Botanical Assessment for the expansion of the existing quarry on Portion 1 of the Farm Bloedzuigerfontein Noord 782, Calvinia, Northern Cape Province

Botanical Surveys & Tours

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Report prepared for CCA Environmental

November 2014

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, 2010.

Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by CCA Environmental to provide specialist botanical consulting services for the Basic Assessment for the proposed expansion of the existing quarry on Portion 1 of the Farm Bloedzuigerfontein Noord 782, Calvinia, Northern Cape Province. The consulting services comprise an assessment of potential impacts on the flora and vegetation in the designated study area due to the proposed activities.

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 30 years' experience in the field of Vegetation Science.
- Founded Bergwind Botanical Surveys & Tours CC in 2006
- Has conducted over 300 specialist botanical / ecological studies.
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request)

Independence

The views expressed in the document are the objective, independent views of Dr McDonald and the survey 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

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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, 2010 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, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) 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 71 of GN No. R. 543.

Note: The terms of reference must be attached.

Signature of the specialist:

Bergwind Botanical Surveys & Tours CC

Name of company:

22 November 2014

Date:

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1. Introduction

A mine, which has now been abandoned, was established on Portion 1 of the Farm Bloedzuigerfontein Noord 782, Calvinia, Northern Cape Province. (It has been given the name 'Merino' for common usage. This name is used for reference in this report.) The mine focused on extracting Iceland Spar, a variety of the mineral calcite, which was used for precision optical instruments. According to Cairncross (2004) large masses of transparent (high grade) calcite several metres in diameter were found at this mine.

In 2011 the vegetation around the old mine site was surveyed (McDonald, 2011) to support the application for establishment a borrow pit. The intention was to use the spoil material from the mine for road-building material. The botanical investigation was to determine how the vegetation in the near vicinity of the old mine would be affected. The following year further botanical survey work was carried out (McDonald 2012) to support the application for expansion of the old mine into a formal quarry for dolerite rock material for road-building. The material was specifically required for the resurfacing of the R27 national highway between Nieuwoudtville and Calvinia in the Northern Cape Province.

A considerable amount of rock material was quarried from the area approved for the expanded quarry since it was found highly suitable as road-building material. The proposal by South African Roads Agency Limited (SANRAL) is to now treat the quarry as a 'strategic quarry' and extend it even further. For this purpose a further application is required which included a further survey of the site, particular the area of future expansion.

In this report the principles, guidelines and recommendations of CapeNature [Western Cape] (although the study is in the Northern Cape) and the Botanical Society of South Africa for proactive assessment of the biodiversity of proposed development sites are followed (Brownlie 2005, De Villiers *et al*. 2005). The assessment is also required to inform the environmental authorization process in terms of NEMA and the Environmental Impact Assessment Regulations, 2010.

2. Terms of Reference

Undertake the requisite field-work and compile a specialist report that considers the following:

- Provide a broad, baseline description of the vegetation of the study area, placing it in a regional context.

- Provide specific information relating to the vegetation of the study site, with reference to any species of special concern and their conservation status.
- Investigate ecological / biological processes that could be affected by the proposed project.
- Identify, describe and assess the impacts of the proposed activity alternatives on the vegetation.
- Determine the significance of the impacts of the proposed activity alternatives on the vegetation.
- Recommend appropriate, practicable mitigation measures that will reduce all major (significant) impacts or enhance potential benefits, if any.

3. Study Area

3.1 Locality

The quarry at Merino (Portion 1 of the Farm Bloedzuigerfontein Noord 782, Calvinia) is 35 km west-south-west of Calvinia as the crow flies (Figure 1). Access to the quarry is along the R364 road 4.3 km south of the R27. The quarry is 1.5 km south-eastwards along a farm track from the R364. Reference co-ordinates of the site are S 31°32'13.74" E 19°24'12.08".

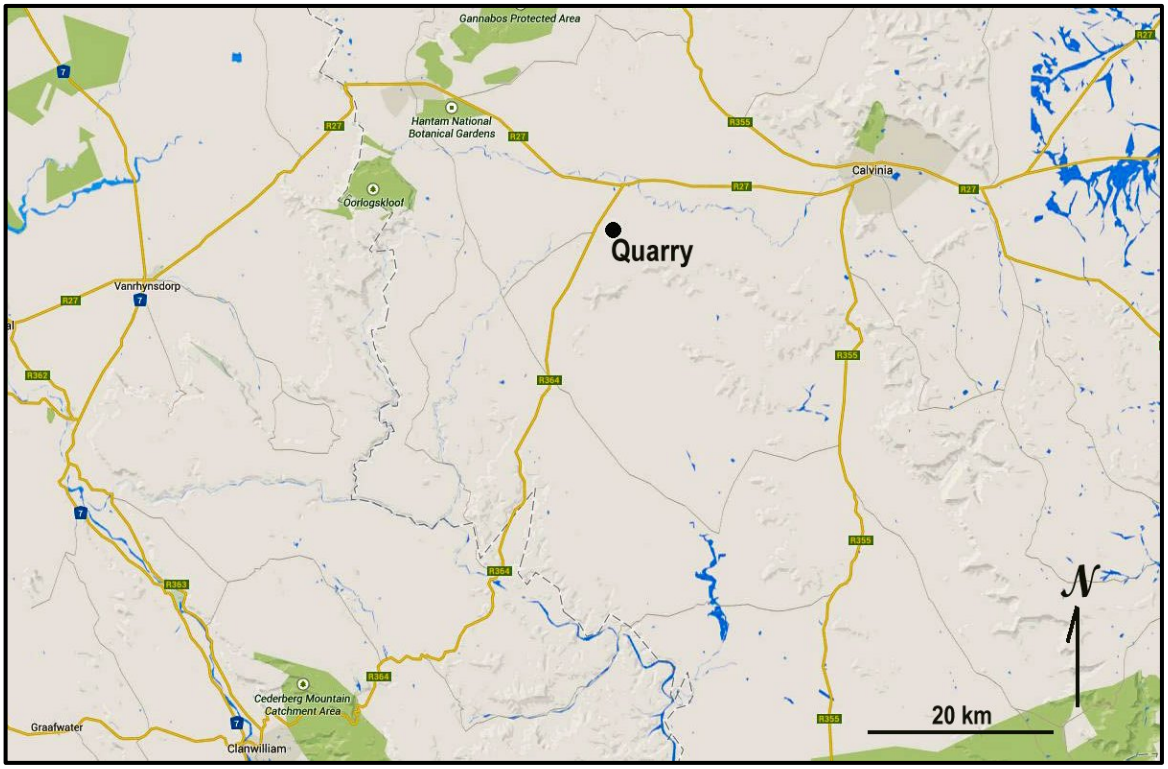

Figure 1. The location of the study area (Quarry) west-south-west of Calvinia in the southern part of the Northern Cape Province

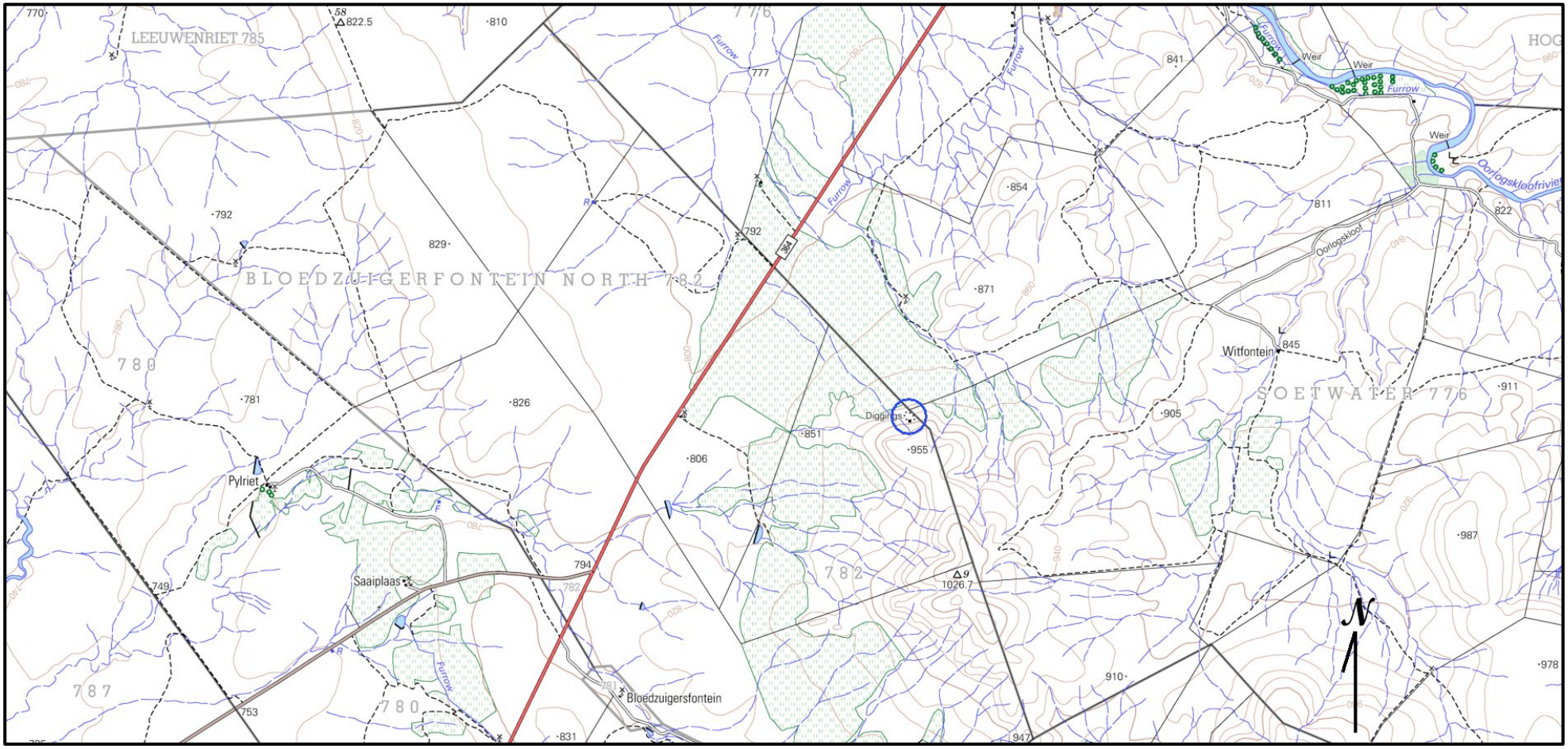

Figure 2. The location of the Merino Quarry at Portion 1 of farm Bloedzuigerfontein 782 (blue circle) on portion of the 1: 50 000 topographical map 3119CB Augustfonteinberge (Chief Directorate: National Geo-spatial Information)

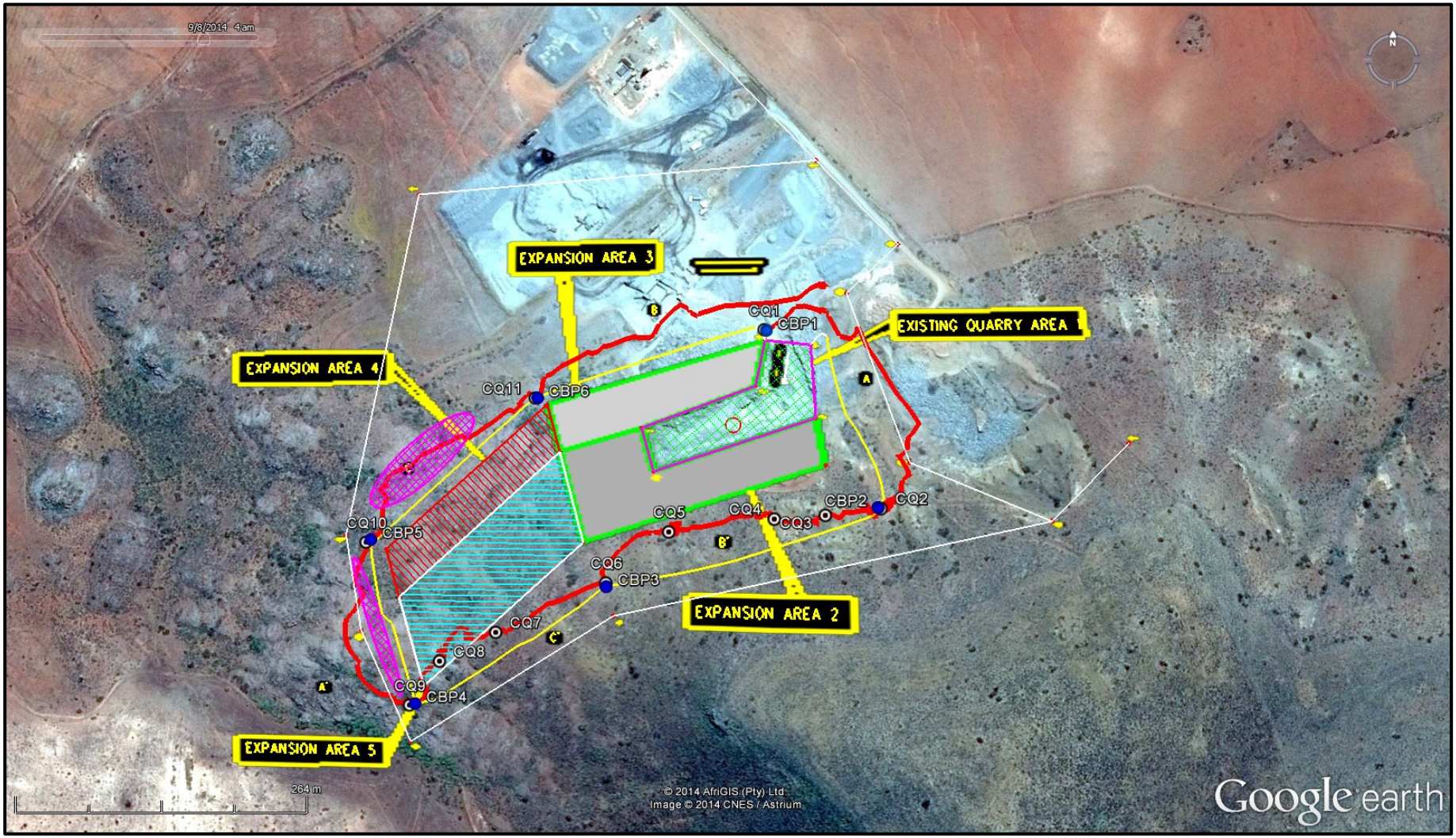

Figure 3. Aerial image (Google Earth ™) of the Merino Quarry showing the existing quarry and the intended expansion areas (phased). The botanical survey sample track is shown as a red line with waypoints CQ#. The corner points of the area surveyed are shown as waypoints CBP#.

3.2 Topography, Geology and Soils

The Hantam Karoo is underlain by sediments of the Karoo Supergroup (Ecca Group shales and Dwyka Group tillites). These sediments were intruded by igneous lava during the Jurassic Period to form dykes and sills of the Karoo Dolerite Suite. The dolerite dykes and sills now stand proud in the landscape as the softer sedimentary rock has eroded away. The dolerite-capped hills are now a prominent feature of the topography in the Hantam (Figure 4).

The quarry at Merino is located on the north side of a dolerite hill. The altitude of the site is between 860 and 920 m above mean sea level (a.m.s.l.) whereas the surrounding undulating plains are at roughly 800 m (a.m.s.l.).

The soil is shallow over bedrock (Mispah Form). The hard, weather-resistant dolerite is the rock sought after for quarrying.

Figure 4. Typical Hantam Karoo vegetation in foreground on shale-derived soils with dolerite boulders on the surface. Dolerite hills are seen in the background.

3.3 Climate

The climate of the quarry area at Merino is similar to that of Calvinia. It lies in a climate zone that experiences hot dry summers and cool, wet winters (May to August). Rainfall occurs in all months from March to December with low or very little rainfall in January and none in February (Figure 5). Mean Annual Precipitation (MAP) is around 189 mm (Figure 7).

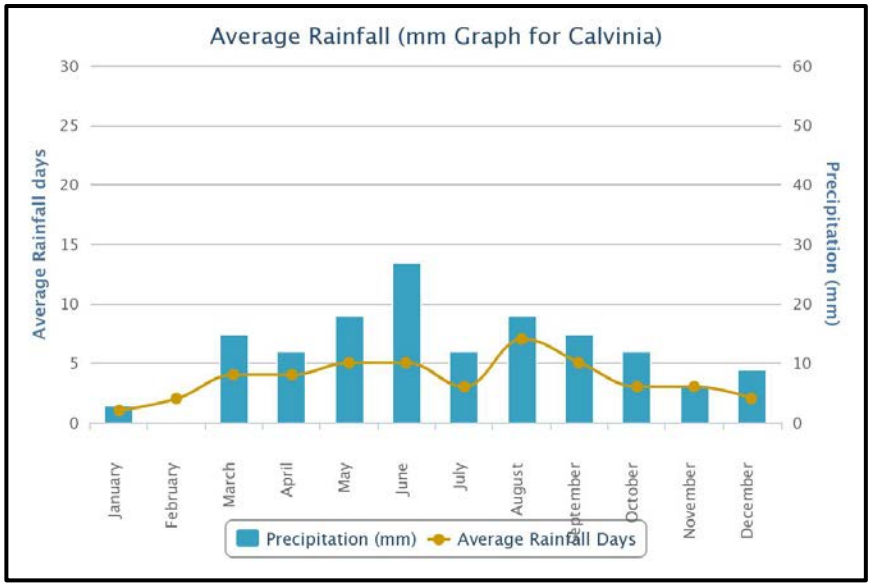

Figure 5. Graph of average monthly rainfall for Calvinia.

Source: http://www.worldweatheronline.com

Winters at Merino are cool to cold with night temperatures dropping to 3 °C in July (mid-winter) with daytime temperatures reaching 17 °C. Incidence of frost is high. January and February are the hottest months with daytime average maximum temperature of 29 °C (Figure 6).

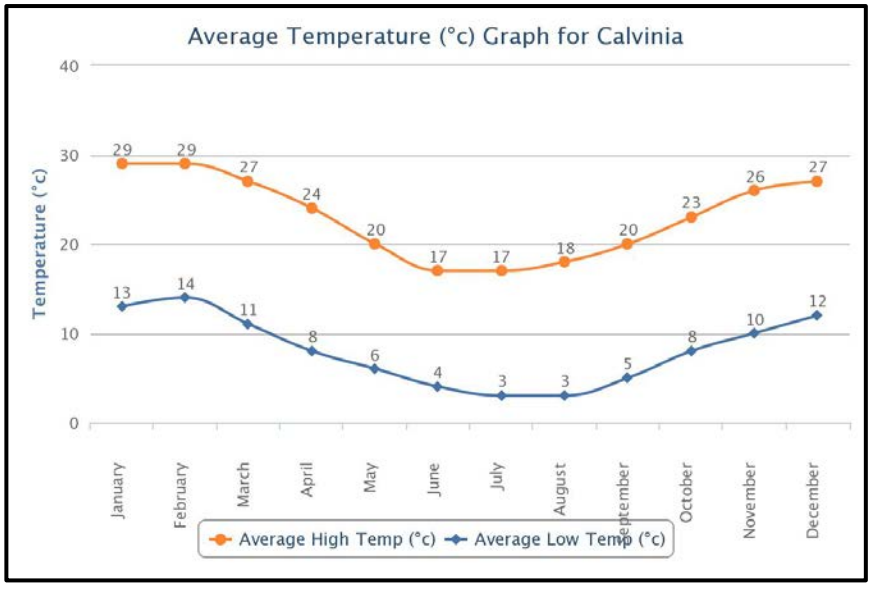

Figure 6. Graph of average monthly temperature for Calvinia.

Source: http://www.worldweatheronline.com

A climate diagram for Hantam Karoo presented by Mucina *et al.* (2006) (in Mucina & Rutherford, 2006) shows that mean annual potential evaporation (MAPE) is high (2558 mm). When compared with MAP this indicates that the climate is semi-arid which is well reflected in the type of vegetation found.

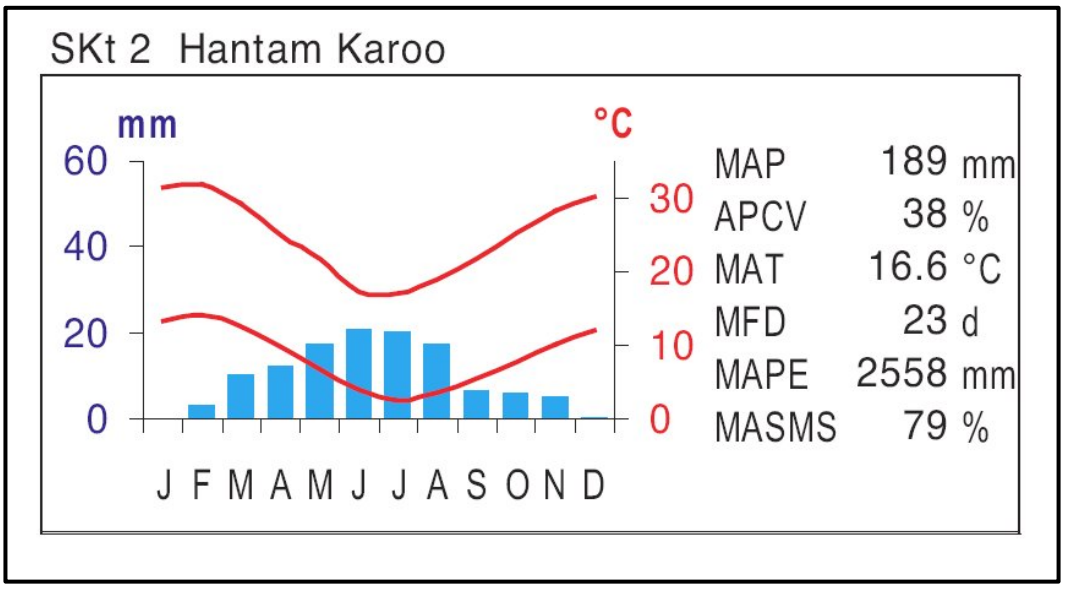

Figure 7. Climate diagram for Hantam Karoo (Mucina *et al.* 2006 in Mucina & Rutherford, 2006). The blue bars show the median monthly precipitation. The upper and lower red lines indicate mean daily maximum and minimum temperature respectively. MAP = Mean Annual Precipitation; ACPV = Annual Precipitation Coefficient of Variance; MAT = Mean Annual Temperature; MFD = Mean Frost Days; MAPE = Mean Annual Potential Evaporation; MASMA = Mean Annual Soil Moisture Stress.

4. Evaluation Method

The visits to the quarry site at Merino in 2011 and 2012 were in summer (November 2011) and early winter (May 2012) when the study area was very dry. Consequently the visit in 2014 was purposefully timed for spring (2 September 2014) to meet the criterion of a 'spring survey'. A rapid assessment, plot-less method was employed as is standard practice in similar surveys. A hand-held Garmin ® GPSMap 62s was used to record 'sample' waypoints of which there were 11. The route followed (sample track) on the site is shown in Figure 3. At the 'sample waypoints' details of the surrounding vegetation and features of habitat were recorded and photographs taken to support the general observations made. No attempt was made to cover the whole property but sampling was focused so as to obtain the best overall understanding of landscape and biodiversity conditions.

The expansion of the quarry is envisaged in five phases (Figure 3) so the botanical survey was carried out to encompass the entire area that would be affected by the ultimate extent of the quarry.

5. Limitations and assumptions

The vegetation of the study area was assessed in spring so season was not a limiting factor in the assessment. Geophytes (bulbs) and annuals were found. However, a single visit to a site, whenever it is undertaken, has its limitations. By using a habitat-based approach and with most of the shrubby vegetation identifiable, a high degree of confidence was achieved in the survey of the study area.

6. The Vegetation

6.1 General description

A single vegetation type is found in the study area. According to Mucina *et al.* (2005) and Mucina *et al.* (2006) the vegetation is Hantam Karoo (Figure 8). This is a widespread vegetation type in the Trans-Escarpment Succulent Karoo that is a sub-unit of the Succulent Karoo Biome.

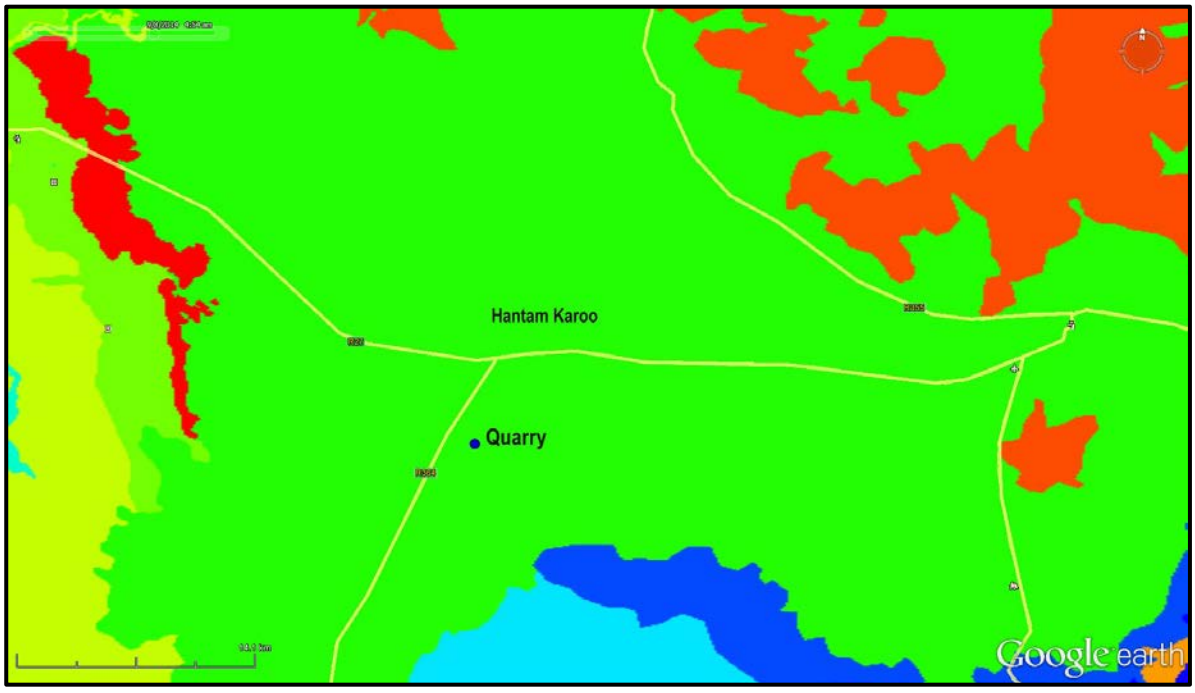

Figure 8. Portion of the Vegetation Map of South Africa, Lesotho and Swaziland (Mucina *et al.* 2005) indicating the position of the quarry at Merino in Hantam Karoo vegetation (extensive darker green).

Mucina *et al.* (2006) describe Hantam Karoo as a 'Dwarf Karoo Shrubland' with nearly equal proportions of succulent elements and low microphyllous karroid shrubs, particularly of the family Asteraceae'. Typical Hantam Karoo vegetation is illustrated in the foreground of Figure 4.

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6.2 The vegetation of the Merino Quarry site

The vegetation of the Merino Quarry site, although mapped as Hantam Karoo, is somewhat atypical of this vegetation and rather reflects shrubby plant communities found on upland, well-drained rocky site with shallow soils.

Two plant communities are found at the site. The first (Community 1) occurs on the upper north-facing slopes on shallow soils with a high component of rock and gravel but where bedrock is generally absent at the surface. The shrubs are low, ranging in height from 0.5 – 1 m in height with cover of 20 per cent (open). A sparse (< 5 per cent cover) lower stratum of herbaceous plants is found amongst the shrubs. This vegetation is well grazed by sheep and apart from the quarry, grazing is the main disturbance factor in the area.

The grazing has resulted in the vegetation Community 1 having an abundance of herbaceous species that reflect disturbance such as annual Asteraceae. Geophytes occur but are not abundant. This vegetation is best expressed at sample waypoints CQ2 and CQ4 (see illustrations in Table 1).

Some areas of Community 1 have already been disturbed by excavation and it is likely that a major part of this community would be impacted (lost) in the proposed future quarry expansion.

The second community (Community 2) is found in the south-western sector of the study area and was sampled at waypoints CQ5—CQ 11 with the best expression at waypoints CQ9 and CQ10 (see Table 1). This vegetation is found on rocky slopes with bedrock exposed at the surface and shallow soil in pockets amongst the rocks. Exfoliated dolerite blocks and slabs are common. The vegetation is dominated by tall shrubs such as *Didelta spinosa* and *Searsia* cf. *undulata*. Herbaceous plants are generally confined to cracks amongst the rocks where they benefit from moisture trapped in the cracks. Geophytes in the rock cracks are also safe from the attention of porcupines that cannot excavate the bulbs.

Figure 9. Geophytes (*Ornithogalum* sp.) in the cracks of the dolerite rock.

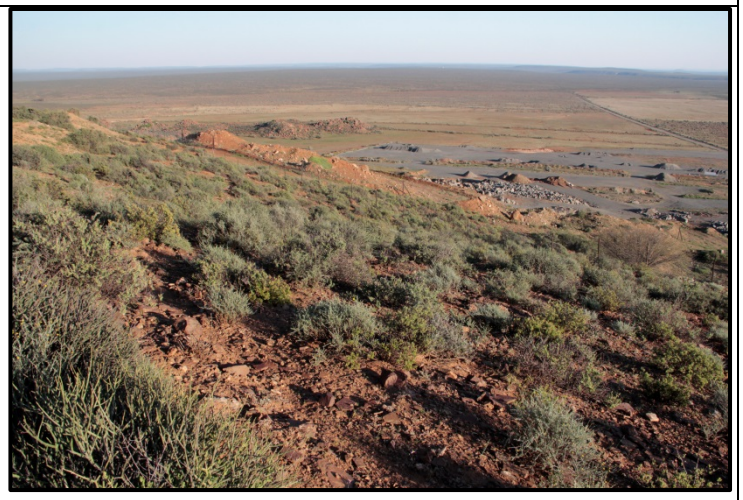
At waypoint CQ10 *Aloe microstigma* plants were located (with more found at S 31 32 20.9 E 19 23 58.8). This is not an uncommon species and is not threatened, however, all *Aloe* species are protected in the Northern Cape Province and a permit is required for their removal or relocation.

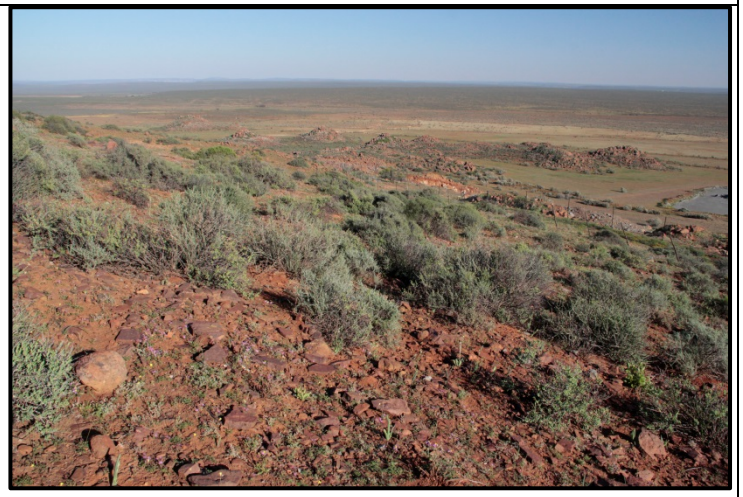
Figure 10. *Aloe microstigma* within the expanded quarry footprint at Merino.

The vegetation at the toe of the north-facing slope consists of an herbaceous layer (including some geophytes) with a low to mid-high shrub stratum. Species found here (waypoint CQ11) include *Aptosimum* sp., *Asparagus capensis, Dorotheanthus sp., Eriocephalus microphyllus, Hermannia paucifolia, Lebeckia cytisoides, Mesembryanthemum (Psilocaulon)* cf. *junceum, Pentzia incana, Pteronia divaricata, Stachys rugosa, Searsia cf. undulata, Tetragonia* cf. *sarcophylla* and *Zygophyllum chrysopteron.*

In general the vegetation in the area proposed for expansion of the Merino Quarry is not sensitive with any threatened species (species of conservation concern) encountered in the survey. It was reasoned by the author (McDonald, 2012) that given the high level of disturbance at the abandoned mine (and now even more disturbance since the further quarrying) and the intense grazing in the area it would be prudent to contain the disturbance in one area i.e. within the proposed expansion footprint than to recommend that another borrow pit should be opened elsewhere in similar dolerite koppie terrain. This view is supported here.

Table 1. Sample waypoints, brief notes and illustrations of the vegetation at the Merino Quarry.

Waypoint	Co-ordinates	Notes	Illustration
CQ1	S 31 32 16.5 E 19 24 11.4	At NE corner of expansion area. This area is completely disturbed by previous quarry work.	
CQ2	S 31 32 21.4 E 19 24 15.1	At corner CBP2 (see Figure 3) on upper slope above existing quarry and about mid-way upslope from the quarry fence. The immediate area at this waypoint is not disturbed by excavation but further along the slope to SW there has been excavation. The vegetation is a low, open shrubland with numerous succulents and herbaceous species.	

CQ3	S 31 32 21.6 E 19 24 13.3	This highly disturbed area lies between the corner locations CBP2 and CBP 3. It would be within the 'new' quarry expansion zone. The vegetation reflects the high level of disturbance with *Galenia sarcophylla*, *Oncosiphon* sp. and *Prosopis glandulosa* (mesquite) notable 'weedy' species.	
CQ4	S31 32 21.7 E 19 24 11.7	Vegetation in slightly better condition than at CQ3. Shows strong similarity to that at CQ2 (compare illustrations). The low, open shrubland is found all along the north-facing slopes on areas with shallow soil but with stony / rocky dolerite on the soil surface.	

CQ5	S 31 32 22.1 E 19 24 08.3	Rocky area with shallow soil. Shrubs are clumped together. The area is well grazed.	
CQ6	S31 32 23.5 E 19 24 06.3	At corner CBP3 (see Figure 3). The slopes below have the same plant community as found all along the north-facing slope. The terrain is more dissected here and there are more shrubs than usual. *Euphorbia* sp. is dominant.	

CQ7	S 31 32 24.9 E 19 24 02.7	On rocky mid-slopes with mostly dolerite boulders and sheet-rock. Shallow soil is found amongst the rocks.	
CQ8	S 31 32 25.8 E 19 24 00.8	On rock promontory towards the south end of the designated quarry site. The rocks are covered with crustose lichen (biogenic crust) indicating interception of moist air which condenses on the rocks. Numerous geophytes are found in the rock cracks but not a great diversity of species. The lower slopes of the koppie in the vicinity of CBP4 (see Figure 3) are much more shrubby.	

CQ9	S31 32 27.0 E 19 23 59.7	Mid-high to tall shrubs are found amongst the dolerite boulders where there is soil in areas between the exposed bedrock.	
CQ10	S31 32 22.5 E 19 23 58.2	This waypoint is near the corner location CBP5. The vegetation is typical of that found on the bedrock (rock slabs) and where there are large boulders. The importance of this location is the presence of *Aloe microstigma*. More aloes were found at the location S 31 32 20.9 E 19 23 58.8. These aloes must be rescued before excavation commences and replanted in suitable habitat that will not be disturbed.	

CQ11	S 31 32 18.4 E 19 24 03.8	At corner location CBP6 (see Figure 3). This waypoint is at the foot of the north-facing slopes near the old dynamite store. The shrubs amongst the rocks are dominated by *Didelta spinosa*.	

7. Conservation Status of the study site

Hantam Karoo vegetation is not considered to be a threatened ecosystem (Government Gazette, 2011). Desmet and Marsh (2008) mapped Critical Biodiversity Areas for the Namaqua District Municipality (Northern Cape Province). Superimposition of their map on a Google Earth ™ image indicates that the Merino Quarry is not within any Critical Biodiversity Area of Ecological Support Area (Figure 11).

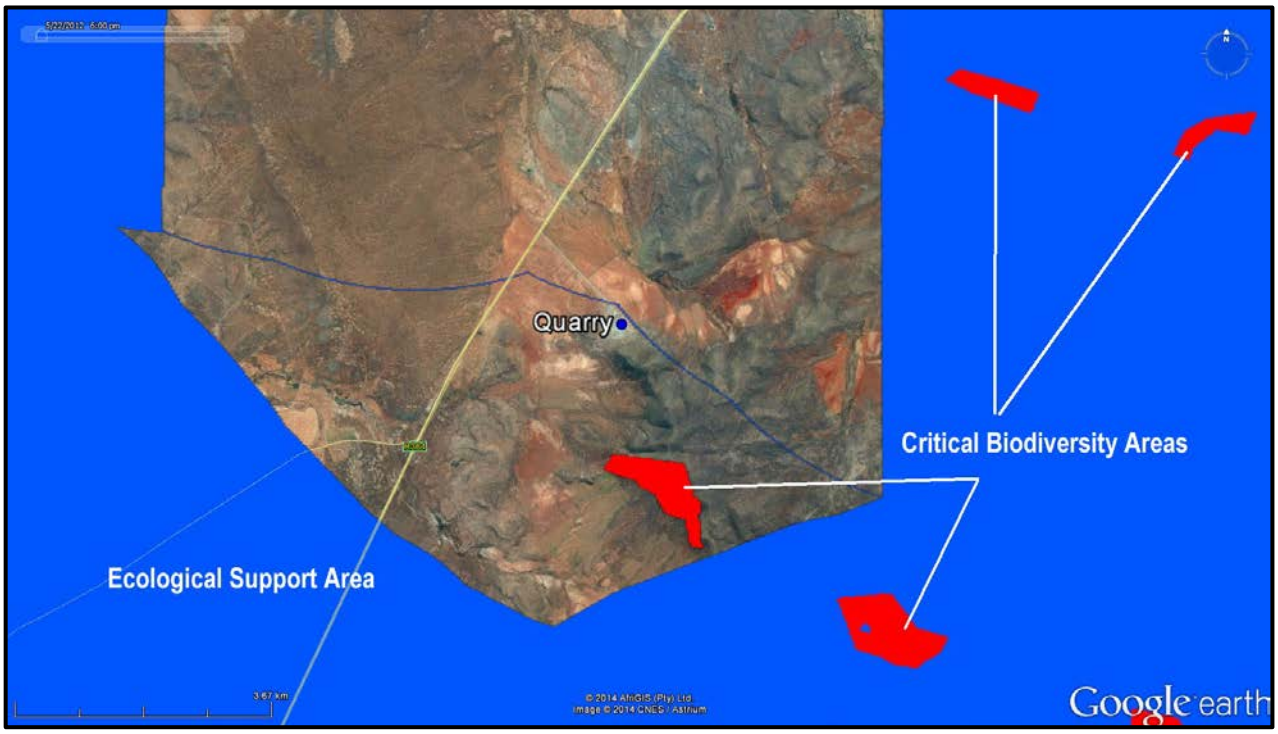


Figure 11. Closest Critical Biodiversity Areas (red) and Ecological Support Areas (blue) to the quarry at Merino.

8. Impact Assessment

8.1 Assessed impacts

The assessment of the impacts is considered as a whole for the Merino Quarry (i.e. all the expansion phases) and the 'No Go' alternative. There are no other alternatives

Three types of impacts are assessed:

- Direct impacts: Impacts occurring directly on the vegetation of the site as a result of the proposed quarry expansion.
- Indirect impacts: Impacts that are not a direct result of the proposed activity but occur away from the original source of impact.
- Cumulative impacts: impacts caused by several similar projects, related strategic actions and existing trends.

8.2 'No Go Alternative

With the 'No Go' option there would be no further quarrying of dolerite at Merino. In the short to long term the 'No Go' alternative would likely result in the *status quo* of moderate to heavy grazing of sheep persisting with a **Medium Negative** impact.

8.3 Direct Impacts

The impacts of further expansion of the Merino Quarry on the vegetation and habitat are considered for two identified potential impacts which are:

- Loss of vegetation type and habitat including plant species
- Loss of ecological processes.

8.3.1. Loss of vegetation type and habitat due to further expansion of the quarry at Merino

The quarry area as proposed for expansion is not botanically sensitive and has only moderate conservation value. Loss of this vegetation from the proposed expanded quarry area would result in a **Medium to Low Negative** impact on Hantam Karoo vegetation (Table 2). In addition this area is not within a Critical Biodiversity Area, Ecological Support area or migration corridor which lends support to the impact rating.

Table 2. Impact and Significance – Loss of Hantam Karoo vegetation due to further expansion of the Merino Quarry

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Long-term	Long-term
Intensity	Medium	Low
Probability	Highly probable	Highly probable
Confidence	High	High
Significance	Medium	Low
Cumulative impact	Low	Low
Nature of Cumulative impact	Loss of Hantam Karoo vegetation	
Degree to which impact can be reversed	Low	
Degree to which impact may cause irreplaceable loss of resources	Low	
Degree to which impact can be mitigated	Medium	

Mitigation

Subsequent to the most recent quarrying at Merino there was no effort made to rehabilitate any of the area where quarry and stockpiling operations took place. The result is a highly undesirable scar in the landscape. It is therefore recommended that in future the quarry area should be actively rehabilitated post-extraction and that topsoil (albeit limited) should be placed over disturbed surfaces to allow the vegetation to re-establish.

All *Aloe microstigma* plants within the expanded quarry footprint should be located prior to commencement of quarrying activities and relocated to safe sites in similar habitat on the dolerite koppie.
No other mitigation measures would be necessary since the vegetation is not a threatened type and is found on other dolerite hills in the near vicinity to the quarry.

8.3.2 Loss of ecological processes due to further expansion of the quarry at Merino

Ecological processes in the area of the existing quarry have been highly negatively impacted and this is likely to happen within the expanded quarry footprint as well. However, ecological processes operate over wide areas and other areas with similar habitat would continue to support

ecological processes that would be impaired in the quarry area. Consequently the ecological processes would not be completely lost. For this reason it may be argued that the expansion of the quarry would only have limited impact on ecological processes and consequently loss of ecological processes is rated as **Low Negative** (Table 3).

Table 3. Impact and Significance – Loss of ecological processes at the Merino Quarry due to its further expansion.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Long-term	Long-term
Intensity	Low	Low
Probability	Highly probable	Highly probable
Confidence	High	High
Significance	Low	Low
Cumulative impact	Low	Low
Nature of Cumulative impact	Loss of ecological processes within Hantam karoo vegetation	
Degree to which impact can be reversed	Low	
Degree to which impact may cause irreplaceable loss of resources	Low	
Degree to which impact can be mitigated	Low	

Mitigation

No mitigation would be possible or required to compensate for loss of ecological processes.

8.4 Indirect Impacts

No indirect impacts of the proposed Merino Quarry expansion on Hantam Karoo or other vegetation and habitats were identified.

8.5 Cumulative Impacts

As stated above, Hantam Karoo vegetation occurs over an extensive area and the dolerite hills or koppies do not harbour unique plant communities or endemic and threatened species with narrow distribution ranges. The quarry operation will cover a relatively small area when

compared with the vast extent of the vegetation type and although there would be local highly negative physical impacts, at a broader scale the quarry is a minor impact which would have low to very low cumulative impacts on Hantam Karoo.

9. Conclusions and Recommendations

- The natural vegetation type found at Merino Quarry as mapped by Mucina *et al*. 2005 and described by Mucina *et al.* (2006) is Hantam Karoo vegetation, a least threatened vegetation type according to the National Biodiversity Assessment (Driver *et al.* 2012) and the Government Gazette (2011).
- Direct impacts of the proposed extension of the quarry would be Medium Negative on the vegetation without mitigation but with mitigation (post-quarrying rehabilitation) the impacts could be reduced to Low Negative.
- Impacts on ecological processes would be Low Negative.
- No endemic or threatened (Red List) species were encountered in the botanical survey of the expanded Merino Quarry area.
- *Aloe microstigma*, although not endemic or threatened, is a protected species in the Northern Cape Province and a permit would be required for disturbance of plants of this species.
- Given the strategic need for road-building material, from a botanical viewpoint it is highly desirable to contain the extraction of such material in a single limited area rather than to excavate numerous borrow pits or quarries at different locations. This in itself is a mitigation measure and therefore the future quarry operation at Merino should be supported.

10. References

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Report submitted: 22 November 2014; revised 2 December 2014

Appendix 1: Species List

Albuca canadensis
Albuca namaquensis
Aloe microstigma
Aptosimum indivisum
Arctotis fastuosa
Asparagus capensis
Asparagus striatus
Atriplex cinerea
Atriplex lindleyi subsp. inflata
Bromus sp.
Bulbine alooides
Didelta spinosa
Dimorphotheca
Dimorphotheca sinuata
Drosanthemum sp.
Ehrharta sp.
Eriocephalus microphyllus
Erodium cicutarium
Euphorbia decussata
Felicia australis
Galenia sarcophylla
Hebenstreitia sp.
Heliophila sp.
Hermannia cuneifolia
Hermannia glabrata
Hermannia paucifolia
Hesperantha cucullata
Lachenalia aurioliae
Lebeckia cytisoides
Lycium amoenum
Thesium sp.
Mesembryanthemum noctiflorum
Mesembryanthemum (Psilocaulon) junceum
Microloma sagittatum
Moraea miniata
Oncosiphon suffruticosum
Ornithogalum multifolium
Ornithogalum sp.
Osteospermum clandestinum
Osteospermum pinnatum
Oxalis pes-caprae
Pentzia incana
Pteronia divaricata
Pteronia incana
Rhyncopsidium pumilum
Ruschia sp.
Searsia cf. undulata

Selago subspinosa
Senecio arenarius
Senecio cardaminifolius
Senecio sp.
Stachys rugosa
Tetragonia cf. sarcophylla
Trachyandra falcata
Zaluzianskya pumila
Zygophyllum cf. morgsana
Zygophyllum chrysopteron

Appendix 2: Convention for assigning significance ratings to impacts.

Specialists will consider seven rating scales when assessing potential impacts. These include:

- extent;
- duration;
- intensity;
- status of impact;
- probability;
- degree of confidence; and
- significance.

In assigning significance ratings to potential impacts before and after mitigation specialists are instructed to follow the approach presented below:

1. The core criteria for determining significance ratings are “extent” (Section 6.3.1), “duration” (Section 6.3.2) and “intensity” (Section 6.3.3). The preliminary significance ratings for combinations of these three criteria are given in Section 6.3.7.

2. The status of an impact is used to describe whether the impact will have a negative, positive or neutral effect on the surrounding environment. An impact may therefore be negative, positive (or referred to as a benefit) or neutral.

3. Describe the impact in terms of the probability of the impact occurring (Section 6.3.5) and the degree of confidence in the impact predictions, based on the availability of information and specialist knowledge (Section 6.3.6).

4. Additional criteria to be considered, which could “increase” the significance rating if deemed justified by the specialist, with motivation, are the following:

- Permanent / irreversible impacts (as distinct from long-term, reversible impacts);
- Potentially substantial cumulative effects (see Item 7 below); and
- High level of risk or uncertainty, with potentially substantial negative consequences.

5. Additional criteria to be considered, which could “decrease” the significance rating if deemed justified by the specialist, with motivation, is the following:
    - Improbable impact, where confidence level in prediction is high.

6. When assigning significance ratings to impacts *after mitigation*, the specialist needs to:
    - First, consider probable changes in intensity, extent and duration of the impact after mitigation, assuming effective implementation of mitigation measures, leading to a revised significance rating; and
    - Then moderate the significance rating after taking into account the likelihood of proposed mitigation measures being effectively implemented. Consider:
        - Any potentially significant risks or uncertainties associated with the effectiveness of mitigation measures;
        - The technical and financial ability of the proponent to implement the measure; and
        - The commitment of the proponent to implementing the measure, or guarantee over time that the measures would be implemented.

7. The cumulative impacts of a project should also be considered. “Cumulative impacts” refer to the impact of an activity that may become significant when added to the existing activities currently taking place within the surrounding environment.

8. Where applicable, assess the degree to which an impact may cause irreplaceable loss of a resource. A resource assists in the functioning of human or natural systems, i.e. specific vegetation, minerals, water, agricultural land, etc.

9. The significance ratings are based on largely objective criteria and inform decision-making at a project level as opposed to a local community level. In some instances, therefore, whilst the significance rating of potential impacts might be "low" or "very low", the importance of these impacts to local communities or individuals might be extremely high. The importance which I&APs attach to impacts must be taken into consideration, and recommendations should be made as to ways of avoiding or minimising these negative impacts through project design, selection of appropriate alternatives and / or management.

The relationship between the significance ratings after mitigation and decision-making can be broadly defined as follows (see overleaf): substance

Significance rating	Effect on decision-making
VERY LOW; LOW	Will not have an influence on the decision to proceed with the proposed project, provided that recommended measures to mitigate negative impacts are implemented.
MEDIUM	Should influence the decision to proceed with the proposed project, provided that recommended measures to mitigate negative impacts are implemented.
HIGH; VERY HIGH	Would strongly influence the decision to proceed with the proposed project.

1. Extent

"Extent" defines the physical extent or spatial scale of the impact.

Rating	Description
LOCAL	Extending only as far as the activity, limited to the site and its immediate surroundings. Specialist studies to specify extent.
REGIONAL	Western Cape. Specialist studies to specify extent.
NATIONAL	South Africa
INTERNATIONAL	

2. Duration

"Duration" gives an indication of how long the impact would occur.

Rating	Description
SHORT TERM	0 - 5 years
MEDIUM TERM	5 - 15 years
LONG TERM	Where the impact will cease after the operational life of the activity, either because of natural processes or by human intervention.
PERMANENT	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient.

3. Intensity

"Intensity" establishes whether the impact would be destructive or benign.

Rating	Description
ZERO TO VERY LOW	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
LOW	Where the impact affects the environment in such a way that natural, cultural and social functions and processes continue, albeit in a slightly modified way.
MEDIUM	Where the affected environment is altered, but natural, cultural and social functions and processes continue, albeit in a modified way.
HIGH	Where natural, cultural and social functions or processes are altered to the extent that it will temporarily or permanently cease.

4. Loss of resources

"Loss of resource" refers to the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable.

Rating	Description
LOW	Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected.
MEDIUM	Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way.
HIGH	Where the activity results in an irreplaceable loss of a resource.

5. Status of impact

The status of an impact is used to describe whether the impact would have a negative, positive or zero effect on the affected environment. An impact may therefore be negative, positive (or referred to as a benefit) or neutral.

6. Probability

"Probability" describes the likelihood of the impact occurring.

Rating	Description
IMPROBABLE	Where the possibility of the impact to materialise is very low either because of design or historic experience.
PROBABLE	Where there is a distinct possibility that the impact will occur.
HIGHLY PROBABLE	Where it is most likely that the impact will occur.
DEFINITE	Where the impact will occur regardless of any prevention measures.

7. Degree of confidence

This indicates the degree of confidence in the impact predictions, based on the availability of information and specialist knowledge.

Rating	Description
HIGH	Greater than 70% sure of impact prediction.
MEDIUM	Between 35% and 70% sure of impact prediction.
LOW	Less than 35% sure of impact prediction.

8. Significance

"Significance" attempts to evaluate the importance of a particular impact, and in doing so incorporates the above three scales (i.e. extent, duration and intensity).

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

Rating	Description
MEDIUM	Impacts could be EITHER: of ***high intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***medium intensity*** at a ***regional level*** in the ***medium term***; OR of ***high intensity*** at a ***regional level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***local level*** in the ***long term***; OR of ***low intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***regional level*** in the ***long term.***
LOW	Impacts could be EITHER of ***low intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***national level*** in the ***short term***; OR of ***high intensity*** at a ***local level*** and endure in the ***short term***; OR of ***medium intensity*** at a ***regional level*** in the ***short term***; OR of ***low intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***local level*** and endure in the ***medium term.***
VERY LOW	Impacts could be EITHER of ***low intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***regional level*** and endure in the ***short term***; OR of ***low to medium intensity*** at a ***local level*** and endure in the ***short term.***
INSIGNIFICANT	Impacts with: Zero to very low intensity with any combination of extent and duration.
UNKNOWN	In certain cases it may not be possible to determine the significance of an impact.

9. Degree to which impact can be mitigated

This indicates the degree to which an impact can be reduced / enhanced.

Rating	Description
NONE	No change in impact after mitigation.
VERY LOW	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact.
LOW	Where the significance rating drops by one level, after mitigation.
MEDIUM	Where the significance rating drops by two to three levels, after mitigation.
HIGH	Where the significance rating drops by more than three levels, after mitigation.

10 Reversibility of an impact

This refers to the degree to which an impact can be reversed.

Rating	Description
IRREVERSIBLE	Where the impact is permanent.
PARTIALLY REVERSIBLE	Where the impact can be partially reversed.
FULLY REVERSIBLE	Where the impact can be completely reversed.

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:** 082-8764051 **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
- Nine 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 400 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