

- 12.9 The contact details for local Fishery Control Officer(s) are provided in Table 1. Should the relevant contact details change during the course of the validity period of this permit, then the Department will update the relevant contact details accordingly and notify the Permit Holder.

Table 1. Fishery Control Officer (FCO) Representatives

OFFICIAL NAME	REGION	TELEPHONE	E-MAIL
1. Buyekezwa Polo	Western Cape	(021) 402 3110	BuyekezwaP@daff.gov.za
2. Wade Theron	Saldanha	(022) 714 1710	WadeT@daff.gov.za
3. Dakalo Gabisi	Gansbaai	(028) 364 0235	DakaloG@daff.gov.za
4. Nomonde Simon	Hermanus	(028) 312 2609	NomondeS@daff.gov.za
5. Mphakamisi Fifana	East London	(043) 722 2091	MphakamisiF@daff.gov.za
6. Dennis Mostert	Port Elizabeth	(041) 585 4051	DennisM@daff.gov.za
7. Zameka Mphangwa	Northern Cape	(027) 851 8363	ZamekaM@daff.gov.za

13. TRACEABILITY AND FOOD SAFETY

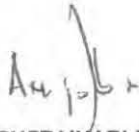
- 13.1 The Permit Holder shall be obliged to comply with traceability protocols implemented by the Department for food safety and compliance purposes, where applicable.
- 13.2 The Permit Holder shall adhere to the South African Molluscan Shellfish Monitoring and Control Programme. For additional information you may access the programme manual available on the website www.daff.gov.za or contact the Directorate: Sustainable Aquaculture Management (SAM), Shellfish Monitoring and Control Programme, John Foord, tel. (021) 430 7003/ 7065 and e-mail SAMSanitation@daff.gov.za.
- 13.3 The Permit Holder shall complete the relevant sections of the movement document obtained from the Department when transporting live shellfish in accordance with the South African Molluscan Shellfish Monitoring and Control Programme. For further enquiries please contact the Directorate: Sustainable Aquaculture Management (SAM), Shellfish Monitoring and Control Programme, John Foord, tel. (021) 430 7003/ 7065, fax (021) 434 2899 and e-mail SAMSanitation@daff.gov.za.

14. FISH PROCESSING ESTABLISHMENT (If applicable)

- 14.1 Any fish processing shall be subject to specific conditions as set out in **Section B** of the **Marine Aquaculture Fish Processing Establishment (FPE)** permit conditions.
- 14.2 The Permit Holder shall only allow such fish to be processed at an authorised Fish Processing Establishment (FPE) which has a valid marine aquaculture processing permit and is authorised to process cultured species.

15. VALIDITY OF PERMIT

- 15.1 This permit shall automatically expire and become invalid should the Right allocated by the Minister or his/her delegate be cancelled or revoked in terms of Section 28 of the Act.
- 15.2 The Permit Holder shall submit a renewal application on notification prior to expiry of this permit to the Department.
- 15.2 This permit shall be valid from the date stipulated in **Section A** until **31 December 2016**.



DIRECTOR: SUSTAINABLE AQUACULTURE MANAGEMENT

DATE: 2015/12/14

ANNEXURE 3C. ABALONE RANCHING PERMIT CONDITIONS: HARVESTING OF RANCHED ABALONE (ANNEXURE R4) 2016

ANNEXURE R4: HARVESTING OF RANCHED ABALONE - NORTHERN CAPE 2016

2. SPECIFIC CONDITIONS

2.1 LIMITATIONS AND RESTRICTIONS

(a) This permit is only valid for harvesting of ranched abalone (*Haliotis midae*) as per **Section A**.

2.2 STOCK MOVEMENT

(a) Relocation of ranched abalone for the purpose of grow out shall not be allowed.

2.3 HARVESTING AND LANDING

(a) The Permit Holder shall only harvest abalone in consultation with the Department. This consultative process will be limited to compliance to the requirements of the permit and the Right granted. The Permit Holder shall undertake an annual stock assessment of the seeded area, which shall be conducted by an independent practitioner in consultation with the Department's Directorate: Inshore Fisheries Research, tel. (021) 402 3203, fax (021) 402 3034 and e-mail GenevieveM@daff.gov.za.

(b) The Permit Holder shall inform the local Fishery Control Officer (FCO) at least 24 hours prior to harvesting of abalone within the seeded area.

(c) The Permit Holder shall undertake harvesting on working days from 08h00 to 15h00 (excluding weekends and public holidays) so that the harvested stocks may be inspected by the local Fishery Control Officer (FCO).

(d) The Permit Holder shall contact the local Fishery Control Officer (FCO) and the Directorate SAM 24 hours prior to harvesting if required to harvest outside the stipulated time frame in clause 2.3 (h) above.

(e) The Permit Holder shall ensure that any stock harvested or landed outside the stipulated harvesting time frame is held in wet storage until the end of the next working day. If the local Fishery Control Officer (FCO) is not available for inspection then processing of the harvested abalone may proceed without supervision.

(f) The Permit Holder shall only commence with harvesting after providing the Fishery Control Officer (FCO) in the area with full details of the diver(s), the exact site location, the time he/ she expects to commence harvesting and the expected time of landing if applicable.

(g) The Permit Holder shall land all abalone in a whole state (i.e. not shucked) even if shell damage was incurred during the process of harvesting.

(h) The Permit Holder shall not simultaneously collect any other species, or engage in fishing or any other activity, when harvesting abalone in terms of this permit. Abalone Ranching Permit Conditions: Harvesting of Ranched Abalone (Annexure R4) 2016

(i) The Permit Holder shall ensure that harvesting is undertaken by diver(s) registered with the Department. Diver(s) shall at all times have positive proof of identification with him/her when harvesting or transporting abalone. A maximum of twenty (20) registered divers may be nominated as indicated in **Section A**, where applicable.

(j) The Permit Holder shall ensure that an enforcement plan is in place to monitor and enforce issues related to access and legal harvesting.

2.4 HARVESTING AND PROCESSING

(a) The Permit Holder shall comply with clauses 11.3 and 13.2 and of the Standard Abalone Ranching permit conditions 2015.

(b) The Permit Holder shall request the Fish Processing Establishment (FPE) to keep the shells after shucking the abalone, for later determination of size composition of the catch by the Department. Arrangements shall be made for the inspection of these shells by the Directorate: Inshore Fisheries Research, tel. (021) 402 3203, fax (021) 402 3034 and e-mail GenevieveM@daff.gov.za.

2.5 RECEIPT AND MARKETING

(a) Ranched abalone harvested in terms of **Section A** may be sold and marketed.

(b) The Permit Holder shall keep a copy of all original invoices issued for any sale of cultured abalone from the establishment for no less than 60 (sixty) months and such invoices shall contain at least the following details:

(i) The names and addresses of the parties to the transaction;

(ii) the name of the product;

(iii) the date of delivery/receipt; and

(iv) the quantity (number or mass) of product sold.

2.6 VALIDITY OF PERMIT

(a) This permit shall automatically expire and become invalid should the Right allocated by the Minister or his/her delegate be cancelled or revoked in terms of Section 28 of the Act.

(b) The Permit Holder shall submit a renewal application on notification prior to expiry of this permit to the Department.

(c) This permit shall be valid from the date stipulated in **Section A**. Abalone Ranching Permit Conditions: Harvesting of Ranched Abalone (Annexure R4) 2016

APPENDIX 3D. ABALONE RANCHING PERMIT CONDITIONS: SEEDING OF ABALONE FOR RANCHING - NC (ANNEXURE R2) 2016

ANNEXURE R2: SEEDING OF ABALONE FOR RANCHING – NORTHERN CAPE 2016

2. SPECIFIC CONDITIONS

2.1 LIMITATIONS AND RESTRICTIONS

(a) This permit is only valid for seeding of abalone (*Haliotis midae*) as per **Section A**.

(b) The following table includes the boundary and co-ordinates of the Northern Cape ranching concession areas:

Table 1. Boundaries and co-ordinates (i.e. latitude and longitude) of the Northern Cape ranching concession areas NC 1 – NC 4.

AREA	BOUNDARY		LATITUDE	LONGITUDE
NC 1	NC 1a	Boegoeberg Noord	28°45'41,35"S	16°33'41,93"E
	NC 1b	Beach north of North Point	29°14' 7,65" S	16°51'14,08"E
NC 2	NC 2a	Rocks outside south end of McDougall Bay	29°17'34,23"S	16°52'32,08"E
	NC 2b	Rob Island	29°43' 7,12"S	16°59'50,45"E
NC 3	NC 3a	Beach at Kleinzee	29°40'43,9"S	17° 3' 3,5" E
	NC 3b	Swartduine	30° 2'52,04S	17°10'39,69E
NC 4	NC 4a	Skulpfontein	30° 6' 8,15S	17°11' 8,03E
	NC 4b	2 small rocks 200m from shore	30°25'56,26"S	17°20' 5,43E

(c) Seeding of abalone for ranching shall only take place between sunrise and sunset. The Permit holder shall inform the local Fishery Control Officer (FCO) at least 24 hours prior to undertaking any seeding operations.

(d) The Permit Holder shall ensure that a baseline survey is conducted by an independent specialist in consultation with the Department in order to quantify existing wild fauna and flora, prior to the seeding of abalone in the ranching concession area.

Abalone Ranching Permit Conditions: Seeding of Abalone for Ranching - NC (Annexure R2) 2016

(e) The Permit Holder shall ensure that the carrying capacity (stocking density) of the seeded area is assessed and evaluated annually by an independent specialist in consultation with the Department.

(f) The Permit Holder shall ensure that a record of all seeded animals is provided to the Department on a monthly basis, which should be forwarded to the Directorate: Sustainable Aquaculture Management (SAM), Zimasa Jika, tel. (021) 402 3356 and e-mail ZimasaJ@daff.gov.za.

(g) The Permit Holder shall only commence with seeding after providing the local Fishery Control Officer (FCO) with full details of the diver(s), the exact site location, the time he/she expects to commence seeding and the expected time of landing if applicable.

(h) The Permit Holder shall ensure that seeding is undertaken by diver(s) registered with the Department. Diver(s) shall at all times have positive proof of identification with him/her when seeding or transporting abalone. A maximum of twenty (20) registered divers may be nominated as indicated in **Section A**, where applicable.

2.2 ANIMAL MOVEMENT: DISEASES

(a) The Permit Holder shall ensure that quarantine procedures are implemented such as described in the ICES Code of Practice on the Introduction and Transfer of Marine Organisms 2004 (ICES 2004) when undertaking seeding operations.

(b) The Permit Holder shall comply with clause 10.1 and 10.2 of the Standard Marine Aquaculture permit conditions 2015 and provide proof of written notification for animal movement.

2.3 SPECIAL CONDITIONS: ABALONE DISEASE CONTROL

(a) All suspected cases of Abalone Tubercle Mycosis or unexplained mortalities shall be reported to the Department within 24 hours. For attention of the Directorate: Sustainable Aquaculture Management (SAM), Aquaculture Animal Health and Environmental Interactions, Sasha Saugh, tel. (021) 430 7052/ 7076, fax (021) 434 2899 and e-mail AquaHealth@daff.gov.za.

(b) The Permit Holder shall obtain approval from the Department prior to seeding and ensure that all abalone spat to be seeded at the ranching site show no clinical signs of disease.

Abalone Ranching Permit Conditions: Seeding of Abalone for Ranching - NC (Annexure R2) 2016

2.4 VALIDITY OF PERMIT

- (a) This permit shall automatically expire and become invalid should the Right allocated by the Minister or his/her delegate be cancelled or revoked in terms of Section 28 of the Act.
 - (b) The Permit Holder shall submit a renewal application on notification prior to expiry of this permit to the Department.
 - (c) This permit shall be valid from the date stipulated in Section A.
-

APPENDIX 4: FINANCIAL ANALYSIS OF THE DCA ABALONE RANCHING VENTURE – JUNE 2015

The following is a summary of the financial model developed by DCA (in part only) that formed the basis for the proposed Abalone ranching in Zone 4. Only information considered pertinent to this report are reproduced

There are many reasons to pursue the potential for abalone ranching in South Africa. The projected internal rate of return of a full commercial 90 ton abalone ranching venture is conservatively expected to be around 26.8%. The forecast earnings before interest, tax and depreciation (EBITDA) margin, around 64%, indicates a very high level of profitability from the operational side of the business.

The relevance of the model in practice will, however, be influenced by and be directly linked to the actual decisions made by Diamond Coast Abalone when they implement the full commercial venture and by the operational decisions of its management. In the long term, sustained growth in earnings will depend on the complementary and mutually supportive functioning of many factors, including maintaining suitable and secure ranching habitats, security of tenure, efficient farming procedures, sought-after products on reliable markets and the ability to maintain margins.

Funding requirement

Total financing of R 39 million is required over the initial 6 years before the project breaks even on a cash flow basis and includes capital expenditure of R 8.6 million. A key aspect of the project is that production has been conservatively phased, with 25 000 spat seeded per month in the first year, 100 000 spat per month in the second year and 200 000 spat per month thereafter. This is due to limited spat availability expected initially. Some abalone sales from the spat seeded during the pilot phase occur during years 2, 3 and 4. The first sales of abalone seeded from 2017 onwards only commence in year 5. The project reaches full production in year 7, where after sales stabilize at 91 tons per year.

Overheads (excluding depreciation and interest) are initially around R 4.2 million and then increase to R 7.9 million in year 4 when a second dive team is added. This results in a negative EBITDA during the first 4 years (except that it is positive in year 3 due to sales from the pilot project).

A key risk and cost factor is that abalone spat must be purchased and seeded in the ocean. It is then only harvested and sold 5 years later. If the volume of spat purchased is decreased it will negatively impact on later sales and profitability. Lower spat prices improve profitability but do not significantly change the financing requirement. Other major annual cost items are salaries and wages (R 2.7 million) and security (R 1.8 million).

In conclusion, while the DCA abalone ranching venture requires substantial funding, it shows very high levels of profitability albeit with correspondingly high levels of risk. The main risk relates to the start-up nature of the sea-based production component of the business and the largely untested nature of some of the underlying assumptions. The business has limited income for the initial 4 years and only comes into full production in year 7. There is a high risk associated with ranching abalone in the sea with the related uncertainty on mortality / harvest recovery rates. The business will be most exposed around year 5 and 6 by when it would have spent almost R 39 million and be on the verge of harvesting the first large abalone that were seeded at the start of the expansion phase. It must, however, be recognized that the pilot project will mitigate many of the abovementioned risks and be of tremendous benefit to the full commercial venture. This upside has not been built into the analysis. The business has relatively low fixed capital requirements and extremely high margins and profitability once in full production. The business should therefore over time provide very high levels of returns that compensate for the initial high risk.

Production volume

The model assumes production of an ultimate average animal harvest size of 175g. It assumes a total ultimate per annum spat input of 200 000 spat per month (from year 3 onwards). This results in a total round weight production volume of 91 tons per annum from year 7 onwards. On current (conservative) carrying capacity estimates, a 91 ton production output would require at least 107 hectares of suitable habitat. Note that the model reduces seeding to 25 000 spat per month in year 1 and 100 000 spat per month in year 2 because of an expected initial shortfall in spat availability.

Production cycle

The model is based on a monthly spat input cycle. Diamond Coast Abalone buys 10 mm spat and grows the spat to seeding size in its land-based system. The seeding size of spat is very important as it is expected to significantly influence harvest recovery rates. In addition spat costs are a key cost item. In this regard various scenarios were tried on the model to determine the optimal seeding size and it was ultimately assumed that the project would stock 30 mm spat. The model assumes an abalone growth rate of 1.3 mm shell length per month, based on an adjusted natural mass length relationship algorithm. Based hereon, seeded abalone reach a harvest size of 175 g after 51 months.

Production costs and overheads

The major cost elements in abalone ranching are spat, processing, salaries and wages (including divers), security as well as the cost of environmental monitoring. The assumed spat price is R 1.30 for 10 mm spat, in line with the current industry average price. Processing costs are based on current SPP Canning costs at R 35.62 / kg. The cost for environmental monitoring was obtained from an actual quote. The model incorporates an inflation rate of 6% per year.

Mortality / harvest recovery

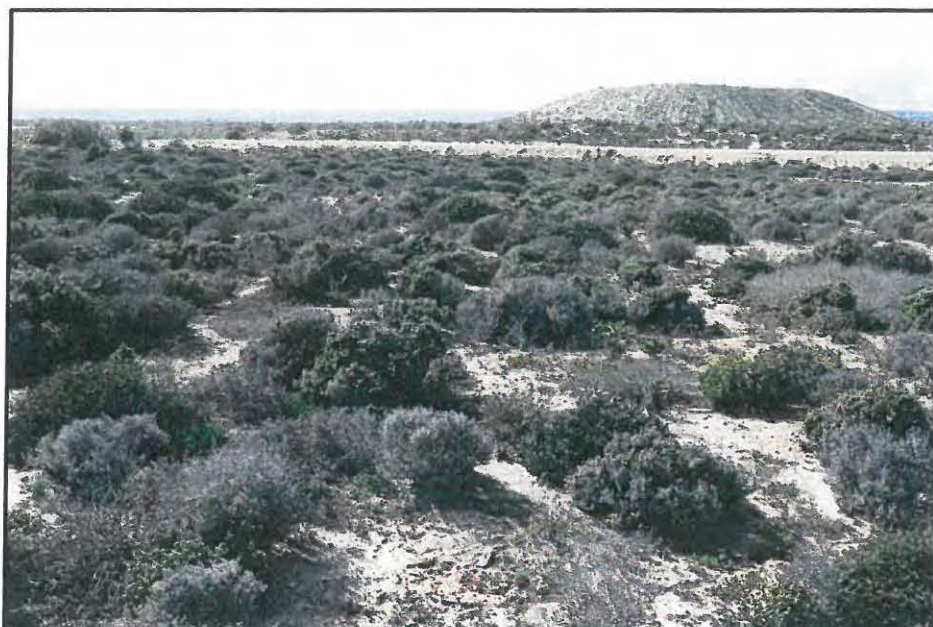
Haliotis midae appear to be relatively resistant to bacterial infections, even when subjected to trauma and other factors that predispose them to such infections and microbial, nutritional and other diseases of cultured abalone are limited. Accordingly the primary cause of mortalities is expected to be predation and theft, with dispersal also affecting recovered harvest volumes. The model incorporates previously published natural mortality data, with an expected mortality rate of 50% in year 1, 30% in year 2 and 20% per year thereafter. This results in an ultimate harvest recovery rate of 20.9%.



WEST COAST RESOURCES (PTY) LTD
KOINGNAAS AND SAMSONS BAK COMPLEX
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

3. Biodiversity study

Biodiversity Assessment for the renewal of Environmental Authorisation for West Coast Resources, Koingnaas Mine, Koingnaas, Northern Cape



Dr David J. McDonald
Bergwind Botanical Surveys & Tours CC.
14A Thomson Road, Claremont, 7708
Tel: 021-671-4056
Fax: 086-517-3806

Prepared for Myezo Environmental Management Services

September 2016

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.

Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by Myezo Environmental Management Services to provide specialist botanical consulting services for renewal of the Environmental Authorisation for the Koingnaas Mine (West Coast Resources) Northern Cape Province. This aspect comprises an assessment of potential impacts on the flora and vegetation in the designated study area by the proposed future mining. In addition, Simon Todd of Simon Todd Consulting was appointed to undertake a concurrent faunal study. These two aspects of the project together constitute a biodiversity study as reported here, that is a combination of the botanical and faunal studies.

Details of Specialist

Dr David J. McDonald Pr. Sci. Nat.
Bergwind Botanical Surveys & Tours CC
14A Thomson Road
Claremont
7708
Telephone: 021-671-4056
Mobile: 082-876-4051
Fax: 086-517-3806
e-mail: dave@bergwind.co.za
Professional registration: South African Council for Natural Scientific Professions No. 400094/06

Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 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)

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.

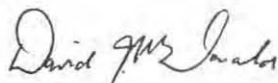
This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of the report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions 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 and any specific environmental management Act;
- have and will not have any 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 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 Section 49A of NEMA.

Note: The terms of reference must be attached.



Signature of the specialist:

Bergwind Botanical Surveys & Tours CC

Name of company:

6 September 2016

Date:

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INTRODUCTION

INTRODUCTION

Myezo Environmental Management Services (Myezo) was appointed by West Coast Resources (WCR) to carry out an Environmental Assessment process to support an application for renewed authorisation for future mining at Koingnaas Mine in the Kamiesberg Local Municipality, Namaqua District Municipality, Northern Cape Province. For this purpose, a study of the biodiversity of the proposed future mining areas was required. As reported here the study comprises an appraisal of the vegetation in the Koingnaas Mine study area (defined below) together with a faunal study, including avifauna.

Bergwind Botanical Surveys and Tours CC was appointed by Myezo to conduct a botanical assessment of the study area and Simon Todd Consulting was commissioned to conduct a faunal study. The main objective of the assessment was to describe the biodiversity of the environment of the mining rights areas at Koingnaas and to determine if there are any 'red-flags' that would require a precautionary approach. If present, the 'red flags' should be included in the Environmental Management Programme (EMPr) when mining operations commence.

The assessment takes careful note of the requirements and recommendations of the Department of Environment Affairs and Nature Conservation, Northern Cape (DENC) and the Botanical Society of South Africa for proactive assessment of biodiversity of sites where there is a proposed change of land use or potential impact (positive or negative) on natural vegetation and fauna. The study follows published guidelines for evaluating potential impacts on the natural environment in an area earmarked for some form of development (Brownlie 2005, De Villiers *et al.* 2005). **Particular note was taken of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) and Regulations (2011).**

This report comprises two sections. **A.** Botanical Assessment and **B.** Faunal Assessment. Each section is a stand-alone assessment with a general summary and conclusions at the end of the report.

The Terms of Reference for the Biodiversity Study as supplied by Myezo are as follows:

SPECIFIC TERMS OF REFERENCE (TOR) FOR BIODIVERSITY (from Myezo Environmental Consulting Services).

- Review of existing data and surveys of the proposed areas to be disturbed to determine vegetation/habitat types, dominant fauna and flora species, as well as rare/endangered/threatened/invasive/alien species - plants/animals that are

protected by law - also indicate any plants used for medicinal or cultural purposes - map/GPS locations - plants that might be sacred;

- Broad-scale structural classification of the vegetation into homogeneous units;
- Describe dominant and characteristic species identified within the broad-scale plant communities comprising each of these units. These descriptions will be based on visual estimates of cover/abundance and density following established vegetation survey techniques;
- Map plant communities and describe dominant and characteristic species within these communities;
- GPS and map rare/endangered species;
- Describe each vegetation unit in terms of its sensitivity, biodiversity value and conservation importance;
- Provide recommendations on aspects such as management of threatened plant species and communities, eradication / control of alien invasive species;
- Recommend species for protection *in situ*, translocation or use in rehabilitation practices.
- Develop a Biodiversity Management Plan in terms of National Environmental Management: Biodiversity Act, No.10 of 2004;
- Profile aquatic systems and characterize fauna and flora
- Determine biodiversity potential of the affected areas and provide measure on how they could be avoided
- All the mapping should be overlaid over the surface infrastructure layout plan which will be provided.
- Provide mitigation measures to alleviate or reduce the determined impacts.
- Provide a cost assessment of the proposed mitigation measures, costing estimates of how much the implementation of each mitigation measure will cost.

A. BOTANICAL ASSESSMENT OF THE KOINGNAAS MINING RIGHTS AREAS

A1. TERMS OF REFERENCE AND SITE DESCRIPTION

A1.1 TERMS OF REFERENCE

The terms of reference for the botanical study are summarized, providing the essential elements, from the above as follows:

- To broadly describe the terrestrial vegetation and flora of the study area that will be affected by the proposed future mining;
- To provide a description of possible impacts (direct, indirect and cumulative) that are anticipated;
- To assess cumulative impacts of the proposed mining on the flora and vegetation.
- To recommend appropriate and practical mitigation measures to minimize the negative impacts and maximize potential benefits associated with the mining; and
- To highlight any 'red flags' that would need to be observed to minimize impacts on the vegetation and flora.

A1.2. Location

The study area is located in Namaqualand in the Kamiesberg Municipality, Namaqua District Municipality, Northern Cape Province. It lies on the Namaqualand West Coast, around Koingnaas and north to Samson's Bak and south of Hondeklip Bay at Rooiwal Bay and Mitchell's Bay (Figures 1 & 2). The area falls within the Succulent Karoo Biome on the 'Coastal Plain' which also is often called the Sandveld or Namaqualand Sandveld Bioregion (Figure 3) (Van Wyk & Smith, 2001; Le Roux, 2005, 2015; Rutherford, Mucina & Powrie, 2006).

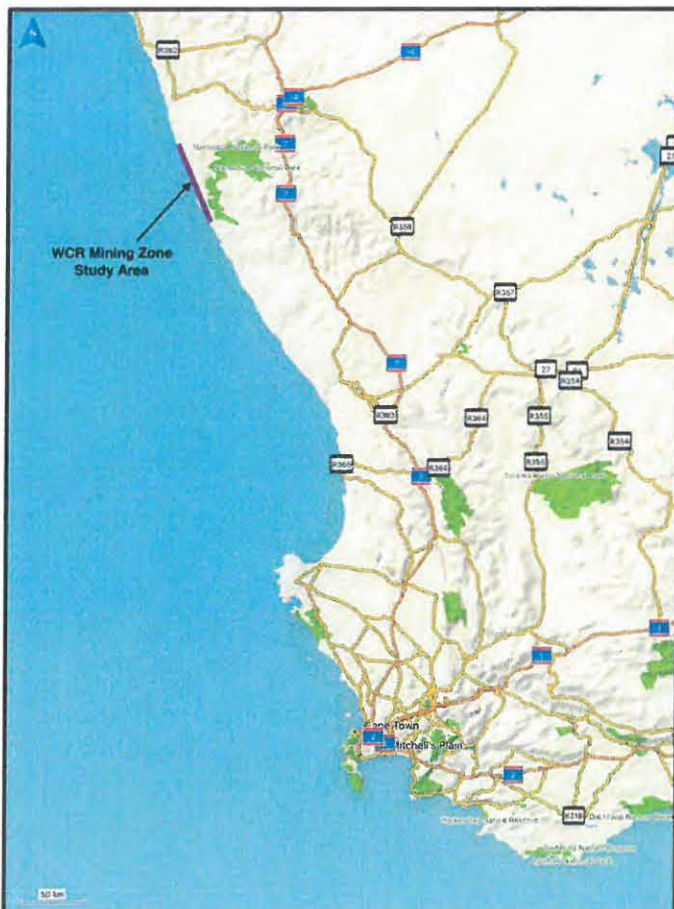


Figure 1. General locality of the study area on the Namaqualand coast.

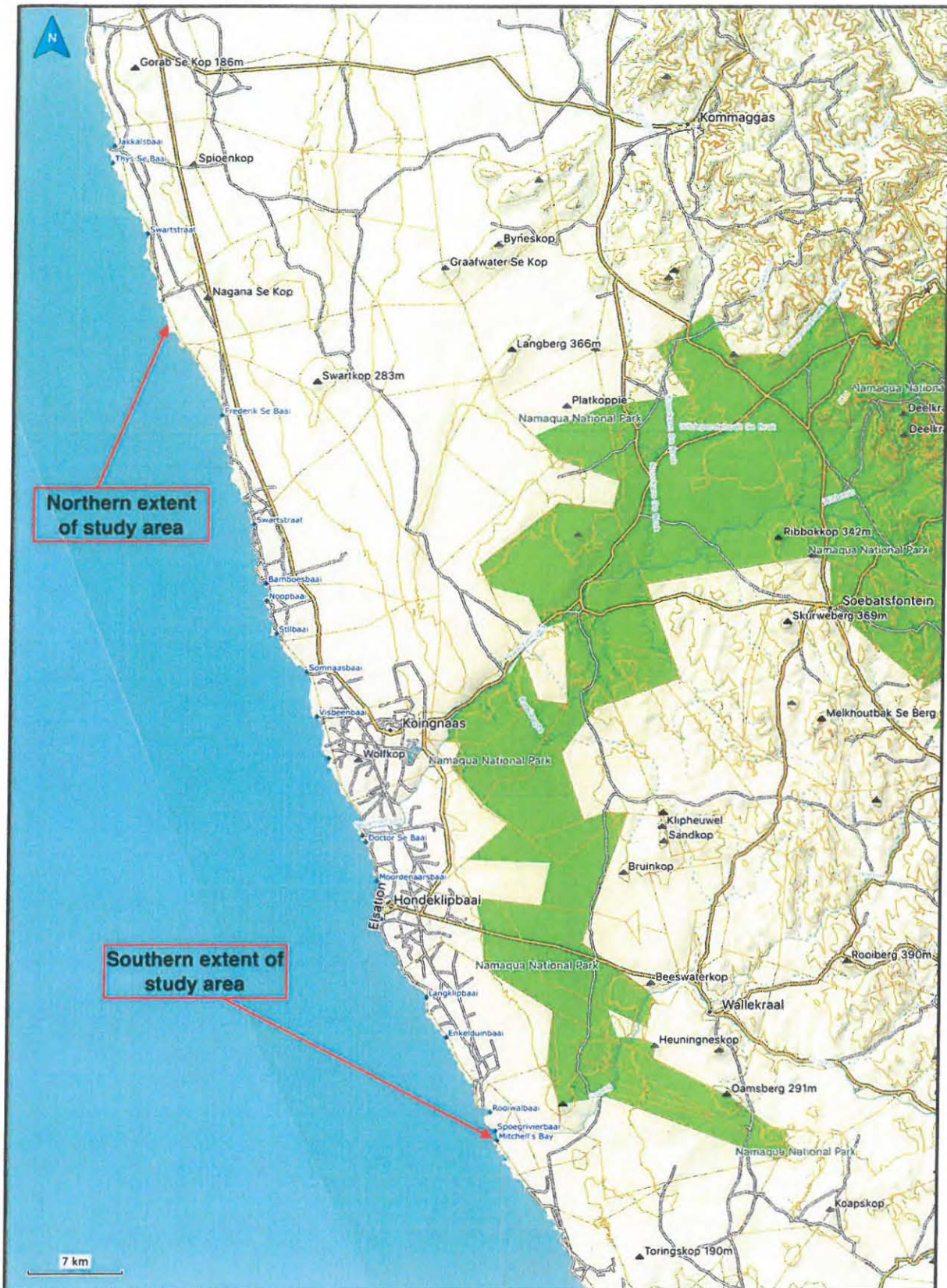


Figure 2. The southern and northern extents of the area investigated, south of Hondeklip Bay and north of Koingnaas.

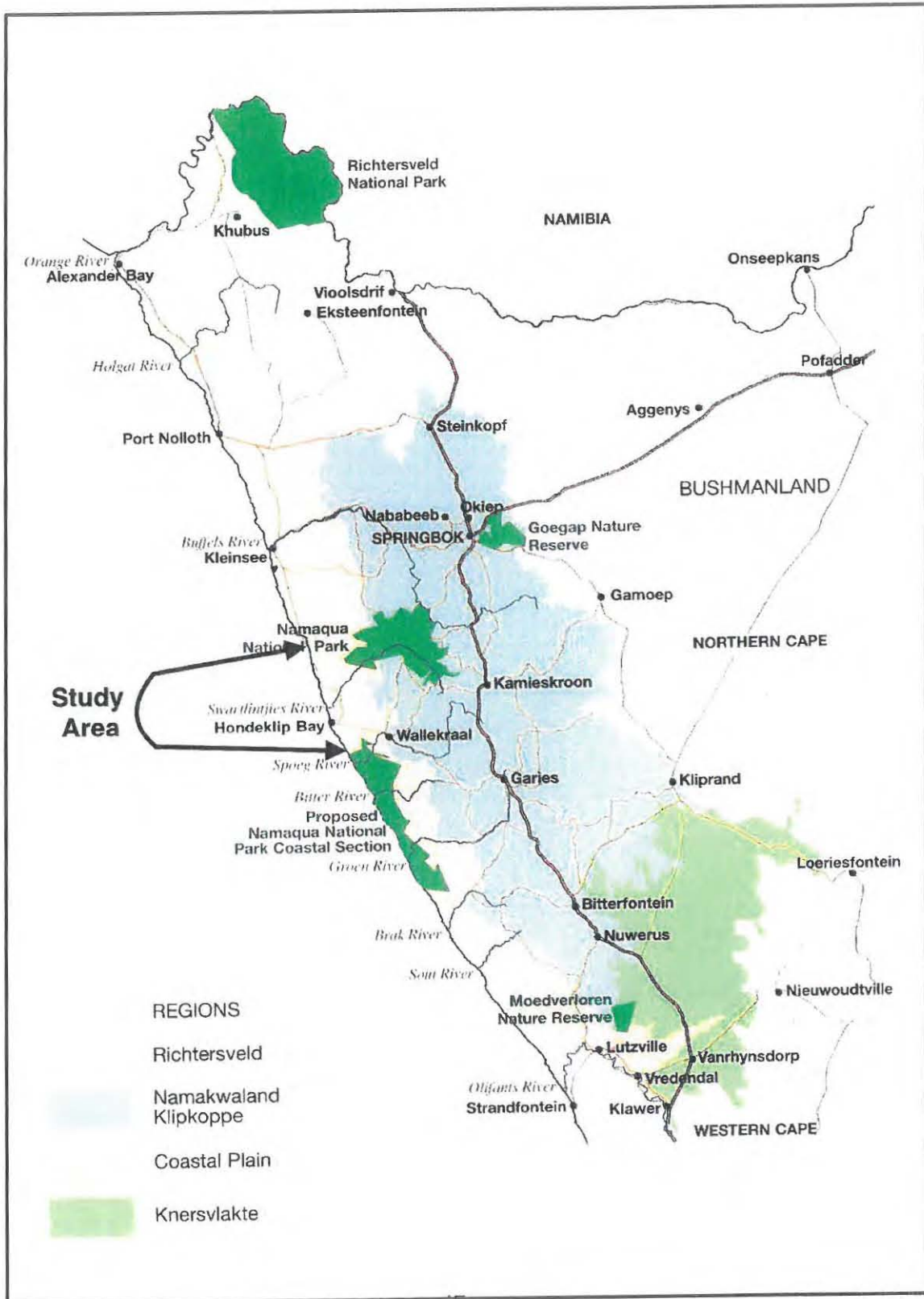


Figure 3. Broad regions of Namaqualand after Le Roux (2005), showing the position of the study area.

A1.3 Geology, topography and soils

The study site is along the Namaqualand coastline on the coastal foreland or 'Coastal Plain'. Elevation of the study area is between sea-level and 72 m above mean sea level (a.m.s.l.).

The region of the study area is underlain by rock of the Namaqua-Natal Metamorphic Belt (Cornell *et al.* 2006). The surface geology in the coastal zone consists of deep stabilized aeolian sands (Quaternary) that are white to grey and calcareous, overlying marine sediments that are composed of calcrete or dorbank hardpans. Immediately above the high-water mark the coastline has exposed granite of the Dikgat and Brazil Formations (Goraap Suite) (Marais, 2001). Further inland the soils are yellow sands becoming either red or yellowish-red overlying granite and gneisses.

The undulating coastal plain is about 30 km wide and separates the coast from the inland Namaqualand Klipkoppe (also known as the Namaqualand Hardeveld) comprising Mokolian granites and gneisses that form domes and rock sheets and weather to form yellow-brown to brown loamy sand (Mucina *et al.* 2006). Le Roux (1991) described the coastal Sandveld topography as consisting of three major landforms, based on the presence or absence of dunes: unstable dunes, semi-stable dunes and shallow, flat sand.

Observations on the study site indicate that a large quantity of the white, wind-blown sand that has given rise to low dunes has been deposited recently due to disturbance associated with diamond mining on the coast.

A1.4 Climate

The Namaqualand coast experiences low rainfall and from rainfall data collected at Koingnaas (Burger, 2007 in Arcus Gibb 2008), mean annual precipitation is 75 mm. Rain falls mainly in winter (see also Figure 4 obtained from www.worldweatheronline.com). However, climate diagrams published for Namaqualand Coastal Duneveld (Figure 6) and Namaqualand Strandveld (Figure 7) (Mucina *et al.* 2006) indicate that the rainfall is in excess of 100 mm per annum for the areas where these vegetation types occur.

The mean maximum temperature does not vary much throughout the year whereas there is a slightly greater amplitude in mean minimum temperature (Figure 5). This is due to the proximity to the Atlantic Ocean and the effect of the Benguela Current with regular fog occurring over the coastal zone. However, there are extremes with summer temperatures as high as 40 °C having been recorded at Koingnaas (November 2006). Winter temperatures can fall to 4 °C (Koingnaas: June 2006).

Temperatures can also be influenced by easterly berg wind conditions (off shore flow) in winter when the temperature may exceed 35 °C.

The prevailing surface winds are mostly from the south and south-east in the summer when winds are strong and speeds can exceed 10 m/s. Strong winds also occur from the west and north-west, mainly in winter.

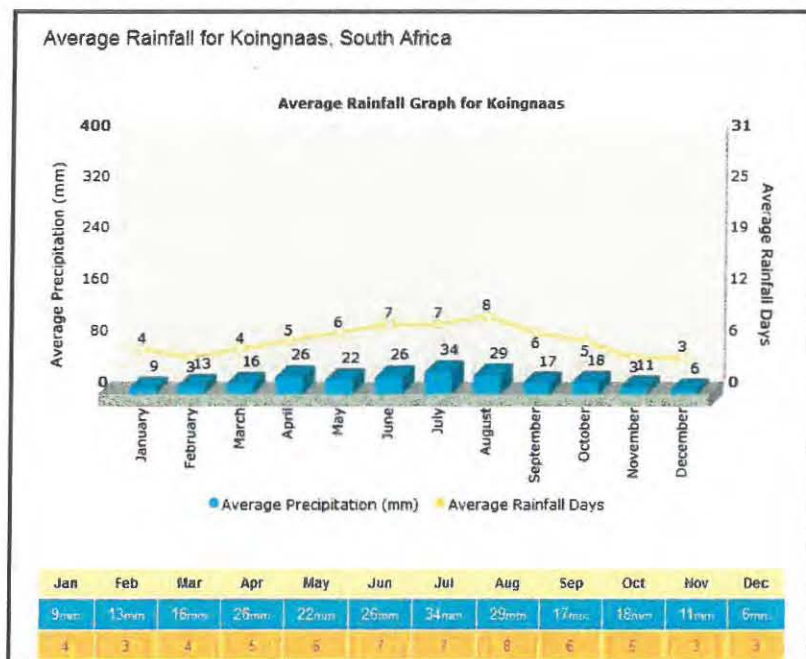


Figure 4. Average rainfall for Koingnaas (source: <http://www.worldweatheronline.com/weather-averages/South-Africa/2610093/Koingnaas/2614753/info.aspx>)

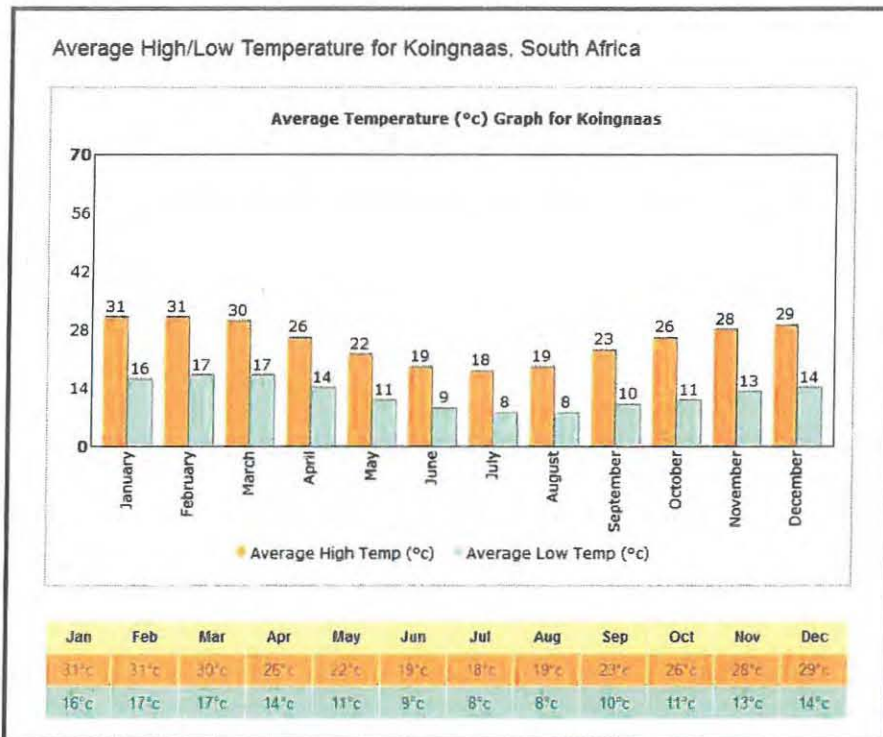


Figure 5. Average temperature at Koingnaas

(source: <http://www.worldweatheronline.com/weather-averages/South-Africa/2610093/Koingnaas/2614753/info.aspx>)

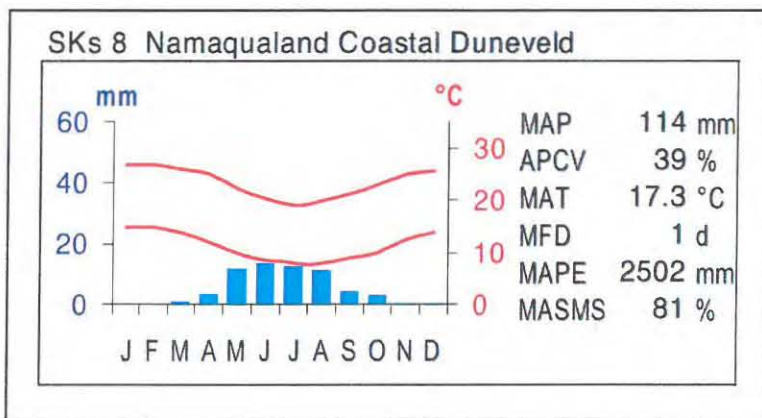


Figure 6. Climate diagram for Namaqualand Coastal Duneveld (from Mucina et al. 2006).

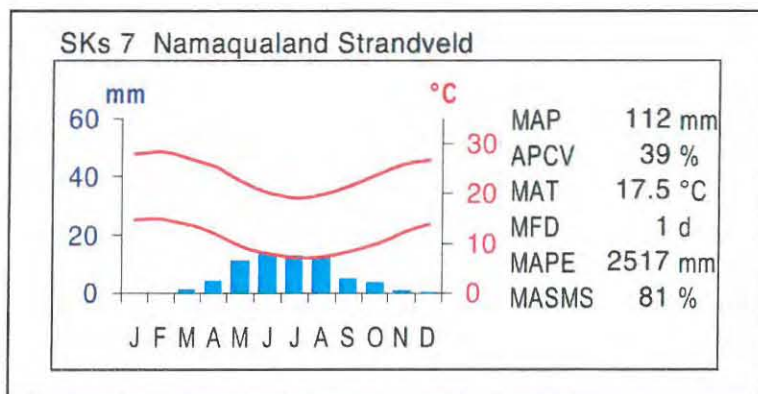


Figure 7. Climate diagram for Namaqualand Strandveld (from Mucina et al. 2006).

A2. METHODOLOGY

A2.1 METHODS AND APPROACH

Firstly, relevant literature was consulted. The author has previous experience of botanical surveys along the Namaqualand coast and these together with other studies were used to inform the present study (Low & Desmet, 2007; McDonald, 2011a, 2011b, 2012, 2013). Books such as 'The Vegetation of South Africa, Lesotho & Swaziland' (Mucina & Rutherford, 2006) and the Botanical Society Guide: Wild Flowers of Namaqualand (le Roux, 2015) have also been liberally consulted.

Field work was carried out over three days (21 – 24 July 2016). I was accompanied by Mr Tommie Diergaard, Security Officer at Koingnaas Mine and the survey followed the route taken by Mr Steve van der Westhuizen of Siteplan Consulting when he was investigating the dust, dune and rehabilitation earlier in July 2016. In this way it was attempted to 'twin' the botanical survey with the work of Siteplan. (A meeting was held with Mr van der Westhuizen in mid-July before my site visit to discuss their findings).

The approach was to first drive through Koingnaas Mine via Hondeklip bay to the southern extent of the study area at Rooiwal Bay that lies on the farm Mitchell's Bay (Farm No 495/0) and at the mouth of the Spoeg River. Thereafter the survey was carried out northwards towards Hondeklip Bay and Koingnaas. Twenty-two sample waypoints were recorded on 21 July 2016 (Figures 8 & 9) and a further 11 waypoints were recorded in 22 July 2016 (Figure 10). Additional photographs were taken at Samson's Bak on 23 July 2016.

The survey method used was a 'rapid appraisal' method where sample waypoints are recorded as surrogates for sample plots. At and around these waypoints, the structure and composition of the vegetation was recorded. In addition, the condition of the area was noted and photographs taken as a record of each site. The approach was not a formal phytosociological survey but the method is a 'tried and tested' method to enable the description of the vegetation.

A2.2 Assumptions and Limitations

The botanical study was carried out in winter. The seasonal timing of the study was not optimal but acceptable. Vegetation in Namaqualand is at its best in spring.

However, a high level of confidence was achieved in the observations made so season was not a limiting factor in this study.

The study area is large and the logistics within the mine are difficult due to security constraints. Therefore, only limited time could be assigned to field-work. The rapid assessment approach allowed for appropriate sampling to be carried out within the time available. It would always be desirable to spend as much time as possible surveying vegetation but despite the limited time, adequate information was collected and this is not seen as a limitation for the study.

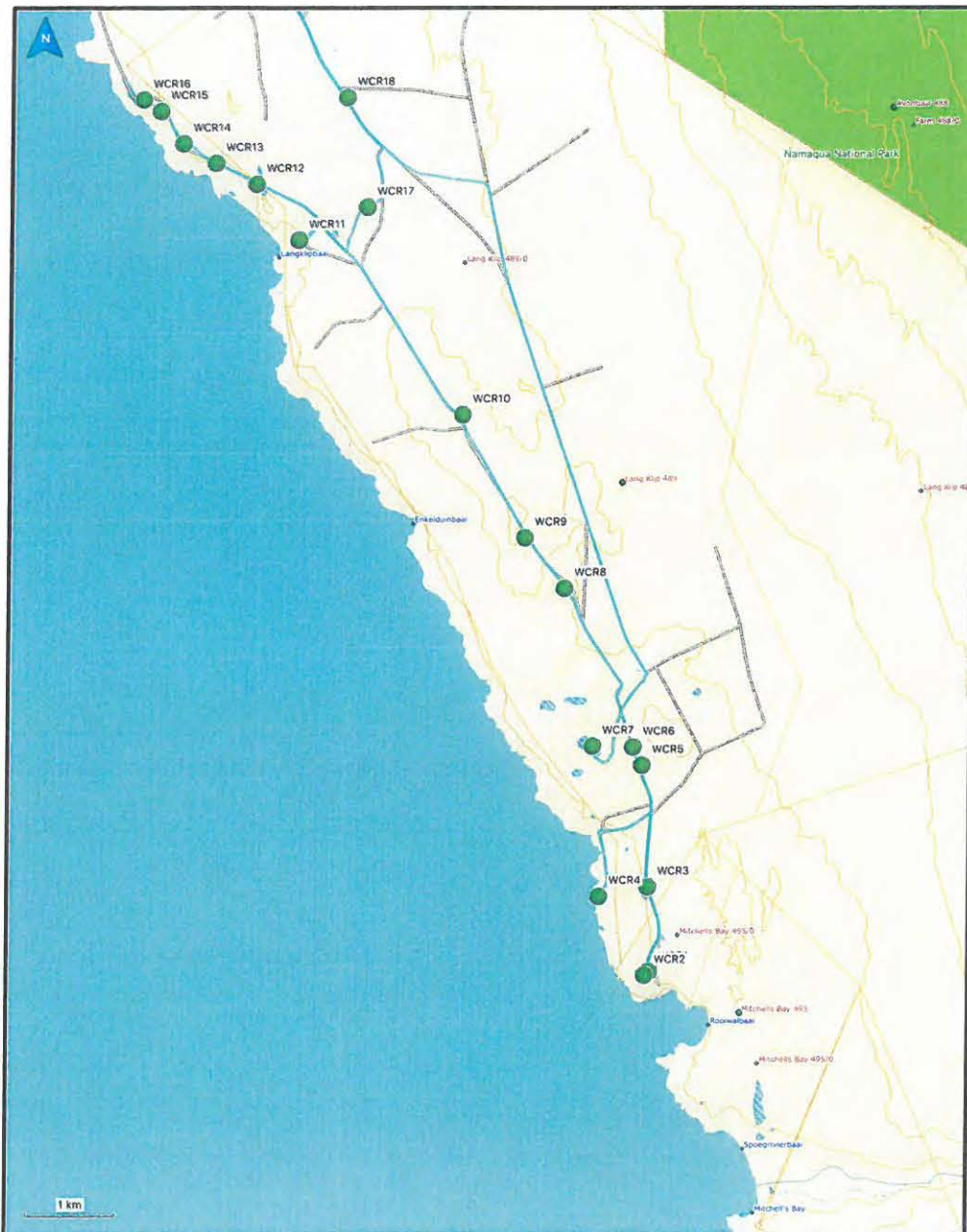


Figure 8. Waypoints (green dots) and track followed in the southern part of the study area, south of Hondeklip Bay.

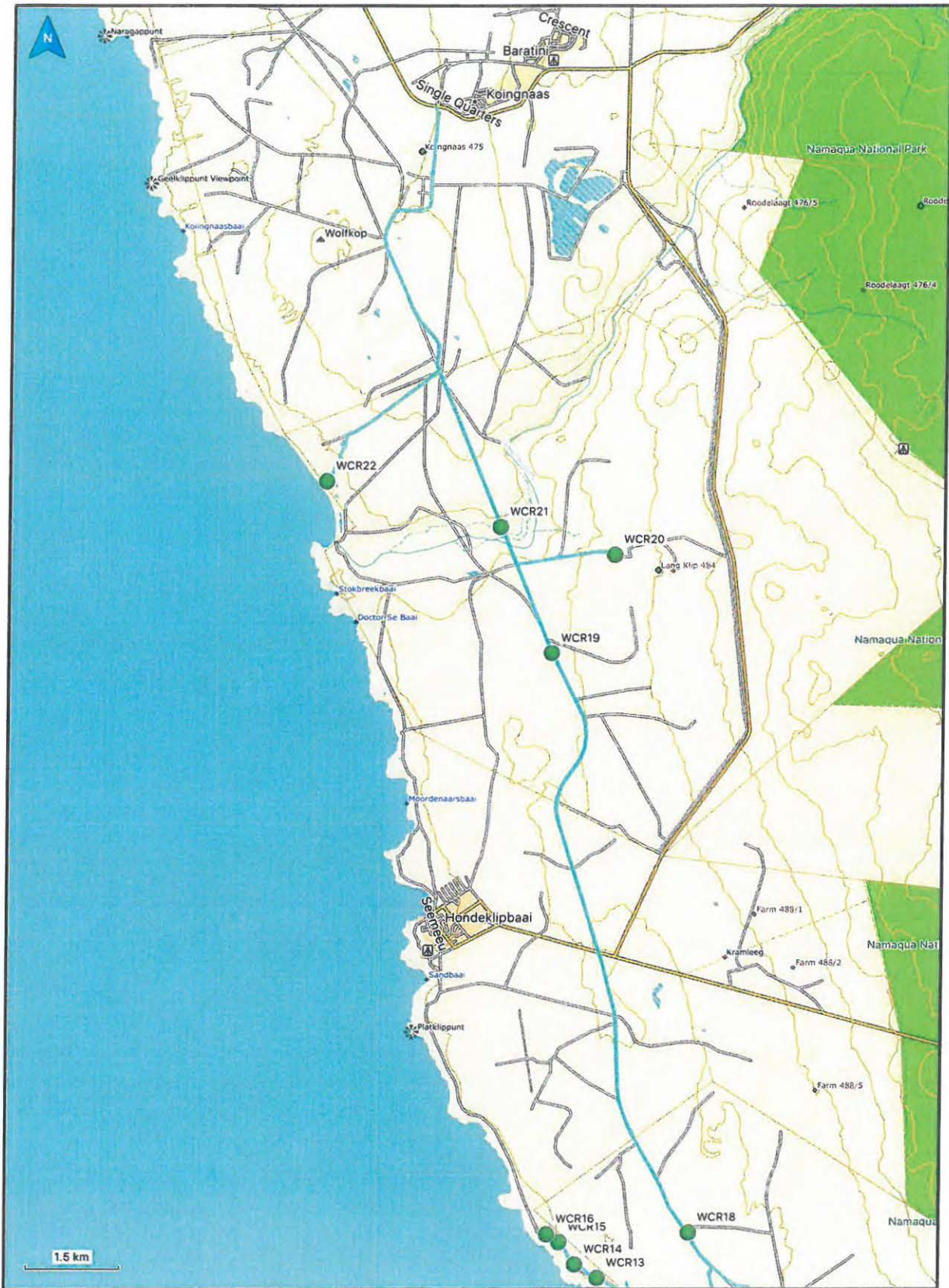


Figure 9. Waypoints (green dots) and track followed in the southern part of the study area from south of Hondeklip Bay to Koingnaas.

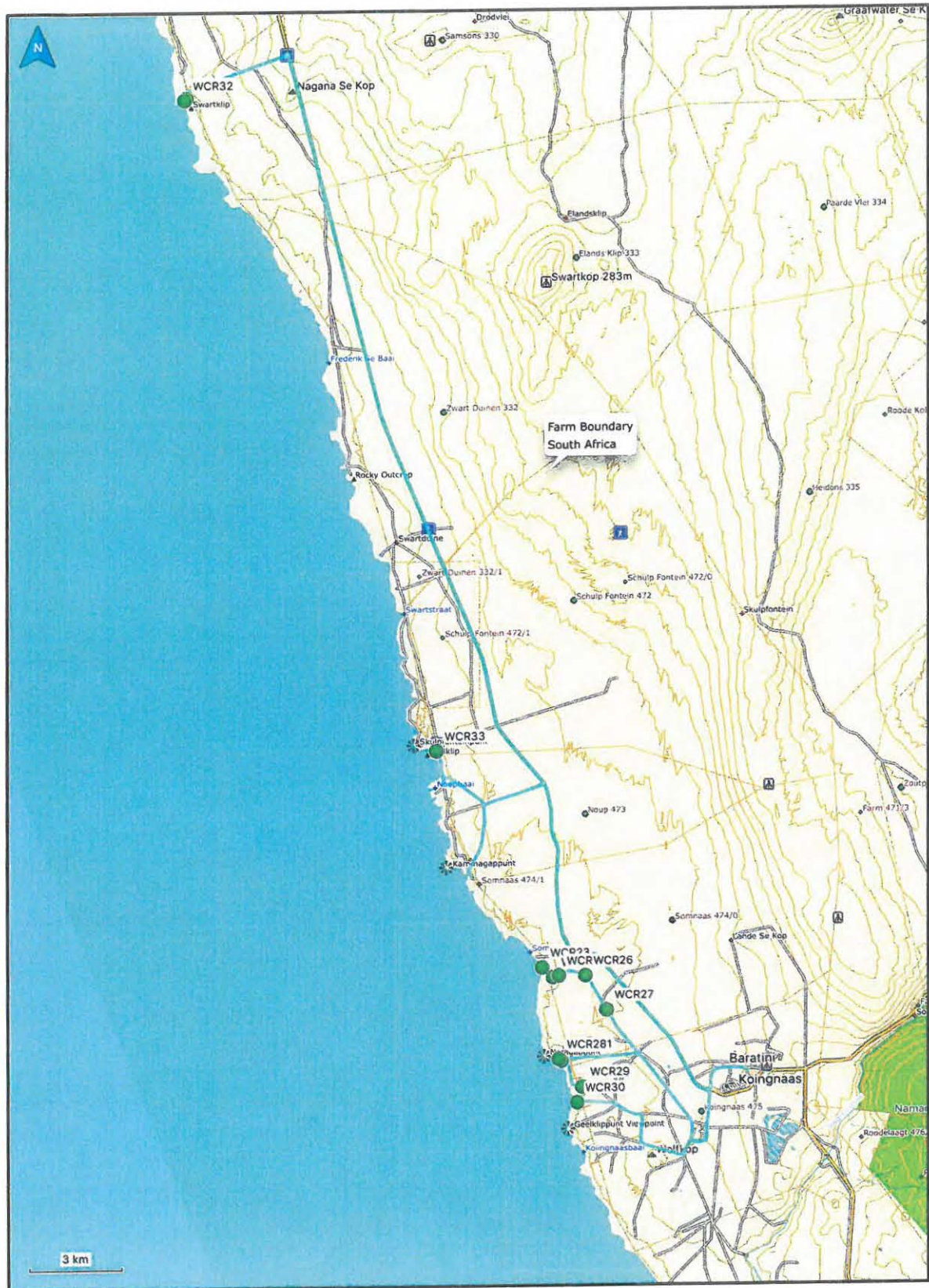


Figure 10. Waypoints (green dots) and track followed in the Koingnaas area and north to Samson's Bak.

A.3 THE VEGETATION

A.3.1 Broad context

The study area falls within the extensive, arid Succulent Karoo Biome (Rutherford & Westfall, 1994; Mucina *et al.* 2006 in Mucina & Rutherford, 2006) and regionally within the Namaqualand Sandveld Bioregion that lies parallel to the west coast in the western part of the Succulent Karoo Biome (Rutherford, Mucina & Powrie, 2006 in Mucina & Rutherford, 2006; Desmet, Turner & Helme, 2009) (Figure 8). The Succulent Karoo Biome has high levels of plant diversity and endemism and is one of the earth's 'hotspots' of plant diversity and the only entirely arid hotspot in the world (Van Wyk & Smith, 2001). Four vegetation types are found in or near the study area. They are (1) azonal Namaqualand Seashore Vegetation (AZd2) along the coast; (2) azonal Namaqualand Salt Pans (AZi2); (3) Namaqualand Coastal Duneveld (SKs8) on the semi-mobile coastal dunes and (4) Namaqualand Strandveld (SKs7) found on red to yellow stabilized aeolian sand overlying a basement of marine sediments and granite-gneisses.

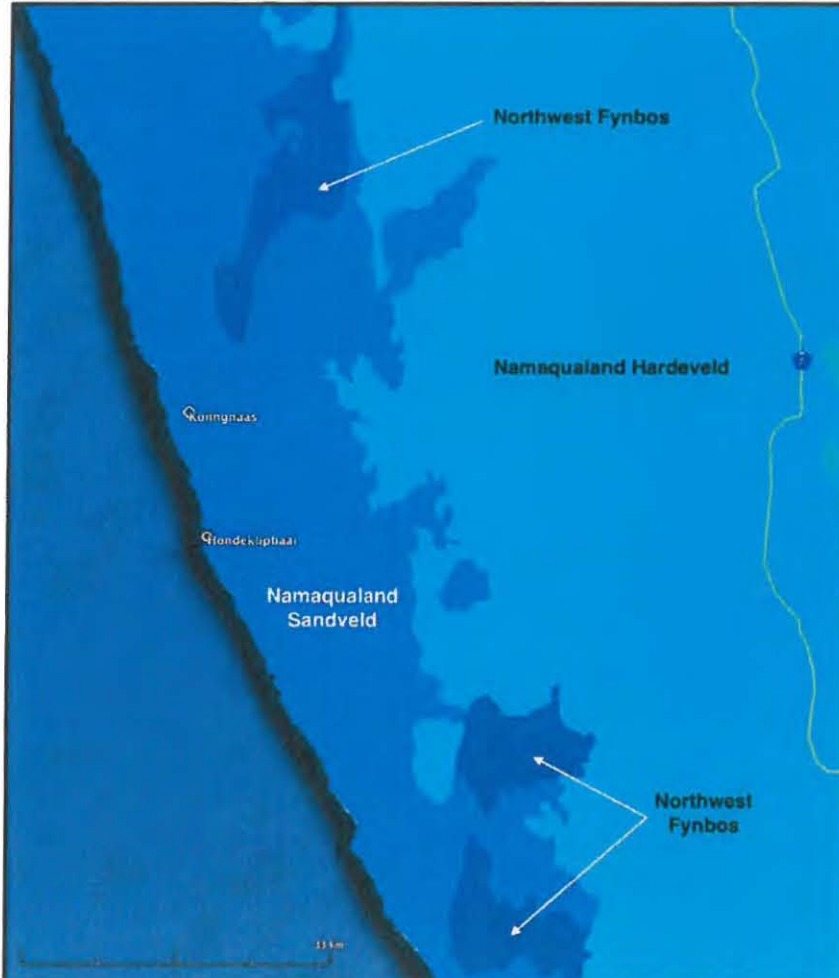


Figure 11. Portion of the bioregions map from Mucina, Rutherford and Powrie (2005) with the dark blue indicating the Namaqualand Sandveld bioregion closest to the coast.

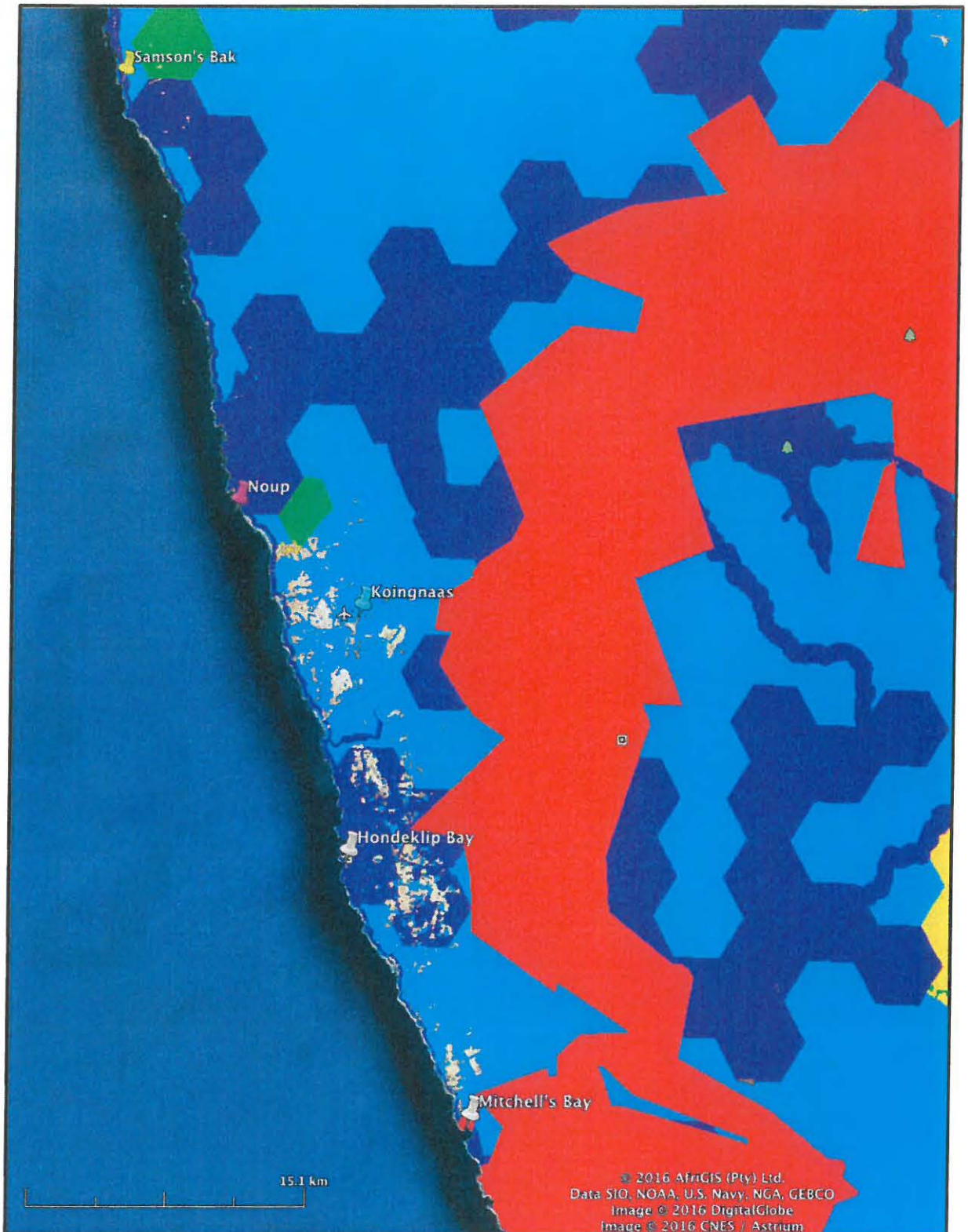


Figure 12. Portion of the mapped Critical Biodiversity Areas (CBA's) and Ecological Support Areas (ESAs) for Namaqua District Municipality on the coast. The purple shading represents Critical Biodiversity Areas (1); the light blue areas are Critical Biodiversity Areas (2), the green areas are Ecological Support Areas (ESAs) and the red area is a protected area, in this case Namaqua National Park.

A3.2 Critical Biodiversity Areas

Critical Biodiversity Areas (CBAs) within the Namaqua District Municipality (NDM) were mapped by Desmet and Marsh (2008). Subsequently Critical Biodiversity Areas maps have been developed and are available for the whole of the Northern Cape Province. The shapefiles for the latter were made available to the author by Mr Enrico Oosthuysen at DENC and have been applied here to obtain the CBA map in Figure 12. The study area largely falls within CBA (1) and CBA (2) within the coastal corridor.

A3.3 Vegetation communities

Owing mainly to restricted access to the diamond-mining areas along the Namaqualand coast there have been few detailed botanical studies in the coastal sandveld of Namaqualand. Le Roux (1991) in a study of Brazil recognized three major plant communities: *Zygophyllum cordifolium*–*Drosanthemum marinum* Shrubland with *Stoeberia beetzii*-*Wooleya farinosa* Shrubland on flat, shallow sands and *Zygophyllum morgsana*-*Arctotis decurrens* (syn. *A. merxmuelleri*; *A. scullyi*) Shrubland on unstable to semi-stable white dunes. Low & Desmet (2007) observed that the dunes in the south of the Brazil area are unstable and poorly vegetated but overall the vegetation is in moderate to good condition with 43 species found in the above communities. These species include *Fenestraria rhopalophylla* subsp. *aurantiaca* the “window succulent”, also of conservation importance.

The broad vegetation types recognized by Low & Desmet (2007) are shown in Figure 13 as determined for their study at Brazil and Schulpfontein (that lie immediately north of Samson’s Bak). This map is very similar to the National Vegetation Map for the area (Mucina *et al.* 2005, 2009).

The vegetation units recognized by Mucina, Rutherford & Powrie (2005, 2009) and Mucina *et al.* (2006) which occur within the study area are Namaqualand Seashore Vegetation (AZd2), Namaqualand Coastal Duneveld (SKs8), Namaqualand Strandveld (SKs7) and Arid Estuarine Salt Marshes (AZe1) (Figure 14). Namaqualand Salt Pans (AZi2) do not occur in the area investigated. The vegetation types principally affected by mining are Namaqualand Seashore Vegetation (AZd2), Namaqualand Coastal Duneveld (SKs8) and Namaqualand Strandveld (SKs7).

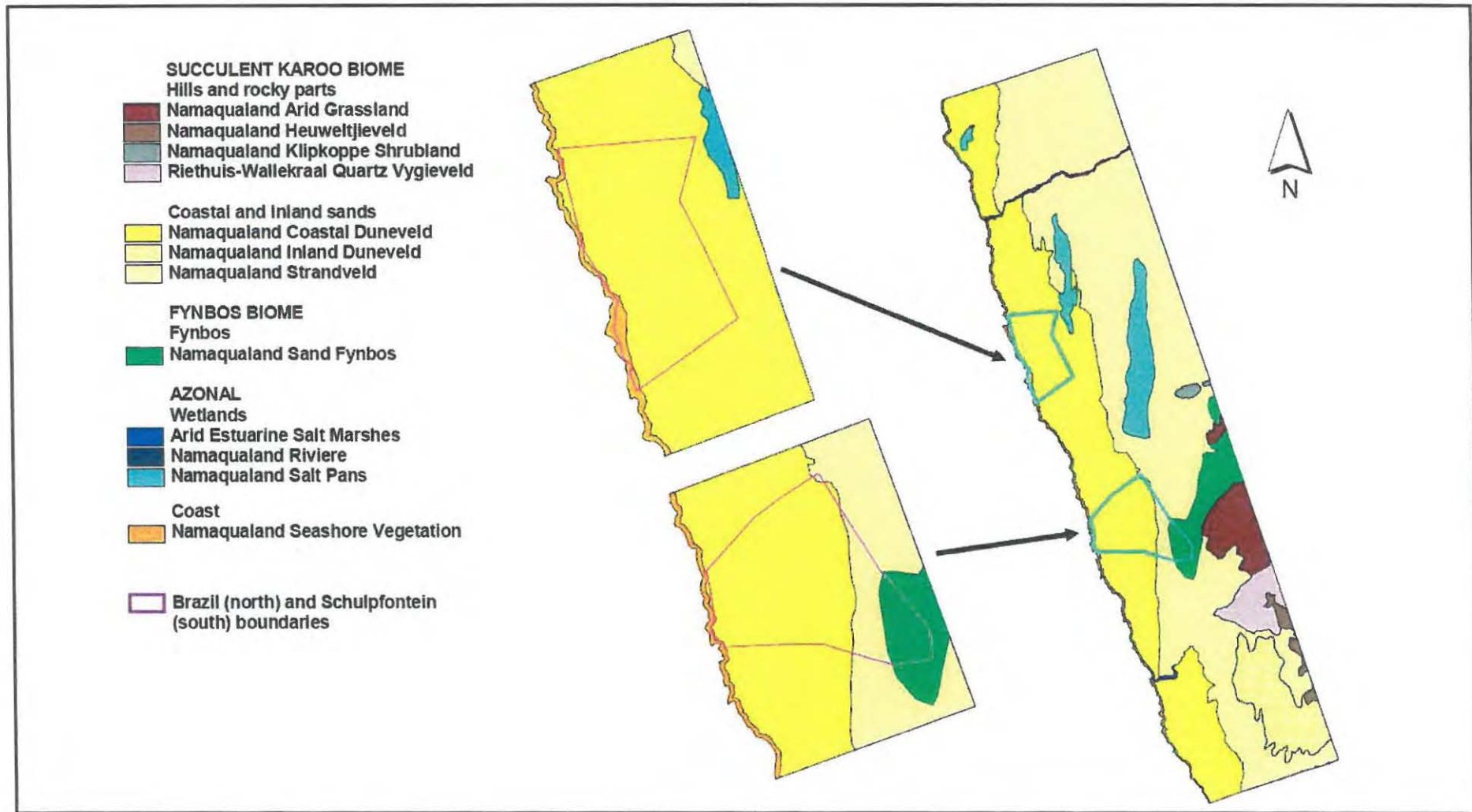


Figure 13. Vegetation map from Low & Desmet (2007) indicating the units they recognized for farms Brazil & Schulpfontein near Samson's Bak.

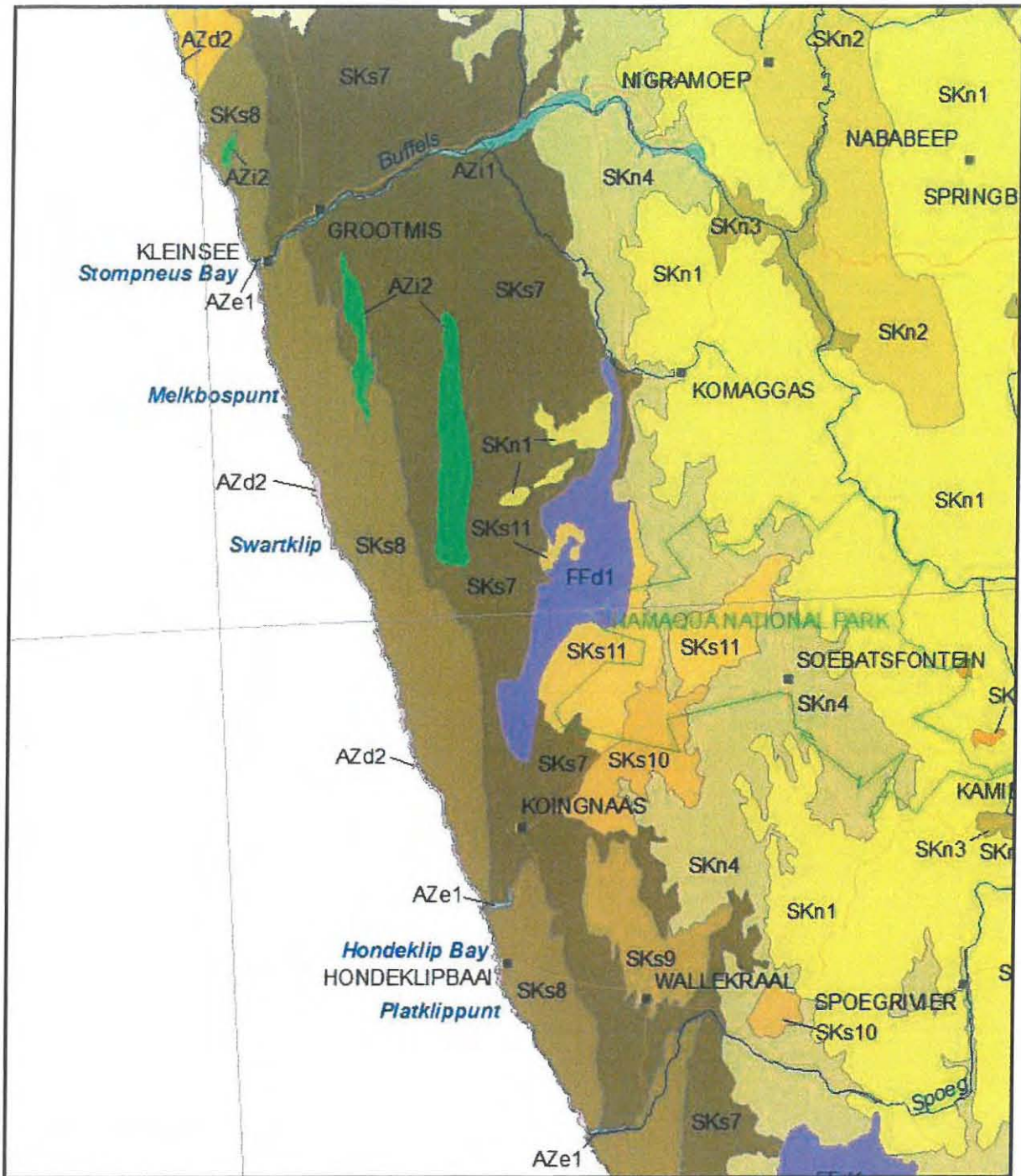


Figure 14. Portion of the Vegetation map of South Africa, Lesotho & Swaziland (Mucina *et. al.* 2005, 2009) showing the vegetation found on the Namaqualand coast. Codes for the relevant units are given in the text in Section A3.3.

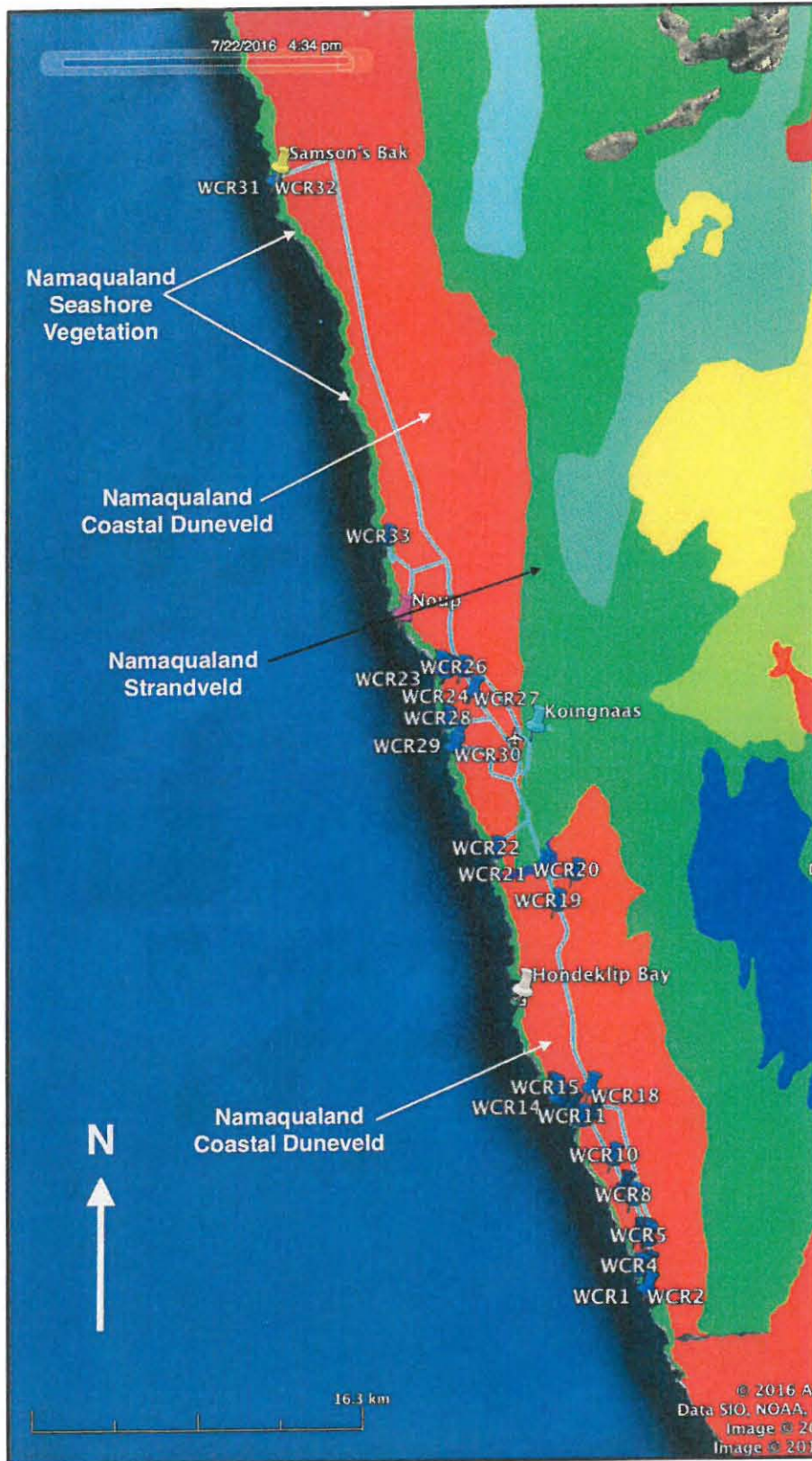


Figure 15. Vegetation map of South Africa, Lesotho & Swaziland (Mucina *et. al.* 2005, 2009) overlaid on Google Earth™ with the survey tracks and sample waypoints superimposed.

A3.3.1 Vegetation recorded at sample waypoints

Observations recorded during the survey at the sample waypoints are given in Table 1.

Table 1. Waypoints, descriptive notes and illustrations of the sites recorded during the field investigation of the WCR study area.

Waypoint	Co-ordinates	Descriptive notes	Illustration
WCR1	S30° 27' 01.3" E17° 20' 50.4	<p>At Rooiwal Bay, Mitchell’s Bay Mining Complex. A high level of disturbance of the near-shore environment with significant areas not vegetated. The original vegetation was probably Namaqualand Coastal Duneveld. Piles of soil have been heaped near the diggings. Plant species recorded amongst the spoil heaps include, <i>Asparagus capensis</i>, <i>Galenia sarcophylla</i>, <i>Helichrysum sp.</i>, <i>Hypertelis angra-pequenae</i>, <i>Lycium sp. (flat, spreading)</i>, <i>Crassothonna cylindrica</i>, <i>Stoeberia beetzii</i>, <i>Tetraria decumbens</i>.</p>	

			
<p>WCR2</p>	<p>S30° 27' 02.6" E17° 20' 48.8</p>	<p>Undisturbed Namaqualand Coastal Duneveld on the sea-side of the diggings. Low open shrubland on yellow sandy soil. Species include, <i>Amphibolia maritima</i>, <i>Arctotis decurrens</i>, <i>Asparagus capensis</i>, <i>Atriplex cinerea</i>, <i>Babiana hirsuta</i>, <i>Cheiridopsis sp.</i>, <i>Cladoraphis cyperoides</i>, <i>Crassothonna cylindrica</i>, <i>Felicia sp.</i>, <i>Galenia sarcophylla</i>, <i>Gazania sp.</i>, <i>Helichrysum sp.</i>, <i>Hypertelis angra-pequenae</i>, <i>Lycium tetrandrum</i>, <i>Mesembryanthemum guerichianum</i>, <i>Osteospermum oppositifolium</i>, <i>Othonna arborescens</i>, <i>Pteronia onobromoides</i>, <i>Ruschia sp.</i>, <i>Stoeberi beetzii</i>, <i>Zygophyllum cordifolium</i>, <i>Zygophyllum morgsana</i>.</p>	