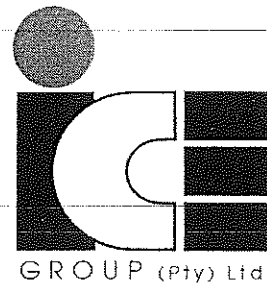


**Contact Address:**

iCE Group (Boland),  
P O Box 813,  
Ceres, 6835

Tel No: 023 316 2264  
Fax No: 086 524 5723  
e-mail: liezl@icegroup.co.za

**Consulting Services**

- Civil Engineering
- Electrical Engineering
- Structural Engineering
- GIS Applications
- Traffic Engineering

**Contact Person:** *Liezl du Plooy (Tel: 082 338 6466)*

**Your Ref:** Khoisan Bay Development

**Our Ref:** iCE/B/923

**Date:** 10 May 2012

Plan Active  
6 Magnolia Avenue  
Hermanus  
7200

**Attention: Merike Lerm**

Sir

**TRAFFIC IMPACT ASSESSMENT FOR THE KHOISAN BAY DEVELOPMENT,  
ERF 712, DE KELDERS**

**1. BACKGROUND**

Divine Inspiration Trading 329 (Pty) Ltd, the owners of the above mentioned property, appointed iCE Group (Boland) to conduct an investigation into the traffic impact of the proposed development on Erf 712 in De Kelders. The property is located just northwest of the R43 and to the northeast of Guthrie Street, as shown on the attached *Locality Plan*.

**2. DEVELOPMENT PROPOSAL**

The Khoisan Bay development is expected to be completed by 2018. The development will entail the following:

- 118 High income single residential units
- 179 Town housing units
- 175 Group housing units
- A church
- Approximately 5783m<sup>2</sup> of commercial space.

**3. EXISTING AND PLANNED ROADS**

It is expected that traffic to the Khoisan Bay development will travel along the R43 (Class 3), Guthrie Street (Class 4), De Villiers Street (Class 4), Main Road (Class 4), Eden Street (Class 4) and Normandie Street (Class 4).

The main access for traffic from Gansbaai and Stanford to and from the new development will be located approximately 1,1 km northeast of Guthrie Street on the R43. The proposed road network of the Khoisan Bay development will also join up with the existing De Kelders road network at three points. At the eastern side of the development, Main Road will serve as access to the development. To the north the development will join up to the existing De Kelders road network at Storm Street and Eden Street.

**Head Office:**

**Tygerberg:**  
PO Box 3970  
Tyger Valley  
7536  
Tel: 021 914 2833  
Fax: 021 914 0916

**Branch Offices:**

**Athlone:**  
Tel: 021 699 1377  
**Ceres:**  
Tel: 023 31 61063  
**Crawford:**  
Tel: 021 697 3116  
**Hermanus:**  
Tel: 028 31222 92  
**Stellenbosch:**  
Tel: 021 8800 443

**Directors:**

B. Sydow, PrEng. (Chairman)  
W.M.E. Van Deijl, PrEng.  
P.J. Van Blerk, PrEng.  
M. Cerfonteyn, PrEng.  
M.M. Kriel, Eng Tech.

Reg No: 1999/008/261/07

www.icegroup.co.za

#### 4. EXISTING TRAFFIC AND SERVICE LEVELS

De Kelders and surrounding towns are mainly vacation destinations and the highest traffic volumes on the internal and surrounding roads are observed in vacation periods. For a worst case scenario, counts that were used for the study were taken in the December 2011 vacation. Traffic counts were done at the Guthrie Street / R43 and Cove Street / R43 intersections on 22 December 2011.

The intersections were analysed by means of the SIDRA software suite. The analysis indicates that all movements at the Guthrie Street / R43 intersection operate at a level of service B or better during both the AM and PM peak hours.

All movements at the Cove Street / R43 intersection also operate at a level of service B or better for both the AM and PM peak hours.

Please refer to *Figure 1* for 2011 traffic volumes and levels of service.

#### 5. BACKGROUND TRAFFIC

The traffic counts that were done on the R43 were used as background information for the Khoisan Bay development. These counts were increased by 3% per annum to obtain expected 2018 background traffic volumes.

Guthrie Street / R43 intersection: The SIDRA analysis of 2018 background traffic volumes at this intersection shows that all movements operate at a level of service B or better during both the AM and PM peak hours.

Cove Street / R43 intersection: The SIDRA analysis of 2018 background traffic volumes at this intersection shows that all movements operate at a level of service B or better during both the AM and PM peak hours.

Please refer to *Figure 2* for expected 2018 background traffic volumes and levels of service.

#### 6. TRIP GENERATION

Trip generation rates were obtained from the latest edition of the South African Trip Generation Rates document. Weekday AM peak hour trip generation rates for the retail component was obtained from the United States Trip Generation Rates document.

##### 6.1 Residential

A rate of 1,5 trips per unit was used for the single residential units, while a rate of 1,1 trips per unit was used for the group housing and town housing units. A 75:25 in:out split was used for all the residential units. The residential component will generate 567 trips (425 out, 142 in) during the AM peak hour and vice versa during the PM peak hour.

##### 6.2 Commercial

It was assumed that the commercial component would include 2024m<sup>2</sup> GLA (gross lettable area) of retail space.

A trip generation rate of 2,83 trips per 100m<sup>2</sup> GLA was used for the AM peak hour, whilst a rate of 16,9 trips per 100m<sup>2</sup> GLA was calculated for the PM peak hour.

Based on the size of the proposed Khoisan Bay development in relation to the existing number of erven in De Kelders, it was estimated that 40,2% of trips generated by the commercial component of the Khoisan Bay development would originate from inside the development and will therefore be seen as internal trips. Only a small volume of trips (2.4%) generated by the commercial component would originate inside the development and make use of the external De Kelders road network. Please refer to paragraph 7.2 for the commercial component's trip distribution.

Pass-by trips from the R43 to the commercial component will also be very restricted due to its local function. The commercial site is also not clearly visible from the R43.

Tables 1 and 2 show a summary of the Khoisan Bay development's total trip generation potential.

**Table 1: AM Peak hour trip generation potential of Erf 712 De Kelders (Khoisan Bay)**

Land use	Units / Area	GLA (m <sup>2</sup> )	TGR	%In	%Out	Total trips	Trips in	Trips out
Single res units	118.00		1.50	25%	75%	177	44	133
Group housing	175.00		1.10	25%	75%	193	48	144
Town Housing	179.00		1.10	25%	75%	197	49	148
Commercial		2024.00	2.83	53%	47%	57	30	27
Total:						624	172	452

**Table 2: PM Peak hour trip generation potential of Erf 712 De Kelders (Khoisan Bay)**

Land use	Units / Area	GLA (m <sup>2</sup> )	TGR	%In	%Out	Total trips	Trips in	Trips out
Single res units	118.00		1.50	75%	25%	177	133	44
Group housing	175.00		1.10	75%	25%	193	144	48
Town Housing	179.00		1.10	75%	25%	197	148	49
Commercial		2024.00	16.90	50%	50%	342	171	171
Total:						908	596	313

## 7. TRIP DISTRIBUTION

### 7.1 Residential trip generation

The Khoisan Bay development consists of 4 clusters of residential units. The trips for these clusters were distributed to the nearest entrances on the R43. It was assumed that very few trips from the Khoisan Bay development's residential units would travel to the northern existing De Kelders road network.

The trips generated by cluster B, which is situated on the most western side of the development, will make use of Guthrie Street to access the R43. Directional splits at the Guthrie Street / R43 intersection were based on existing traffic splits.

The trips generated by clusters A, C and D will make use of the proposed access on the R43 to the east. Directional splits at the proposed access / R43 intersection were also based on the existing Guthrie Street / R43 intersection's traffic splits.

## 7.2 Commercial trip distribution

The trips generated by the commercial development were distributed to originate between the existing residential node to the north and northwest of the development (638 residences) and the new residential units of the Khoisan Bay development (472 units).

The number of residential units in each direction from the commercial node was used to determine the potential number of trips that will travel to and from the commercial development in that direction. Table 3 shows the distribution of new trips to and from the commercial development via which street. The percentage of trips from the southeast is internal trips from the Khoisan Bay development's residential units as well as a few pass by trips from the R43.

**Table 3: Trip distribution of commercial development**

Direction	Percentage of trips	Trips			
		AM		PM	
		In	Out	In	Out
Via Normandie Street	1.5%	0	0	3	3
Via Eden Street	8.7%	3	2	15	15
Via De Villiers Street	46.6%	14	13	79	79
From Southeast	43.2%	13	12	74	74
<b>Total:</b>	<b>100.0%</b>	<b>30</b>	<b>27</b>	<b>171</b>	<b>171</b>

Please refer to **Figure 3** for the distribution of trips generated by the Khoisan Bay Development.

## 8. TRAFFIC IMPACT

R43 / Cove Street Intersection: The analysis of this intersection shows that all movements operate at a level of service C or better during both the AM and PM peak hours.

R43 between Cove Street and Guthrie Street: With 2018 background traffic volumes, this section of road will operate at a level of service B for the AM peak hour and a level of service C for the PM peak hour. With the addition of the Khoisan Bay Development's traffic volumes, the level of service for the AM peak hour will deteriorate to a level of service C. The level of service for the PM peak hour will remain at a level of service C.

R43 / Guthrie Street Intersection: The analysis of this intersection shows that all movements will operate at a level of service B or better during both the AM and PM peak hours.

R43 between Guthrie Street and Proposed Khoisan Bay Access: With 2018 background traffic volumes, this section of road will operate at a level of service C for both the AM and PM peak hours. With the addition of the Khoisan Bay Development's traffic volumes, the levels of service for the AM and PM peak hours will remain at a level of service C.

R43 / Proposed Khoisan Bay Access intersection: All movements at this intersection will operate at a level of service B or better during both the AM and PM peak hours.

It is expected that low volumes of traffic from the Khoisan Bay development will make use of the existing De Kelders road network. The intersections at the access points which connect the Khoisan Bay development with the existing De Kelders road network will therefore not be affected to a great extent. Good levels of service for both the AM and PM peak hours for all these stop controlled intersection are expected.

Please refer to **Figure 4** for expected 2018 background traffic volumes and levels of service.

## 8. GEOMETRY

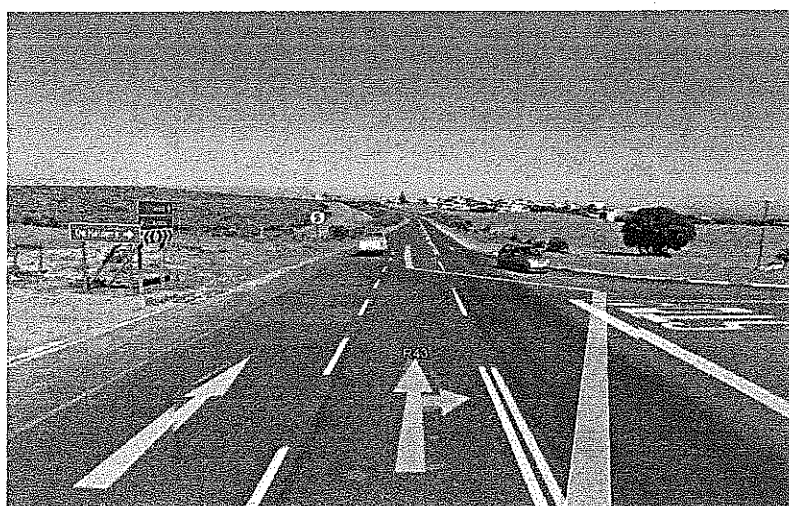
### 9.1 Turning Lanes and Tapers

Although the SIDRA analysis indicates that all 2018 movements on the R43 / Cove Street, R43 / Guthrie and R43 / Proposed Khoisan Bay intersections operate at levels of service C or better during both the AM and PM peak hours, the Road Access Guidelines indicate that some intersections require additional turning lanes for safety reasons.

R43 / Cove Street Intersection: The existing layout consists of a T-junction between the two-lane R43 and the two-lane Cove Street. The Road Access Guidelines require that a left turn lane be added to the southern leg of the intersection on the R43. A right turn lane is also required for the northern leg of the R43.

R43 / Guthrie Street Intersection: The existing layout consists of the R43 with one north eastbound lane and two south westbound lanes with a through lane and a through-right turn lane. The third leg of the intersection is formed by the two-lane Guthrie Street. The road Access Guidelines indicates that a left turn lane is required for the northeast bound travelling traffic on the R43 at this intersection. For the southwest bound traffic travelling on the R43 in the direction of Gansbaai, a right turn lane is required, but the existing layout makes provision for this with the through and through-right turn lanes. Figure 1 shows the R43 / Guthrie Street stop controlled intersection with its turning lanes.

**Figure 1: Looking west along the R43 across the R43 / Guthrie Intersection**



R43 / Proposed Access Intersection: The analysis for this intersection was done with only a two lane R43 and a two lane access road. All movements with this layout will operate at a level of service B or better for both the AM and PM peak hours. The Road Access Guidelines indicates for safety reasons that a left turn lane is required for traffic travelling northeast bound on the R43 towards Stanford for this intersection. For the southwest bound traffic on the R43, a right turn lane is also required at this intersection.

All the intersections to the north of the Khoisan Bay Development which forms at the points where the existing De Kelders road network meets the proposed development will require no additional turning lanes or tapers.

### 9.3 Internal roads

It is recommended that internal roads should have a 13-metre reserve with 5,5 metres surfaced widths, whereas access and internal link roads should have a minimum reserve width of 16 metres; preferably 20 metres, and a surfaced width of 7,4 metres.

### 9.4 Parking

The Site Development Plan does not show any on-street parking for the residential component, which means that parking will be provided on the individual erven. The parking requirement for the commercial component will be 4 bays per 100m<sup>2</sup> Gross Lettable Area for offices and service industries (laundries, hairdressers, etc.), 2 bays per 100m<sup>2</sup> for industrial activities and 6 bays per 100m<sup>2</sup> for retail activities (convenience stores). Parking bays should be dimensioned as per the SA Parking Guidelines requirements.

## 9. PUBLIC TRANSPORT

It is expected that the Khoisan Bay Development will attract some public transport trips. It is suggested that the provision of a public transport embayment should be investigated near the commercial node of the Khoisan Bay Development.

## 10. NON-MOTORISED TRANSPORT

The Khoisan Bay development will generate some pedestrian and cycling traffic. No improvements are suggested on the existing road network, but it is recommended that a sidewalk should be provided on at least one side of the eastern internal access road, which links the new commercial development to the R43.

## 11. CONCLUSIONS

The conclusions drawn from the traffic impact assessment for Erf 712, De Kelders, may be summarised as follows:

- The development will be known as Khoisan Bay;
- The full development is expected to be completed by 2018;
- The Khoisan Bay Development will entail the provision of 472 residential units, a church and 2 024m<sup>2</sup> lettable retail space;
- The development will join up with the existing De Kelders road network at three points and access to and from the R43 will be obtained through one of these as well as a proposed access to the eastern side of the development.
- The R43 / Proposed Access intersection will be stop controlled.

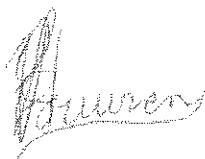
- The full development will generate 624 trips (172 in, 452 out) during the AM peak hour and 908 trips (596 in, 313 out) during the PM peak hour.
- These trips were distributed to the three access points to the north of the development. The majority of trips were however distributed to the accesses which link the development to the R43.
- The commercial component's trips were distributed between the Khoisan Bay's residential component and the existing residential component of De Kelders. The commercial component has a local function and does not generate many by-pass trips.
- All movements on the R43 / Cove Street intersection will operate at a level of service C or better for both the AM and PM peak hours.
- All movements on the R43 / Cove Street intersection will operate at a level of service C or better for both the AM and PM peak hours.
- The R43 between Cove Street and Guthrie Street will operate at a level of service C during both the AM and PM peak hours.
- All movements on the R43 / Guthrie Street intersection will operate at a level of service B or better during both the AM and PM peak hours.
- The R43 between Guthrie Street and the Proposed Khoisan Bay Development Access will operate at a level of service C or better during both the AM and PM peak hours.
- All movements on the R43 / Proposed Khoisan Bay Development Access will operate at a level of service B or better during both the AM and PM peak hours.
- For safety reasons, the Provincial Road Access Guidelines indicate that right and left turning lanes should be added to the R43 at the R43 / Cove Street, R43 / Guthrie Street and R43 / Proposed Access intersections.

#### 10. RECOMMENDATIONS

- A public transport embayment should be investigated near the commercial node of the Khoisan Bay Development.
- Adequate sidewalks must be provided for pedestrians and cyclists on the eastern internal access road of the Khoisan Bay Development.
- Right and left turning lanes should be provided on the R43 at the R43 / Cove Street, R43 / Guthrie Street and R43 / Proposed Access intersections;
- A sidewalk should be provided on at least one side of the eastern internal access road, which links the new commercial development to the R43

We trust that you will find this traffic impact assessment in order. Kindly contact the undersigned should you require any additional information.

Yours truly



**Douw Louwrens (B. Eng)**  
On behalf of: ICE Group (Boland)



# ANNEXURE A

## DRAWINGS

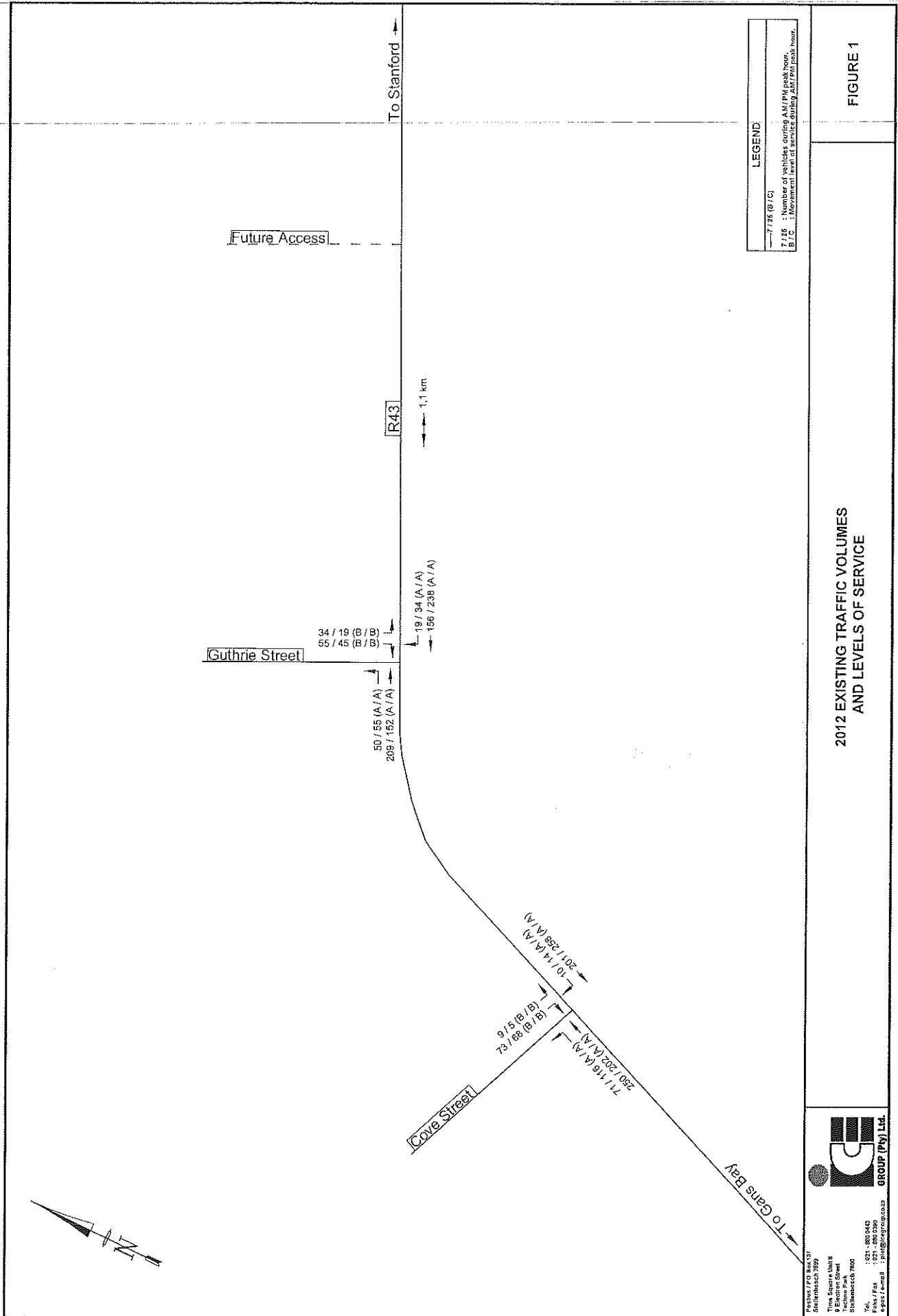
**Background:**

- a) Locality plan

**Roads and traffic:**

- b) Figure 1: 2012 Existing traffic volumes and levels of service
- c) Figure 2: Expected 2018 background traffic volumes and levels of service
- d) Figure 3: Distribution of trips generated by the Khoisan Bay development
- e) Figure 4: Expected 2018 traffic volumes and levels of service. (Khoisan Bay traffic included)





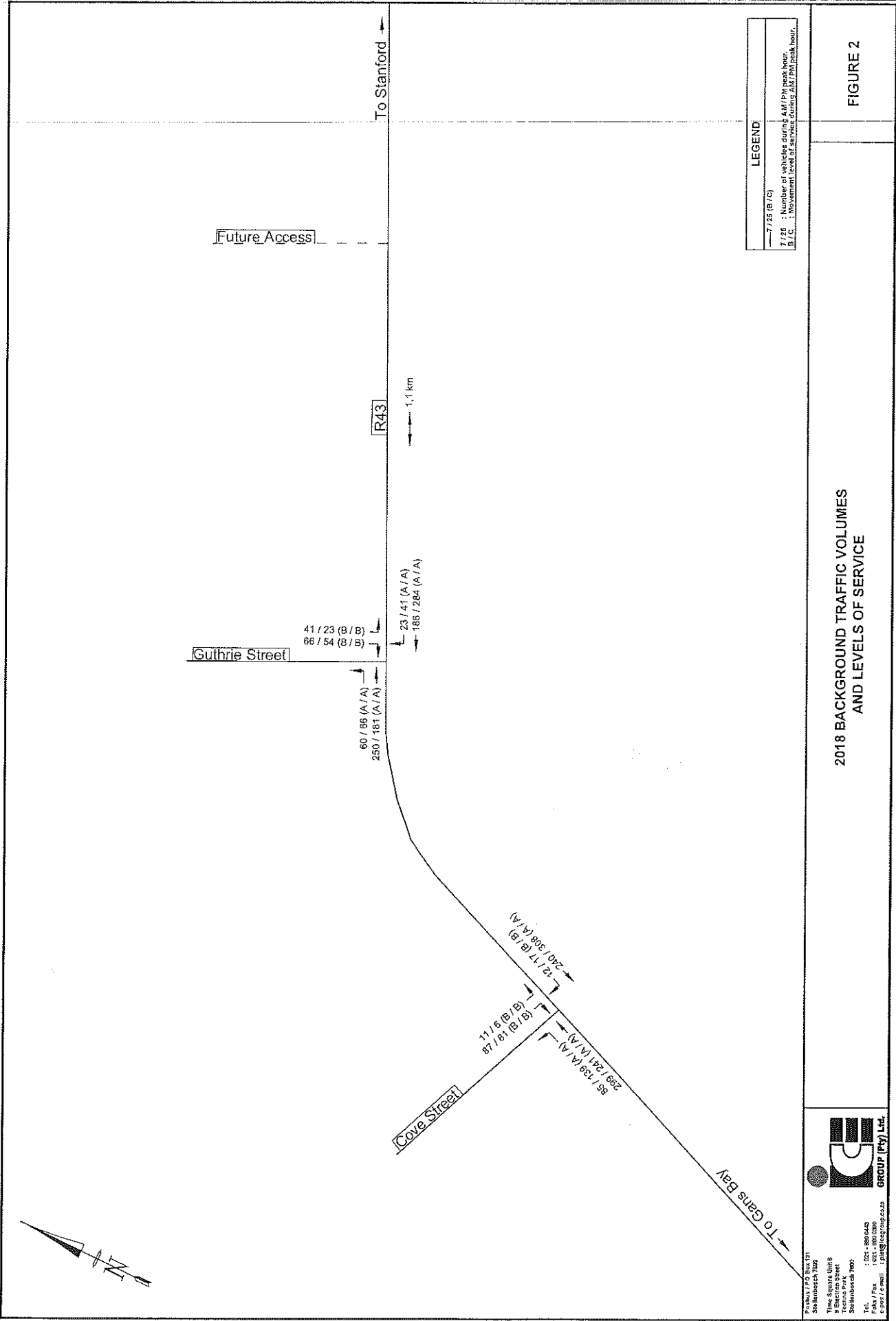
2012 EXISTING TRAFFIC VOLUMES AND LEVELS OF SERVICE

FIGURE 1

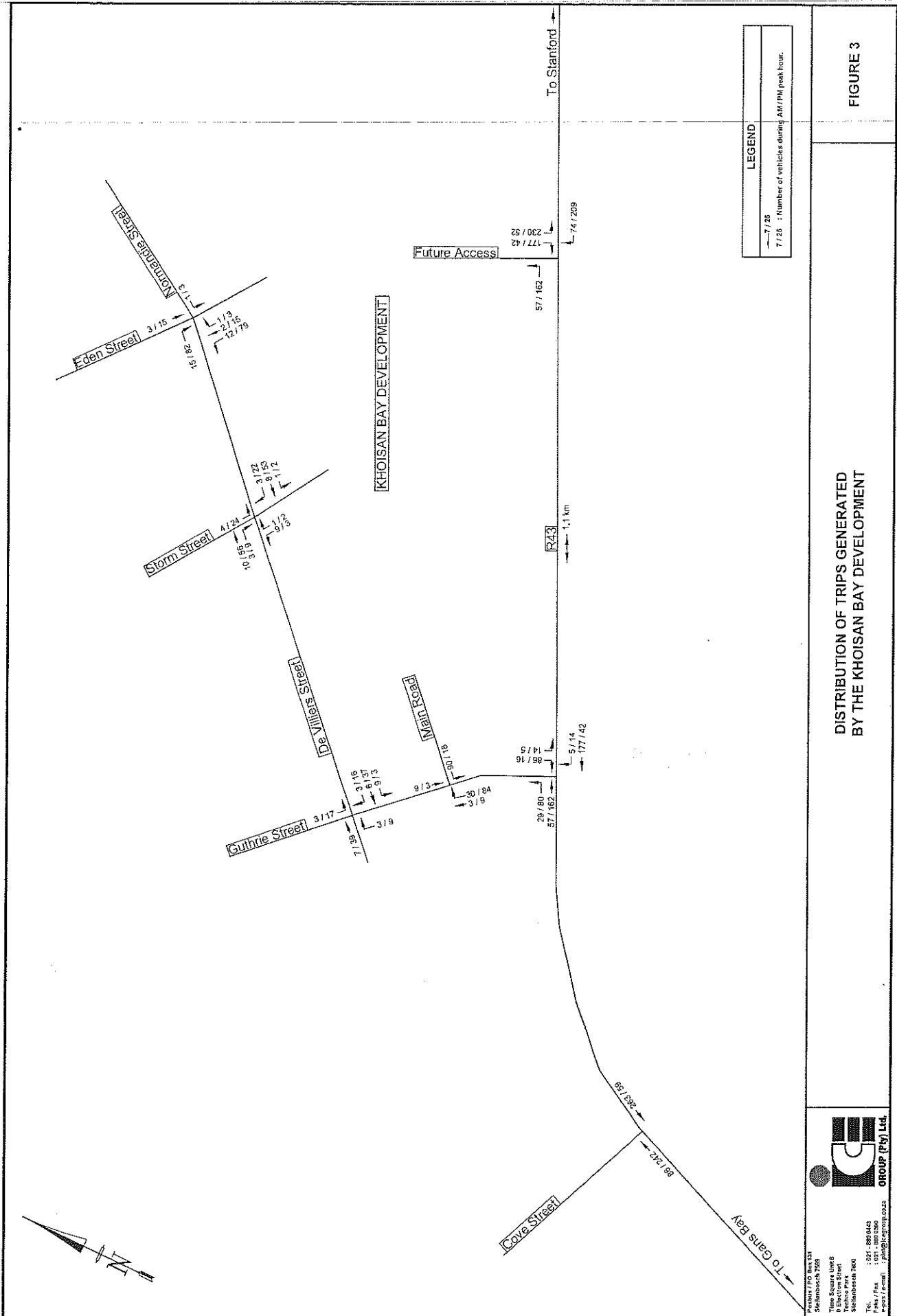

  
**GROUP (Pty) Ltd.**

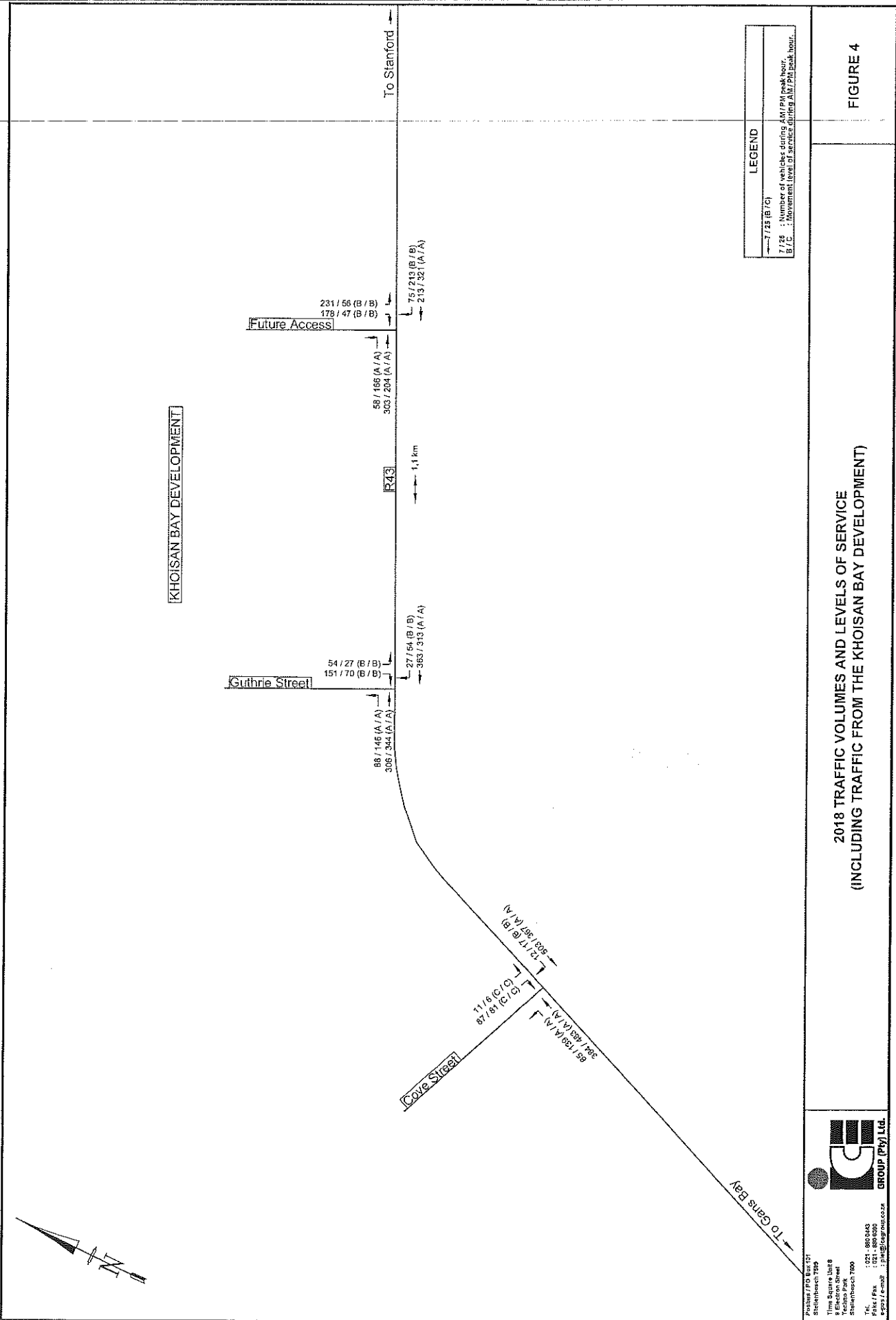
Plot 10 / PO Box 131  
 Gansbaai 7950  
 9 km Square Units  
 Techno Park  
 Stellenbosch 7600

Tel. : 021-880-0442  
 Fax / Faks : 021-880-0390  
 E-mail : info@gansbaygroup.co.za



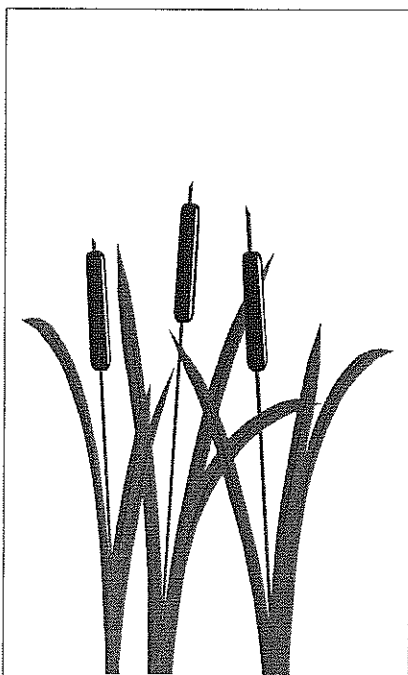
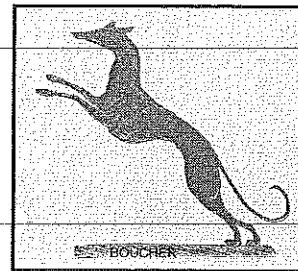
Pretorius / PO Box 131  
 Stellenbosch 7529  
 Free Square Unit 8  
 The Square  
 Stellenbosch 7529  
 YEL : 021-889 0410  
 Faxes / Fax : 021-889 0300  
 e-post / e-mail : info@group.co.za





Ecological Research Report No. 151

Ekologiese Navorsingsverslag No. 151



**Botanical issues  
relating to the proposed  
KHOISAN BAY DEVELOPMENT,  
on Portion 2 of the Farm  
Strandfontein No. 712  
De Kelders**

4 November 2009  
Revised 3 May 2012

COMPILED BY - SAAMGESTEL DEUR

**Dr C. Boucher**

18 Patrys Street  
Stellenbosch  
7600  
South Africa

Telephone / Fax 021 887 1421; Cell 083 628 2570

Patrysstraat 18  
Stellenbosch  
7600  
Suid-Afrika

Telefoon / Faks 021 887 1421; Sel 083 628 2570

Botanical Issues relating to the proposed Khoisan Bay Development, De Kelders

## CONTENTS

Summary .....	4
1. Introduction .....	5
1.1 Location .....	5
1.2 General flora and vegetation .....	5
2. Zietsman's findings .....	7
2.1 Flora and Vegetation .....	7
2.1.1 <i>Olea exasperata</i> – <i>Thamnochortus guthrieae</i> Overberg Dune Strandveld community .....	9
2.1.1.1 <i>Metalasia muricata</i> – <i>Olea exasperata</i> Overberg Dune Strandveld sub-community	10
2.1.1.2 <i>Diosma subulata</i> – <i>Olea exasperata</i> Overberg Dune Strandveld sub-community .....	10
2.1.1.3 <i>Pelargonium betulinum</i> – <i>Olea exasperata</i> Overberg Dune Strandveld sub-community .....	11
2.1.1.4 <i>Erica plukenetii</i> var. <i>plukenetii</i> – <i>Olea exasperata</i> Overberg Dune Strandveld sub-community .....	12
2.1.2 <i>Agathosma geniculata</i> – <i>Helichrysum retortum</i> Agulhas Limestone Fynbos community .....	12
2.1.3 <i>Euclea racemosa</i> – <i>Pterocelastrus tricuspidatus</i> Overberg Dune Strandveld thicket community .....	13
2.2 Zietsman's conservation recommendations .....	14
3. Assessment of Zietsman's findings .....	15
3.1 Flora .....	15
3.2 Vegetation .....	17
3.3 Alien flora .....	18
3.4 Linkages .....	19
4. Botanical impact of the proposed development .....	19
4.1 Development Alternative 1 .....	19
4.2 Development Alternative 2 integrating development with partial conservation .....	21
4.3 Development Alternative 3 – Development of Portion 1 with an Extended Conservation Area .....	27
4.4 Impact assessment evaluation .....	28
5. Management issues .....	30
5.1 Fires and Firebreaks .....	30
5.2 Restrictions .....	34
6 Offsets .....	34
7. References .....	35

Appendices

Appendix 1. Threatened vegetation categories .....	35
Appendix 2. Threatened Ecosystem categories .....	36
Appendix 3. Categories for "Flora of Conservation Concern" .....	37
Appendix 4. Phytosociological table for area (data from M Zietsman re-analysed) .....	39
Appendix 5. Protocols for assessment of impacts associated with development alternatives	40
Appendix 6. Declaration of Independence of Practitioner .....	42
Appendix 7. Dr Charles Boucher Abridged CV. ....	43

List of Figures

- Figure 1. The north-western part of the Khoisan Bay property with the stable dunefield in the foreground with the limestone cliffs at Die Plaat in the centre and Walker Bay in the left and the Kleinrivier Mountains in the distance.
- Figure 2. National potential vegetation map of the De Kelders area extracted from Mucina & Rutherford (2006). FS 7 = Overberg Dune Strandveld; FFI 1= Agulhas Limestone Fynbos; FFs 12 = Overberg Sandstone Fynbos; FOz 6 = Southern Coastal Forest.
- Figure 3. Detailed vegetation map of area by Zietsman (undated).
- Figure 4. Areas identified by Zietsman (undated) as containing sensitive vegetation.
- Figure 5. Khoisan Bay vegetation on stable dunes in foreground with Walker Bay Nature Reserve in middle to far distance showing recently stabilised to loose dunes (Photo by E. Foster).
- Figure 6. Initial development Alternative 1.
- Figure 7. Aerial image of the proposed Khoisan Bay development site showing environmental constraints, conservation areas, firebreaks and recommended buffer between the development, the Walker Bay Nature Reserve and the R43 provincial road.
- Figure 8. The layout of Development Alternative 2.
- Figure 9. Development Alternative 2, superimposed on the vegetation map and including the suggested outline from Figure 7 (pink development line) with the proposed compromise development outline (red boundary line) as in Figure 8.
- Figure 10. Development Alternative 2, superimposed on the GoogleEarth image.
- Figure 11. Portion 1 will be developed now as the Khoisan Bay development, with Portion 2 (Private Open Space) being earmarked for future development and Portion 3 being zoned as Public Open Space
- Figure 12. Alternative 3, Phase 1, plot layout with the Public Open Space along the R43 in green.
- Figure 13. Aerial image of Strandfontein Farm 712 (Portions 1 & 2) showing Alternative 3 Development Option (Portions 1 & 2), together with environmental constraints, conservation areas, firebreaks and recommended buffer between the development, the Walker Bay Nature Reserve and the R43 provincial road. (PrOS = Private Open Space).

List of Tables

- Table 1. Key descriptors for the *Olea exasperata* – *Thamnochortus guthrieae* Overberg Dune Strandveld community
- Table 2. Key descriptors for the *Metalasia muricata* – *Olea exasperata* Overberg Dune Strandveld sub-community
- Table 3. Key descriptors for the *Diosma subulata* – *Olea exasperata* Overberg Dune Strandveld sub-community
- Table 4. Key descriptors for the *Pelargonium betulinum* – *Olea exasperata* Overberg Dune Strandveld sub-community
- Table 5. Key descriptors for the *Erica plukenetii* var. *plukenetii* – *Olea exasperata* Overberg Dune Strandveld sub-community

- Table 6. Key descriptors for the *Agathosma geniculata* – *Helichrysum retortum* Agulhas Limestone Fynbos community
- Table 7. Key descriptors for the *Euclea racemosa* – *Pterocelastrus tricuspidatus* Overberg Dune Strandveld thicket community
- Table 8. Total area occupied by each plant community together with area proposed as Alternative 2, for development versus conservation
- Table 9. Total area occupied by each plant community together with area proposed as Alternative 3 for development versus that undeveloped and potentially all conserved
- Table 10. Botanical impact assessment of the "No Go" or Status Quo development alternative at Khoisan Bay, De Kelders
- Table 11. Botanical impact assessment of Alternative 1, the Full Area Development Option, at Khoisan Bay, De Kelders
- Table 12. Botanical impact assessment of Alternative 2, the 60% Development and 40% Conservation Option, at Khoisan Bay, De Kelders
- Table 13. Botanical impact assessment of Alternative 3, the 50% Development and 50% Conservation Option, at Khoisan Bay, De Kelders

## **Summary**

Three communities with four sub-communities are identified on site in the Zietsman report. These are upheld. The 83 species (9 exotic aliens, 4 Red Data Book species) reported for the site is low for this diverse area. The vegetation is primarily Overberg Dune Strandveld and transitional vegetation developing toward Agulhas Sand Fynbos and Agulhas Limestone Fynbos. Three development alternatives and a "No Go" Option are evaluated. In Development Alternative 3, the preferred alternative, a natural buffer conservation area between the proposed development and the Walker Bay Nature Reserve, which includes a consolidated dune field, and another along the R43 road, are proposed. A large Public Open Space (54 ha) and a Private Open Space (18 ha), which together occupy 68% of this portion of the farm, are proposed in the preferred 3<sup>rd</sup> Alternative. A buffer with firebreak of 5.8446 ha parallels the development along the R43. Alternative 3 would incorporate examples of all the vegetation types present on the property in a consolidated area. The location of firebreaks are suggested but must be finalised in agreement with Walker Bay Nature Reserve management, who need to be involved in their maintenance and in the management of the conservation areas in consultation with an Environmental Control Officer appointed for the management of the estate.

## **1. Introduction**

Khoisan Bay Developments (Pty) Ltd through Johan Neethling Environmental Services requested an evaluation of the Open Space System they proposed to determine whether it would meet environmental requirements as CapeNature were unsatisfied with the proposals put forward.

The Farm Strandfontein at De Kelders (**Figure 1**) was inspected on 3 April and 28 August 2009 followed later by discussions with C. Maartens (telephonic) and S. Ralston both of CapeNature to discuss their concerns about the proposed development. The basic proposals presented below are put forward to solve problems with the earlier development design so as to make it more acceptable to CapeNature. It is noted that the Fine-scale Spatial Diversity Conservation Plan for the area identifies the property as a "Critical Biodiversity Area" (S. Holness pers. com.).



Figure 1. The north-western part of the Khoisan Bay property with the stable dune field in the foreground with the limestone cliffs at Die Plaat in the centre and Walker Bay in the left and the Kleinrivier Mountains in the distance (Photo by E. Foster).

### 1.1 Location

The proposed Khoisan Bay Development site, 110 hectares in extent, abuts onto the northern extremity of De Kelders Town. The R43 Provincial Road borders the southern side of the property and the Walker Bay Nature Reserve the northern side.

The property is crossed by Municipal services servitude from De Kelders in the form of a pipeline and a gravel road).

### 1.2 General flora and vegetation

The Cape Floristic Kingdom, one of six world floral kingdoms, is internationally renowned for its special rich flora containing an estimated 9 000 species of vascular plants of which almost 69% are endemic (restricted to the region). This makes it one of the richest regions in the world in terms of botanical diversity. It is characterized by five endemic families and by the conspicuous presence of, amongst others, species belonging to the families Aizoaceae, Ericaceae, Fabaceae, Iridaceae, Orchidaceae, Proteaceae, Restionaceae, Rutaceae and Scrophulariaceae (Goldblatt & Manning, 2000).

The publication describing the national vegetation types by Mucina & Rutherford (2006) was not available to Zietsman (undated) although she refers to the accompanying national vegetation map (Mucina, Rutherford & Powrie, 2005) (**Figure 2**). The information included below from Mucina & Rutherford (2006) is provided to augment data provided in the Zietsman report.

An important major vegetation type difference relevant to the study area is the distinction between forest, strandveld and fynbos. Strandveld is a shrubland dominated by sclerophyllous, broad-leaved shrubs and are found closer to the seashore. In sheltered moister sites strandveld can grow taller and become replaced by low scrub milkwood forest. Structural and floristic differences between strandveld and fynbos are striking. Although restios can be common elements in both, the Proteaceae are absent from Strandveld while Ericaceae are extremely rare to absent altogether. The substrate of Strandveld is mineral-rich, with high concentrations of lime (locally called kalksteen) in coastal sands. An intricate relationship between topography, substrate type and age, local water-logging and fire dictates the distributional relationship between Strandveld and Fynbos (Mucina & Rutherford 2006).

Overberg Dune Strandveld (FS 7) is distributed from Rooiels (Kogelberg Biosphere Reserve) to Cape Infanta and is concentrated on the Agulhas Peninsula. It is found on Recent to Quaternary marine-derived calcareous sands (Bredasdorp Group) often in dune fields or coastal sands. It consists of up to 4 m tall closed evergreen sclerophyllous (hard-leaved) shrublands in wind-protected valleys forming low, 1 m tall, wind-shorn coastal thicket in exposed littoral situations.

Currently, this vegetation type has a similar status for Vegetation Conservation (Mucina & Rutherford 2006) and Ecosystem Threat (Government Gazette 2011) of "Least Threatened" (see **Appendix 1** for Threatened Vegetation Category and **Appendix 2** for Threatened Ecosystem Category explanations). This status is primarily attributed to a historical legacy of state-owned control of a number of erstwhile mobile coastal dune fields (to ensure their stabilisation) and thus of their present conservation through ownership being transferred from the erstwhile Department of Forestry to CapeNature. Walker Bay Nature Reserve (previously Forest Reserve) contributes significantly toward the conservation of the Overberg Dune

Strandveld. Private Nature Reserves also contribute to the conservation of certain important prime habitats. The survival of this vegetation is seriously threatened by the invasion of thicket-forming aliens such as *Acacia cyclops* (rooikrans), *Acacia saligna* (port jackson) and *Leptospermum laevigatum* (myrtle), urbanisation and cultivation.

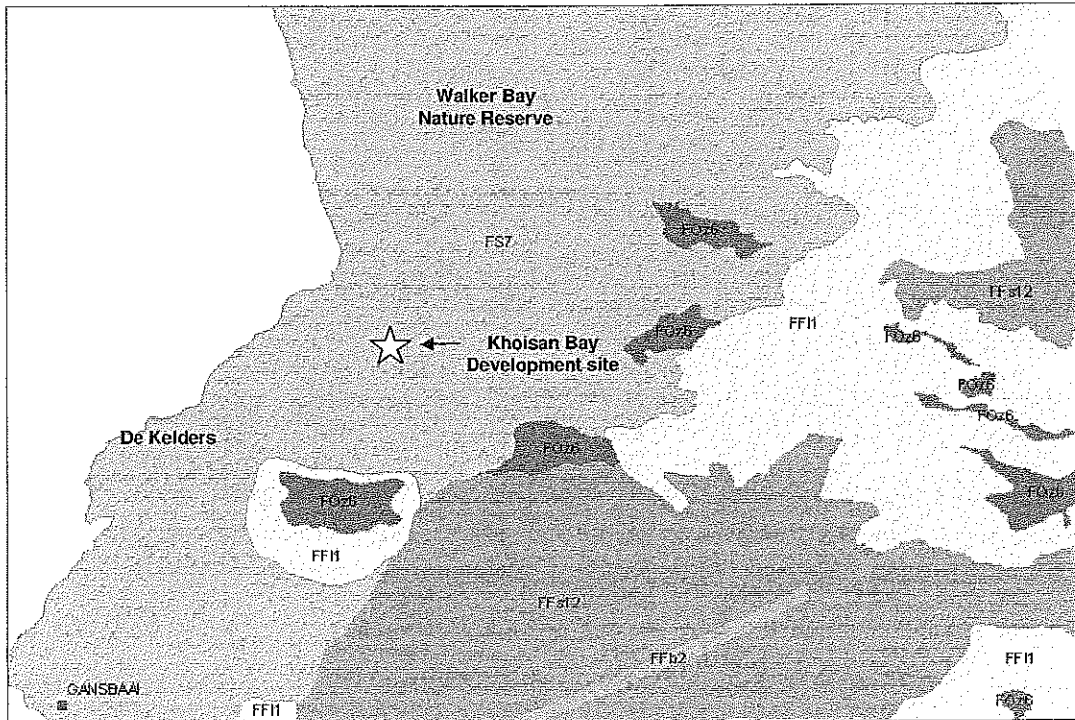


Figure 2. National potential vegetation map of the De Kelders area extracted from Mucina & Rutherford (2006). FS 7 = Overberg Dune Strandveld; FFI 1= Agulhas Limestone Fynbos; FFs 12 = Overberg Sandstone Fynbos; FOz 6 = Southern Coastal Forest.

## 2. Zietsman's findings

### 2.1 Flora and Vegetation

Zietsman (undated) recorded 83 species on the property and lists six of these as Red Data Book threatened species and 14 as invader or problem plants. (These data are revised in the current report using more recent information.)

The following plant communities are identified by Zietsman (undated) (her nomenclature and numbering system is included to match the numbers used in her vegetation map (**Figure 3, Appendix 3**):

- 1 *Olea exasperata* – *Thamnochortus guthrieae* Overberg Dune Strandveld community
  - 1.1 *Metalasia muricata* – *Olea exasperata* Overberg Dune Strandveld sub-community
  - 1.2 *Diosma subulata* – *Olea exasperata* Overberg Dune Strandveld sub-community
  - 1.3 *Pelargonium betulinum* – *Olea exasperata* Overberg Dune Strandveld sub-community
  - 1.4 *Erica plukenetii* var. *plukenetii* – *Olea exasperata* Overberg Dune Strandveld sub-community
- 2 *Agathosma geniculata* – *Helichrysum retortum* Agulhas Limestone Fynbos community

3 *Euclea racemosa* – *Pterocelastrus tricuspidatus* Overberg Dune Strandveld thicket community

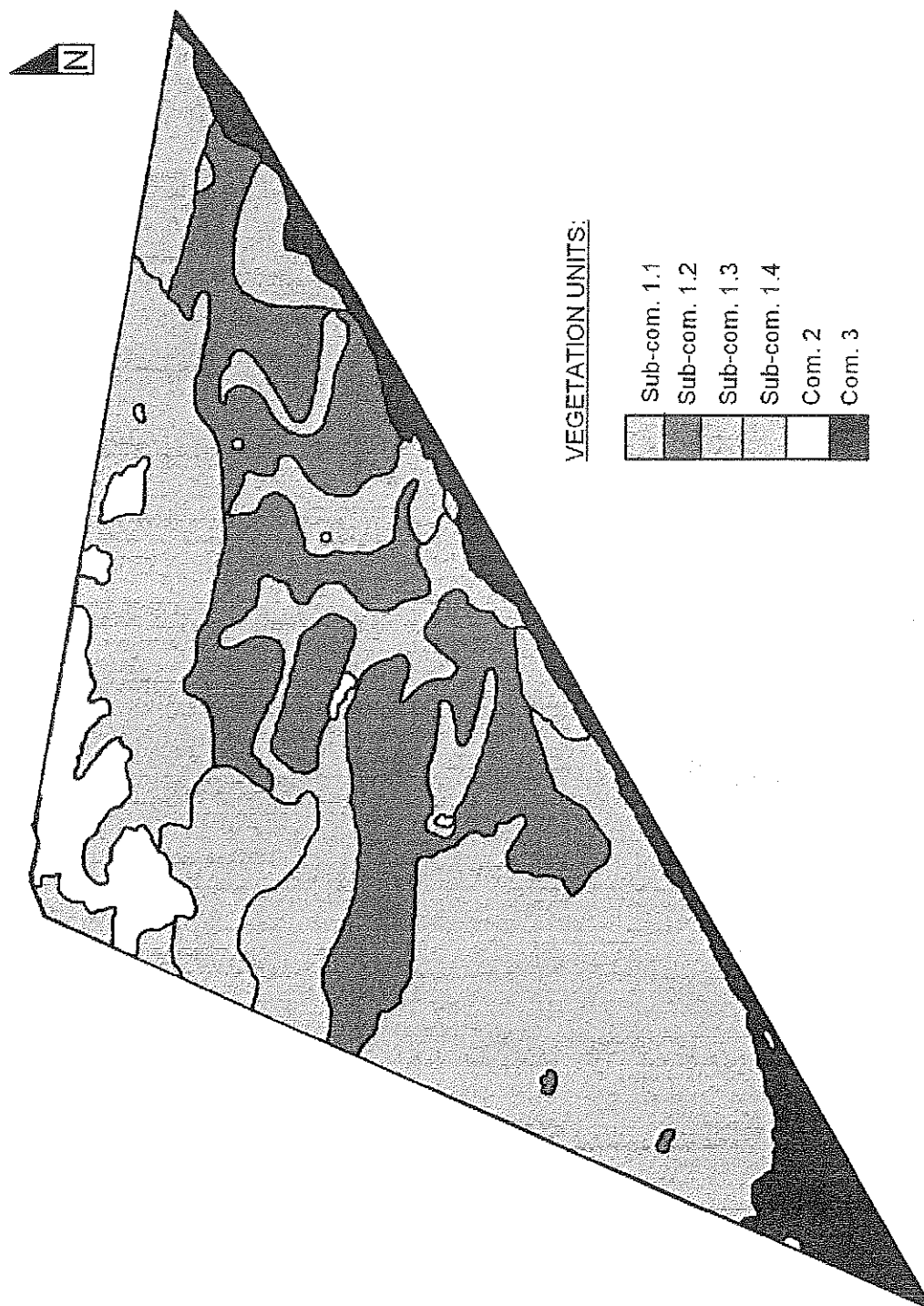


Figure 3. Detailed vegetation map of area by Zietsman (undated).

The description of each community is briefly condensed below to features essential for their identification and typification, while their distribution is included in **Figure 3**. The list of species found in each community is included here to assist in the diagnosis of each community as no phytosociological table is included in the Zietsman report. Changes to Flora of Conservation Concern (Red Data Book plants) status, subsequent to Zietsman's work, are indicated in each table and in section 3. The Flora of Conservation Concern category definitions, indicated by abbreviations in this section, are given in **Appendix 3**.

### 2.1.1 *Olea exasperata* – *Thamnochortus guthrieae* Overberg Dune Strandveld community

Table 1. Key descriptors for the *Olea exasperata* – *Thamnochortus guthrieae* Overberg Dune Strandveld community

<b>Area &amp; % of total area</b>	94.11 ha or 86.45%
<b>Soils</b>	Sandy soils
<b>Rockiness</b>	0 %
<b>Characteristic species</b>	<i>Diosma subulata</i> , <i>Thamnochortus insignis</i> , <i>Helichrysum pulchellum</i> , <i>Pelargonium suburbanum</i> subsp. <i>bipinnatifidum</i> , <i>Crassula nudicaulis</i> var. <i>nudicaulis</i> , <i>Brunsvigia orientalis</i> , <i>Ficinia pinguior</i> , <i>Erica plukenetii</i> var. <i>plukenetii</i> , <i>Trichocephalus stipularis</i> , <i>Metalasia muricata</i> , <i>Morella cordifolia</i> , <i>Pelargonium betulinum</i> , <i>Thamnochortus guthrieae</i> , <i>Passerina paleacea</i>
<b>Red Data species</b>	<i>Ficinia pinguior</i> (VU)

The shrub *Olea exasperata* dominates this community. Other species found here include: the trees and shrubs: *Acacia cyclops*\*, *Anthospermum aethiopicum*, *Cassine peragua*, *Chrysanthemoides monillifera*, *Conicosia pugioniformis* subsp. *muirii*, *Euclea racemosa*, *Indigofera brachystachya*, *Jamesbrittenia albomarginata*, *Maytenus procumbens*, *Metalasia densa*, *Muraltia satureioides* var. *satureioides*, *Otholobium bracteolatum*, *Passerina vulgaris*, *Passerina rigida*, *Phyllica ericoides*, *Pterocelastrus tricuspidatus*, *Searsia glauca*, *Searsia laevigata* var. *villosa*, *Searsia lucida*, *Salvia africana-lutea*, *Sutera hispida*, *Tephrosia capensis*, *Zygophyllum flexuosum*; the grasses *Cenchrus incertus*\*, *Ehrharta villosa* var. *maxima*, *Pentaschistis calcicola* and *Koeleria capensis*, the restios *Calopsis viminea* and *Ischyrolepis eleocharis*; the sedge *Ficinia pinguior*, the geophyte *Brunsvigia orientalis*; the sub-shrubs *Chironia baccifera*, *Carpobrotus acinaciformis*, *Euphorbia arceuthobioides*, *Helichrysum patulum*, *Pelargonium capitatum*, *Selago polystachya*, *Senecio arenarius*, *Lyperia lychnidea* and the climbers *Cassytha ciliolata* and *Cissampelos capensis*.

Boucher (this report), provides detail from the further analysis of Zietsman's data to differentiate this community, namely, Boucher community number 2 the *Olea exasperata*-*Thamnochortus guthrieae* Coastal Dune Fynbos in **Appendix 4**.

2.1.1.1 *Metalasia muricata* – *Olea exasperata* Overberg Dune Strandveld sub-communityTable 2. Key descriptors for the *Metalasia muricata* – *Olea exasperata* Overberg Dune Strandveld sub-community

<b>Map identification</b>	Sub-community 1.1 in <b>Figure 3</b>
<b>Area &amp; % of total area</b>	50.70 ha or 46.57%
<b>Soils</b>	Sandy soils
<b>Rockiness</b>	0 %
<b>Characteristic species</b>	<i>Pelargonium suburbanum</i> subsp. <i>bipinnatifidum</i> and <i>Morella cordifolia</i>
<b>Red Data species</b>	<i>Pentaschistis calcicola</i> (NT), <i>Thamnochortus guthrieae</i> (LC – delisted now)

The dominant species in this sub-community is the shrub *Olea exasperata*. Other species found here include: the trees and shrubs: *Anthospermum aethiopicum*, *Cassine peragua*, *Euclea racemosa*, *Indigofera brachystachya*, *Maytenus procumbens*, *Metalasia muricata*, *Morella cordifolia*, *Muraltia satureioides* var. *satureioides*, *Passerina rigida*, *Phyllica ericoides*, *Pterocelastrus tricuspidatus*, *Salvia africana-lutea*, *Searsia glauca*, *Passerina paleacea*, *Searsia laevigata* var. *villosa* and *Zygophyllum flexuosum*; the sub-shrubs *Chironia baccifera* and *Selago polystachya*; the grass *Pentaschistis calcicola*; the restio *Thamnochortus guthrieae* and the climber *Cissampelos capensis*.

Boucher (this report), provides detail from the further analysis of Zietsman's data to differentiate this community, namely, Boucher community number 2.1, titled the *Olea exasperata*-*Metalasia muricata* Transitional Strandveld to Dune Fynbos, which is subdivided into two variations namely, 2.1.1 *Olea exasperata*-*Morella cordifolia* Transitional Strandveld to Dune Fynbos and 2.1.2 *Olea exasperata*-*Passerina corymbosa* Transitional Strandveld to Dune Fynbos in **Appendix 4**.

2.1.1.2 *Diosma subulata* – *Olea exasperata* Overberg Dune Strandveld sub-communityTable 3. Key descriptors for the *Diosma subulata* – *Olea exasperata* Overberg Dune Strandveld sub-community

<b>Map identification</b>	Sub-community 1.2 in <b>Figure 3</b>
<b>Area &amp; % of total area</b>	28.27 ha or 25.97%
<b>Soils</b>	Sandy soils
<b>Rockiness</b>	0 %
<b>Characteristic species</b>	No plant species were recorded that are restricted to this vegetation unit
<b>Red Data species</b>	<i>Pentaschistis calcicola</i> (NT), <i>Carpobrotus acinaciformis</i> (LC – delisted now), <i>Thamnochortus guthrieae</i> (LC – delisted now)

The dominant plant species in this sub-community is the shrub *Diosma subulata*. Other species found here include the trees and shrubs *Acacia cyclops*\*, *Olea exasperata*, *Passerina rigida*, *Pelargonium betulinum*, *Phylica ericoides*, *Pterocelastrus tricuspidatus* and *Indigofera brachystachya*; the sub-shrubs *Carpobrotus acinaciformis*, *Conicosia pugioniformis* subsp. *muirii*, *Crassula nudicaulis* var. *nudicaulis* and *Euphorbia arceuthobioides*; the grasses *Pentaschistis calcicola* and *Koeleria capensis*; the restios *Calopsis viminea*, *Thamnochortus guthrieae* and *Ischyrolepis eleocharis*; and the parasite *Cassytha ciliolata*.

Boucher (this report), provides detail from the further analysis of Zietsman's data to differentiate this community, namely, Boucher community number 2.3, titled the *Olea exasperata-Diosma subulata* Dune Fynbos in **Appendix 4**.

#### 2.1.1.3 *Pelargonium betulinum* – *Olea exasperata* Overberg Dune Strandveld sub-community

Table 4. Key descriptors for the *Pelargonium betulinum* – *Olea exasperata* Overberg Dune Strandveld sub-community

<b>Map identification</b>	Sub-community 1.3 in <b>Figure 3</b>
<b>Area &amp; % of total area</b>	15.05 ha or 13.83%
<b>Soils</b>	Sandy soils
<b>Rockiness</b>	0 %
<b>Characteristic species</b>	<i>Thamnochortus insignis</i> , <i>Helichrysum pulchellum</i> , <i>Lyperia lychnidea</i> , <i>Passerina vulgaris</i>
<b>Red Data species</b>	<i>Helichrysum pulchellum</i> (LC - delisted now), <i>Pentaschistis calcicola</i> (NT), <i>Carpobrotus acinaciformis</i> (LC - delisted now), <i>Thamnochortus guthrieae</i> (LC - delisted now)

The dominant plant species of this sub-community is the shrub *Olea exasperata*. Other species found in this sub-community include: the trees and shrubs: *Acacia cyclops*\*, *Anthospermum aethiopicum*, *Cassine peragua*, *Chrysanthemoides monilifera*, *Crassula nudicaulis* var. *nudicaulis*, *Euclea racemosa*, *Indigofera brachystachya*, *Metalasia muricata*, *Muraltia satureioides* var. *satureioides*, *Otholobium bracteolatum*, *Passerina paleacea*, *Pterocelastrus tricuspidatus*, *Searsia glauca*, *Sutera hispida*, *Tephrosia capensis*, and *Zygophyllum flexuosum*; the sub-shrubs *Carpobrotus acinaciformis*, *Euphorbia arceuthobioides*, *Helichrysum patulum*, *Pelargonium betulinum*, *Pelargonium capitatum*, *Selago polystachya* and *Wahlenbergia tenella*; the grasses *Cenchrus incertus*\*, *Ehrharta villosa* var. *maxima* and *Pentaschistis calcicola*; the restios *Calopsis viminea*, *Thamnochortus guthrieae* and *Ischyrolepis eleocharis*; the geophyte *Brunsvigia orientalis*; the annual *Senecio arenarius* and the climbers *Cassytha ciliolata* and *Cissampelos capensis*.

Boucher (this report), provides detail from the further analysis of Zietsman's data to differentiate this community, namely, Boucher community number 2.2, titled the *Olea exasperata-Helichrysum pulchellum* Dune Fynbos in **Appendix 4**.

#### 2.1.1.4 *Erica plukenetii* var. *plukenetii* – *Olea exasperata* Overberg Dune Strandveld sub-community

Table 5. Key descriptors for the *Erica plukenetii* var. *plukenetii* – *Olea exasperata* Overberg Dune Strandveld sub-community

<b>Map identification</b>	Sub-community 1.4 in <b>Figure 3</b>
<b>Area &amp; % of total area</b>	0.09 ha or 0.08%
<b>Soils</b>	Sandy soils
<b>Rockiness</b>	0 %
<b>Characteristic species</b>	<i>Erica plukenetii</i> var. <i>plukenetii</i> , <i>Trichocephalus stipularis</i>
<b>Red Data species</b>	<i>Ficinia pinguior</i> (VU – added now), <i>Pentaschistis calcicola</i> (NT), <i>Thamnochortus guthrieae</i> (LC - delisted now)

The dominant plant species of this sub-community is the sedge *Ficinia pinguior*.

Other species found in this sub-community include: the trees and shrubs: *Cassine peragua*, *Euclea racemosa*, *Indigofera brachystachya*, *Jamesbrittenia albomarginata*, *Olea exasperata*, *Otholobium bracteolatum*, *Passerina rigida*, *Passerina paleacea*, *Phyllica ericoides*, *Pterocelastrus tricuspidatus*, *Searsia glauca*, *Searsia lucida* and *Tephrosia capensis*; the sub-shrub *Chironia baccifera*; the grasses *Koeleria capensis* and *Pentaschistis calcicola*; the restios *Calopsis viminea*, *Ischyrolepis eleocharis* and *Thamnochortus guthrieae*; the sedges *Ficinia pinguior*, the geophyte *Brunsvigia orientalis*; and the parasite *Cassytha ciliolata*.

Boucher (this report), provides detail from the further analysis of Zietsman's data to differentiate this community, namely, Boucher community number 2.4, titled the *Olea exasperata-Erica plukenetii* Dune Fynbos in **Appendix 4**.

#### 2.1.2 *Agathosma geniculata* – *Helichrysum retortum* Agulhas Limestone Fynbos community

Table 6. Key descriptors for the *Agathosma geniculata* – *Helichrysum retortum* Agulhas Limestone Fynbos community

<b>Map identification</b>	Community 2 in <b>Figure 3</b>
<b>Area &amp; % of total area</b>	7.00 ha or 6.43%
<b>Soils</b>	Shallow rocky soils
<b>Rockiness</b>	30%
<b>Characteristic species</b>	<i>Agathosma geniculata</i> , <i>Crassula expansa</i> , <i>Helichrysum retortum</i> , <i>Knowltonia vesicatoria</i>
<b>Red Data species</b>	<i>Agathosma geniculata</i> (NT), <i>Pentaschistis calcicola</i> (NT).

The dominant plant species of the community is the shrub *Agathosma geniculata*. Other species found in this community include: the trees and shrubs: *Anthospermum aethiopicum*, *Euclea racemosa*, *Metalasia densa*, *Olea exasperata*, *Passerina rigida*, *Phylica ericoides*, *Pterocelastrus tricuspidatus*, *Searsia laevigata* var. *villosa*; the sub-shrubs *Chironia baccifera*, *Euphorbia arceuthobioides*, *Jamesbrittenia albomarginata*, *Selago polystachya*, *Sutera hispida*; the grasses *Pentaschistis calcicola* and *Koeleria capensis*; the restios *Calopsis viminea* and *Ischyrolepis eleocharis*; and the parasite *Cassytha ciliolata*.

Boucher (this report), provides detail from the further analysis of Zietsman's data to differentiate this community, namely, Boucher community number 3, titled the *Olea exasperata*-*Agathosma geniculata* Proto-Limestone Fynbos in **Appendix 4**.

### 2.1.3 *Euclea racemosa* – *Pterocelastrus tricuspidatus* Overberg Dune Strandveld thicket community

Table 7. Key descriptors for the *Euclea racemosa* – *Pterocelastrus tricuspidatus* Overberg Dune Strandveld thicket community

<b>Map identification</b>	Community 3 in <b>Figure 3</b>
<b>Area &amp; % of total area</b>	8.80 ha or 8.08%
<b>Soils</b>	Sandy soils with rocks
<b>Rockiness</b>	15%
<b>Characteristic species</b>	<i>Athanasia dentata</i> , <i>Ammi majus</i> *, <i>Avena fatua</i> *, <i>Bromus diandrus</i> *, <i>Cassine parvifolia</i> , <i>Centella virgata</i> , <i>Colpoon compressum</i> , <i>Cynodon dactylon</i> *, <i>Emex australis</i> *, <i>Eragrostis sarmentosa</i> *, <i>Euphorbia peplus</i> *, <i>Felicia aculeata</i> , <i>Festuca scabra</i> , <i>Lagarus ovatus</i> *, <i>Metalasia brevifolia</i> , <i>Passerina ericoides</i> , <i>Pelargonium myrrhifolium</i> , <i>Pennisetum villosum</i> *, <i>Solanum linnaeanum</i> *, <i>Tetragonia fruticosa</i> , <i>Thesium</i> sp., <i>Trachyandra hirsutiflora</i> , <i>Tribulus terrestris</i> *, <i>Wahlenbergia tenella</i> , <i>Sebaea aurea</i>
<b>Red Data species</b>	<i>Passerina ericoides</i> (NT- now changed to VU), <i>Carpobrotus acinaciformis</i> (LC - delisted now)

The dominant species in the community are the alien invader tree *Acacia cyclops*\*, together with *Euclea racemosa*, *Pterocelastrus tricuspidatus* and *Olea exasperata*. Other species found in this community include: the trees and shrubs: *Anthospermum aethiopicum*, *Cassine peragua*, *Chrysanthemoides monilifera*, *Tephrosia capensis*, *Muraltia saturoioides* var. *saturoioides*, *Indigofera brachystachya*, *Otholobium bracteolatum*, *Passerina rigida*, *Phylica ericoides*, *Searsia glauca*, *Selago polystachya*, *Searsia laevigata* var. *villosa* and *Zygophyllum flexuosum*; the sub-shrubs *Carpobrotus acinaciformis*, *Helichrysum patulum*, *Pelargonium capitatum* and *Sutera hispida*, the grasses *Cenchrus incertus*\*, *Ehrharta villosa* var. *maxima*, and *Koeleria capensis*; the restios *Calopsis viminea* and *Ischyrolepis eleocharis*; the annual *Senecio arenarius*; and the climber *Cissampelos capensis*.

Boucher (this report), provides detail from the further analysis of Zietsman's data to differentiate this community, namely, Boucher community number 1, titled the *Olea exasperata-Eragrostis sarmentosa* Strandveld Thickets in **Appendix 4**.

## **2.2 Zietsman's conservation recommendations**

The following extract is from Zietsman's (undated) conclusions (pages 39-40 of her report):

"All the vegetation units could be developed as no Critical Endangered or Endangered or Vulnerable ecosystems are present in the area, and as no Critical Endangered or Endangered or Vulnerable red data species were found in the area. It would however be very good if a part of Com. 2 containing the *Agathosma geniculata* population as well as *Pentascistis calcicola*, two Near Threatened red data species; and sub-com. 1.3, as well a buffer-zone around this area, (Fig. 2), containing three Least Concern red data species (*Carpobrotus acinaciformis*, *Helichrysum pulchellum* and *Thamnocortus guthrieae*), could be conserved. Due to the fact that the vegetations units do not belong to any threatened ecosystems or contains any highly important red data species the development of the vegetation units would, have either an impact of LOW (Com. 3) or MEDIUM (Com. 1 & 2) significance before mitigation and a LOW significance after mitigation. Where red data species occur, which area easily transplantable, a Search & Rescue operation could take place as an added mitigation measure or an alternative to the conservation of parts of these vegetation units. A Search & Rescue operation would however not be very effective for the *Agathosma geniculata* population, as this species is a medium shrub, which might not be easily transplantable.

It is recommended that the important vegetation areas, the undeveloped areas, as well as the vegetation buffer should be managed as described under 'General Management Principles'. All other vegetated areas can be developed. "

Zietsman provides the following map (**Figure 4**) indicating the location of her "important" vegetation units: