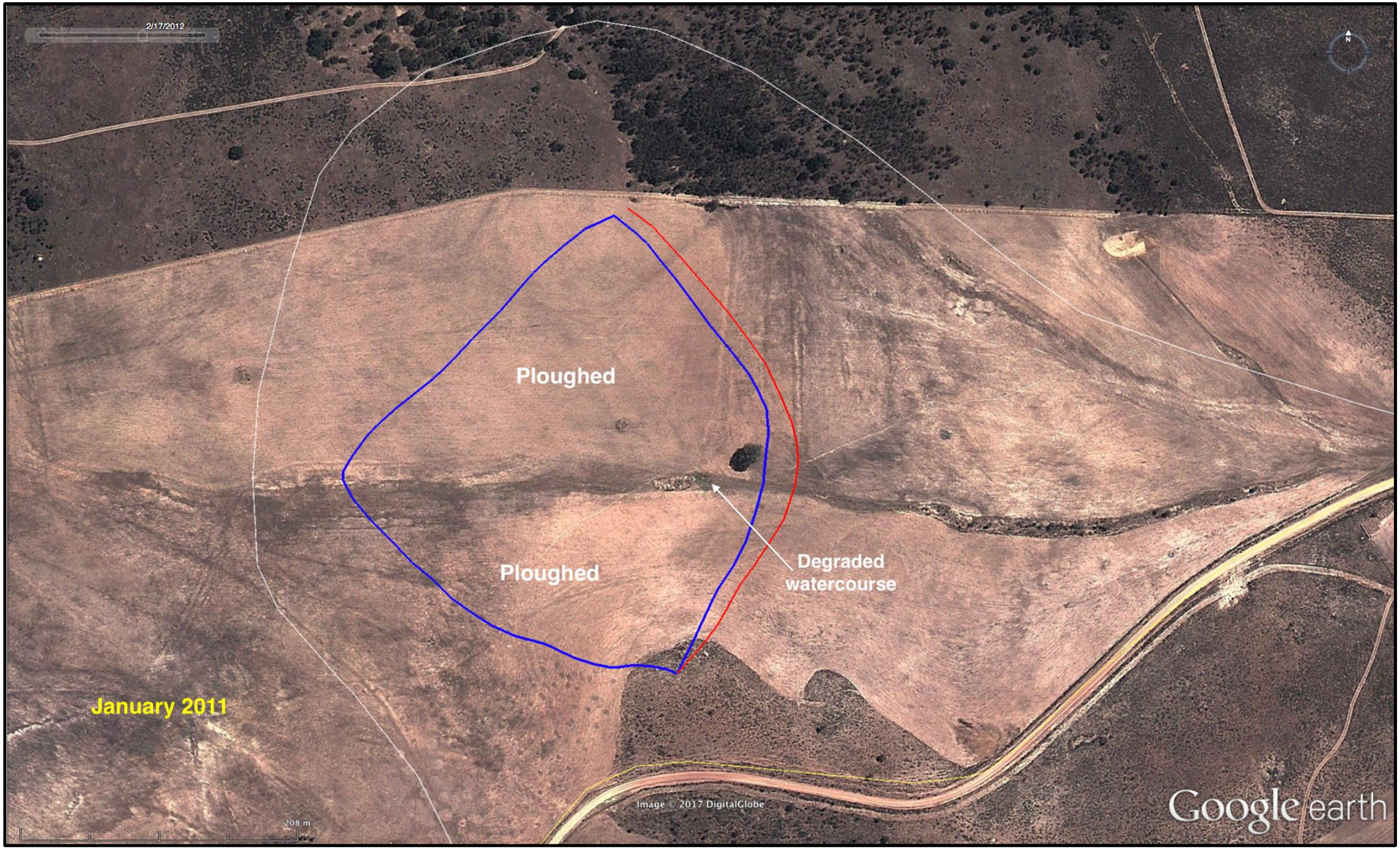

Figure 17. Aerial image (Google Earth ™) of the alternative dam site (blue outline) in 2011. Virtually the entire site was cleared and ploughed and the watercourse degraded.

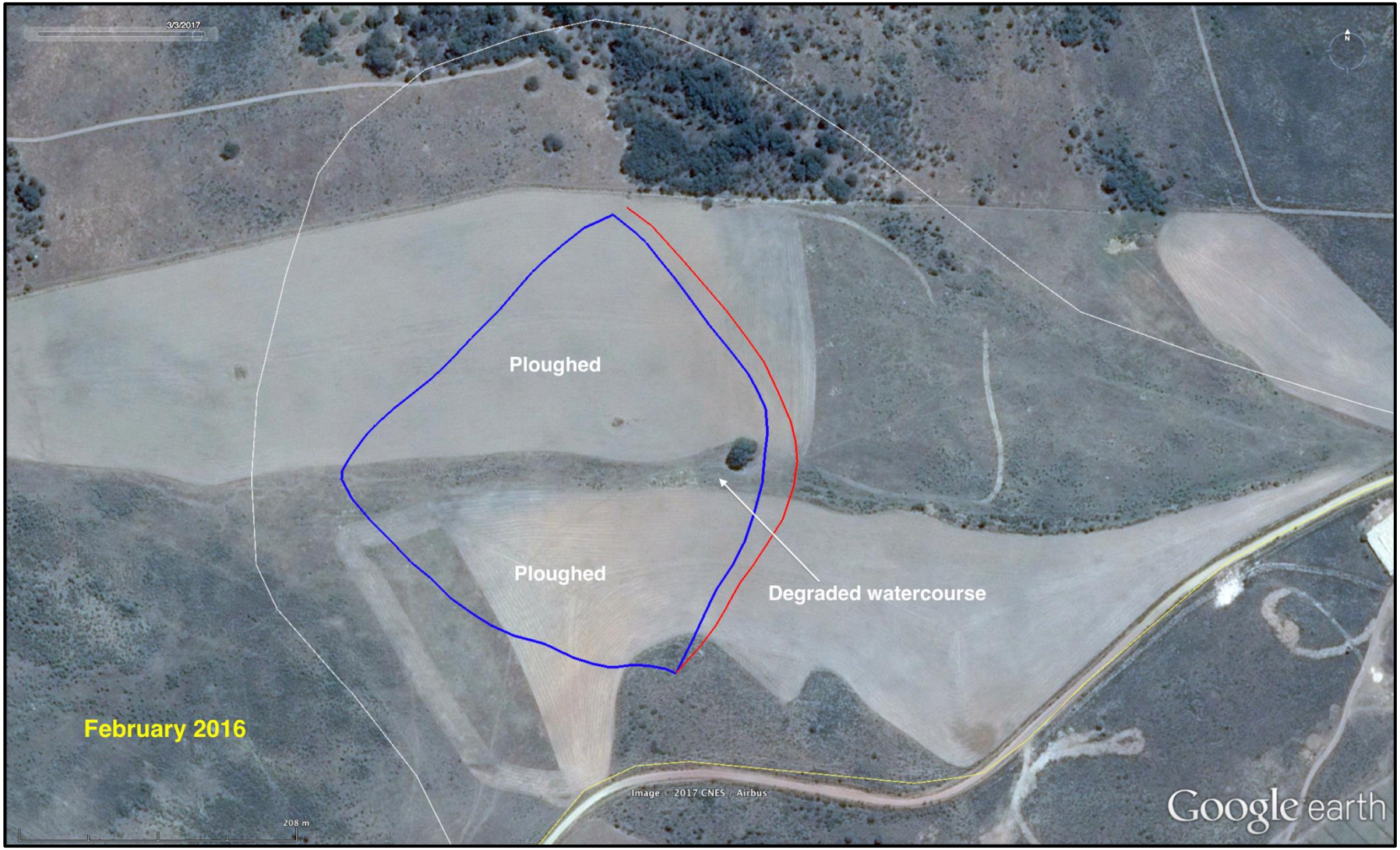

Figure 18. Aerial image (Google Earth ™) of the alternative dam site (blue outline) in 2016. The northern and southern parts were ploughed and converted to pasture and the watercourse remains degraded.

8. Conservation status

Greyton Shale Fynbos is not listed in the National List of Threatened Ecosystems (Government Gazette, 2011) which implies that it is Least Threatened. However, in a more recent appraisal by Pool-Stanvliet *et al.* (2017), Greyton Shale Fynbos is rated as Endangered A1 (A1 = irreversible loss of natural habitat). This means that there should be no further loss of this vegetation type otherwise the national conservation target may not be met. This immediately raises the need for caution when encountering this vegetation type.

The Hut Dam site (preferred) has a small area of critical Biodiversity Area 1 (CBA1), minimal areas of Ecological Support Areas 1 (ESA1) and a larger area of ESA2[1] (Figure 19). The ESA2 is related mainly to the stream and denotes that the area has conservation merit but is not essential for meeting conservation targets. From a botanical viewpoint, the 'conservation status' units that fall within the Hut Dam footprint are, in my opinion, spurious. The habitat is so degraded by invasion by alien trees that there is very low conservation value. Even efforts to restore this habitat would be fruitless in my view.

The alternative dam site has an ESA2 area running through it. Once again this is related to the watercourse. As described above, this watercourse is extremely degraded and now has very little ecological value. I question the application of ESA2 status to this watercourse.

No Red List species (i.e. species of conservation concern) were encountered during the survey. This is not surprising since the habitat is generally extremely degraded and compared with undisturbed Greyton Shale Fynbos, is a 'botanical desert'.

[1] ESA 2 areas are defined as: *"Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning protected areas or critical biodiversity areas and are often vital for delivering ecosystem services."* ESA 2 conservation objectives are: *"Restore and/or manage to minimize impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and to allow for faunal movement."*

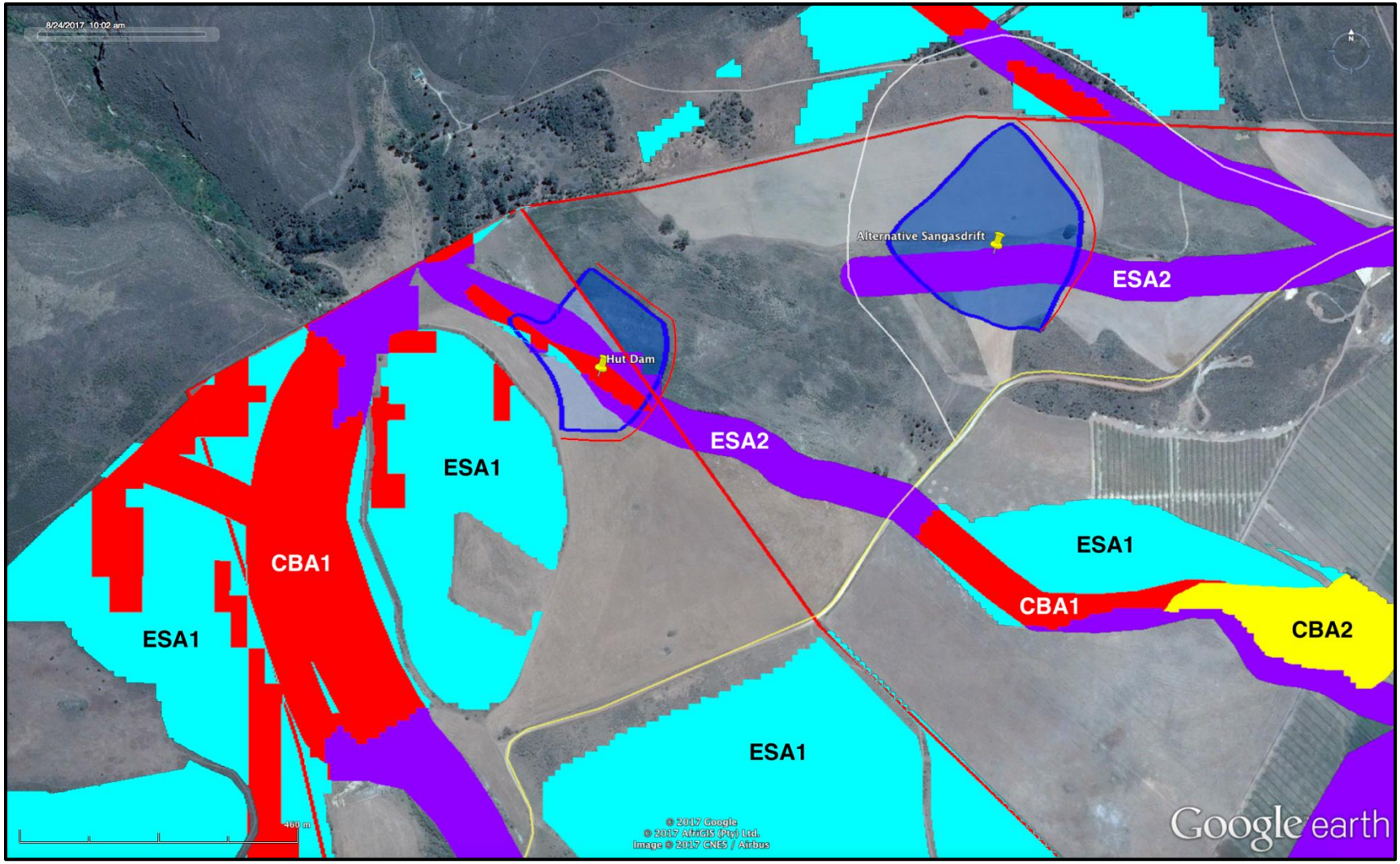

Figure 19. Aerial photo (Google Earth ™) with superimposed Critical Biodiversity Areas Map (CapeNature 2017). The red areas are Critical Biodiversity Areas (CBA1) and the yellow areas CBA2. The light-blue areas are Ecological Support Areas (ESA1) and the purple areas are ESA2. The proposed Hut Dam would impact an area classified as CBA1, ESA1 and ESA2. The alternative dam site would impact an ESA2.

9. Development layouts

The proposed dam (either the preferred or alternative) would have an earth wall. The dam wall would extend in a shallow arc from north to south (in both cases) as may be seen in Figure 3.

10. Impact Assessment

Impacts on the vegetation are assessed for the 'No Go' alternative and the construction of the Hut Dam or an alternative dam at Sangasdrift.

10.1 Direct Impacts

Direct impacts are those that would occur directly on the vegetation of the site as a result of the proposed dam construction. 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 Hut Dam development (or the alternative) 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.
- Loss of ecological processes due to construction and operational activities.

10.1.1 Loss of vegetation type and habitat including plant species due to construction and operational activities

In the case of the **"No Go" alternative** where there would be no dam construction, the *status quo* would persist and the farming operation would continue in much the same way as at present. The 'no development' alternative or 'No Go' alternative would thus have a **VERY LOW NEGATIVE** impact on any natural vegetation with no significant further loss in the long-term.

If the **Hut Dam development option** is followed there would be **VERY LOW NEGATIVE** impact on the stream as well as on the cultivated areas. No mitigation would be necessary to compensate for loss of natural vegetation, habitat or ecological processes (Table 1). The same would apply to the **alternative site** where the negative impacts would be even less.

Table 1 Impact and Significance – Loss of natural vegetation (Greyton Shale Fynbos), habitat and ecological processes during the construction and operational phases.

CRITERIA	**'NO GO' ALTERNATIVE**		**PREFERRED ALTERNATIVE Construction of Hut Dam**		**ALTERNATIVE Construction of Alternative Sangasdrift Dam**	
Nature of direct impact (local scale)	**Loss of Greyton Shale Fynbos, habitat and ecological processes**					
	WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local	Local	Local	Local	Local
Duration	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term
Intensity	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Probability of occurrence	Probable	Probable	Probable	Probable	Probable	Probable
Confidence	High	High	High	High	High	High
Significance	Negligible	Negligible	Very Low Negative	Very Low Negative	Very Low Negative	Very Low Negative
Nature of Cumulative impact	**Loss of Greyton Shale Fynbos, habitat and ecological processes**					
Cumulative impact prior to mitigation	Very Low negative		Very Low Negative		Very Low Negative	
Degree to which impact can be reversed	Not reversible		Not reversible		Not reversible	
Degree to which impact may cause irreplaceable loss of resources	Very low		Very low		Very low	
Degree to which impact can be mitigated	Not required		Not required		Not required	
Proposed mitigation	None advised		None advised		None advised	
Cumulative impact post mitigation	Very low negative		Very low negative		Very low negative	
Significance of cumulative impact (broad scale) after mitigation	Very low negative		Very low negative		Very low negative	

10.1.2 Mitigation

The **development option** would have a high physical impact. However, the preferred and alternative sites are so badly degraded (with Greyton Shale Fynbos already having been lost many years ago) that no mitigation is advocated. No further loss of Endangered Greyton Shale Fynbos would result from construction of a dam at either of the sites.

10.2.1 Loss of ecological processes

Ecological processes are highly compromised in the area at both the preferred and alternative sites. There would be no further net loss of ecological processes due to dam construction and operation and the impact is thus **VERY LOW NEGATIVE** (Table 1).

10.2.2 Mitigation

No mitigation for loss of ecological processes would be required.

10.3 Indirect impacts

By definition indirect impacts occur away from the 'action source' i.e. away from the development site. The impact assessed here is specifically how the proposed development would have an indirect impact on vegetation and flora away from the development site. Construction and operation of a dam at either the preferred or alternative site would not result in any indirect impacts on natural flora or intact natural habitat.

10.4 Cumulative impacts

Even though Greyton Shale Fynbos is an Endangered vegetation type, there would be no further loss of this type due to the proposed dam project. The construction of a dam at either the preferred or alternative site would not result in ANY cumulative impact on Greyton Shale Fynbos.

11. General Assessment and Recommendations

- A single Endangered (A1) vegetation type, Greyton Shale Fynbos was the original vegetation type found over most of Sangasdrift 394. At the study site this vegetation type has been completely lost (at both the preferred and alternative dam sites).
- The impact of the proposed dam construction at a local scale would thus result in **VERY LOW NEGATIVE** impact.
- For the same reason, as above, the dam construction would not result in any contribution to cumulative impacts on Greyton Shale Fynbos and for that reason NO mitigation measures are advocated or recommended.

12. Conclusions

The study area at Sangasdrift has been subject to intensive disturbance over a long period. The disturbance has resulted from intensive agriculture; ploughing and planting of pastures for livestock production, as well as invasion by woody alien invasives. The area of the proposed 'Hut Dam' (preferred) has parts that are classified as CBA1, ESA1 and ESA2. From observations made in the field, there appears to be no justification for this conservation status mapping in this area. In my opinion, this area is extremely disturbed and degraded and has very low botanical and ecological value. I contend that the mapping of CBAs and ESAs here should be checked and changed to reflect the actual situation 'on the ground'. The same applies to the 'alternative dam site'. The ESA2 classification of the watercourse is, in my opinion, only tenuously valid since the watercourse is extremely degraded and not ecologically functional.

In my professional opinion, the two dam sites are some of the most degraded and ecologically compromised sites I have yet surveyed and the negative impacts of the proposed dam at either site would be **VERY LOW NEGATIVE**. Construction of a dam at either of the sites is therefore unconditionally supported from a botanical perspective.

13. References

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Report submitted: 12 December 2017

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
Impact nature	
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

Impact magnitude	
Extent	*On-site* – impacts that are limited to the boundaries of the rail reserve, yard or substation site. *Local* – impacts that affect an area in a radius of 20km around the development site. *Regional* – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem. *National* – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.
Duration	*Temporary* – impacts are predicted to be of short duration and intermittent/occasional. *Short-term* – impacts that are predicted to last only for the duration of the construction period. *Long-term* – impacts that will continue for the life of the Project, but ceases when the Project stops operating. *Permanent* – 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: *Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie. habitats, species or communities).* **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: *Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the Project.* **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.

Table7.6 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: Botanical Assessment Content Requirements of Specialist Reports, as prescribed by Appendix 6 of GN R326.

Regulation	Content as required by NEMA	Specialist Report Section/Annexure Reference
1 (1) (a)	Details of- (i) The specialist who prepared the report; and	Cover page and Page 2
	(ii) The expertise of that specialist to compile a specialist report, including a CV.	Page 2 and Appendix 3
1 (1) (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority.	Pages 3 & 4
1 (1) (c)	An indication of the scope of, and purpose for which, the report is prepared.	Pages 6 & 7
1 (1)(cA)	An indication of the quality and age of base data used for the specialist report.	Pages 7—25
1 (1)(cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change.	Pages 14—25
1 (1) (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment.	Page 13
1 (1) (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used.	Page 13; Appendix 1
1 (1) (f)	Details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives.	Pages 10, 11, 28—31
1 (1) (g)	An identification of any areas to be avoided, including buffers.	Not applicable
1 (1) (h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.	Pages 10, 11, 15, 16, 18, 19, 20, 23, 24, 25 & 27
1 (1) (i)	A description of any assumptions made and any uncertainties or gaps in knowledge.	Page 13
1 (1) (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities.	Pages 17—25
1 (1) (k)	Any mitigation measures for inclusion in the EMPr.	Page 30
1 (1) (l)	Any conditions for inclusion in the environmental authorisation.	Not applicable

Regulation	Content as required by NEMA	Specialist Report Section/Annexure Reference
1 (1) (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Not applicable
1 (1) (n)	A reasoned opinion- (i) whether the proposed activity, activities or portions thereof should be authorised; and	Page 31
	(iA) regarding the acceptability of the proposed activity or activities; and	Page 31
	(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Not applicable
1 (1) (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report	Not applicable
1 (1) (p)	A summary and copies of any comments received during any consultation process and where applicable, all responses thereto	Not applicable
1 (1) (q)	Any other information requested by the competent authority	Not requested

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
- Twelve 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:

- South Africa Association of Botanists
- 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 300 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