

INTEGRATED RESERVE MANAGEMENT PLAN

ZANDVLEI ESTUARY NATURE RESERVE

June 2011



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AUTHORIZATION PAGE

This Integrated Management Plan for the Zandvlei Estuary Nature Reserve was drafted by the Area Manager and recommended by the Reserve Planning Team, a multi-disciplinary team consisting of:

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DOCUMENTED

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Environmental Resource Management Department

City of Cape Town

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List of abbreviations used

APO	annual plan of operations
C.A.P.E	Cape Action for People and the Environment
CDF	Conservation Development Framework
CFR	Cape Floristic Region
EIA	environmental impact assessment
IDP	Integrated Development Plan
IMEP	Integrated Metropolitan Environmental Policy
IRMP	Integrated Reserve Management Plan
IUCN	International Union for Conservation of Nature
LBSAP	Local Biodiversity Strategy and Action Plan
METT-SA	Management Effectiveness Tracking Tool South Africa
MOU	memorandum of understanding
RPC	Reserve Planning Committee
SANBI	South African National Biodiversity Institute
SWOT	strengths, weaknesses, opportunities, threats
TOR	terms of reference

PART 1

DESCRIPTION

1. INTRODUCTION

Zandvlei is an estuary located in the south-western corner of the Cape Flats, near Muizenberg, a small coastal town on the False Bay coastline. The reserve was started when 22 ha along the northern shore of the vlei was proclaimed the Zandvlei Bird Sanctuary in 1978. This was enlarged to 204 ha with the proclamation of the Greater Zandvlei Estuary Nature Reserve (the expansion of the boundaries) on 26 October 2006 in terms of Provincial Gazette 6389/27, October 2006 (PN 344/2006). The reserve lies some 20,4 km from Cape Town.

The catchment for the Zandvlei estuary falls entirely within the boundaries of the City of Cape Town, and is bordered by the Muizenberg mountain, Silvermine plateau, Constantia mountain, Cecilia Ridge, Wynberg Hill and a less conspicuous watershed along the eastern boundary. It is a relatively small catchment, comprising an area of 92 km², or 9,655 ha, and is drained by a number of rivers and streams, of which the main ones are the Little Princess Vlei stream, Westlake stream, the Keysers river, Langvlei canal and the Sand river canal/Diep river.

These rivers converge on Zandvlei, with the Keysers river and Westlake stream entering it through an extensive reed bed on its north-western margin, while the Sand river canal enters the vlei west of Wildwood Island. The wetland area covers some 60 ha, while the main body of the vlei is 56 ha. In addition, the system includes a marina of 31 ha along its eastern margin, and an outlet channel of 9 ha, which links to the sea on the north-western shore of False Bay.

Both the northern and lateral boundaries comprise the 100-year flood line, as shown in figure 1.



Figure 1: The Zandvlei estuary, comprising the channel, vlei, marina and wetland, with the 1-in-100-year flood line shown

Although the catchment as a whole has a relatively low population, the eastern parts together with lower reaches of the river – including the estuary – fall within a highly urbanised environment. The 1996 census data put the population figure at 10472 for Muizenberg, Lakeside and Marina da Gama alone, while the projections from Thornton and colleagues (1995) suggest that the population for the catchment as a whole could be of the order of 100000.

There is also an increased understanding of the need to maintain the environmental health of Zandvlei in order to optimise the recreational and conservation benefits. In addition, Zandvlei Estuary Nature Reserve has a strong environmental education programme, which involves both students from local schools and a number of environmental clubs. Local residents are actively involved in the management of the area.

The strategic management planning process that resulted in the development of an Integrated Reserve Management Plan (IRMP) for Zandvlei Estuary Nature Reserve began with the definition of the vision followed by the purpose of the reserve. This purpose is then supported by desired states for the reserve. The reserve objectives contribute to realising the purpose and desired states. For each desired state, a number of management objectives are identified. These management objectives are then implemented through the identification of outputs. Objectives for each desired state are prioritised for the five-year time horizon of the plan. Time frames, deliverables, performance indicators and targets are then allocated to each objective, or a group of linked outputs contributing to the desired state.

In context, this IRMP is a dynamic document, and the detailed subsidiary plans should be updated on an annual basis or as soon as new information comes to light that may better inform decisions on responsible land management. The IRMP should be updated every five years.

1.1 Aim of the Integrated Reserve Management Plan

The aim of the IRMP is to ensure that Zandvlei Estuary Nature Reserve has clearly defined objectives and activities to direct the protection and sustainable use of its natural, scenic and heritage resources over a five-year period. The IRMP thus provides the medium-term operational framework for the prioritised allocation of resources and capacity in the management, use and development of the reserve. The IRMP intends to add value and continuity by clearly stating management objectives, scheduling action, and providing management guidelines.

The planning process for Zandvlei Estuary Nature Reserve takes place against the backdrop of (i) the City of Cape Town's Integrated Development Plan (IDP) (Anon 2010); (ii) the City of Cape Town's Integrated Metropolitan Environmental Policy (IMEP) (Anon 2003¹); (iii) the biodiversity strategy (Anon 2003²) and Local Biodiversity Strategy and Action Plan (LBSAP) (Anon 2009¹), and (iv) the bioregion (Cape Action for People and the Environment, or C.A.P.E).

The major elements of the IRMP are this document (overall strategy, vision and context); the detailed subsidiary plans (as required), and the annual plan of operations (APO). The IRMP for Zandvlei Estuary Nature Reserve is supported by a State of Biodiversity report, operational guidelines as well as a monitoring and evaluation framework to ensure ongoing implementation and review of the protected-area management activities (figure 2).

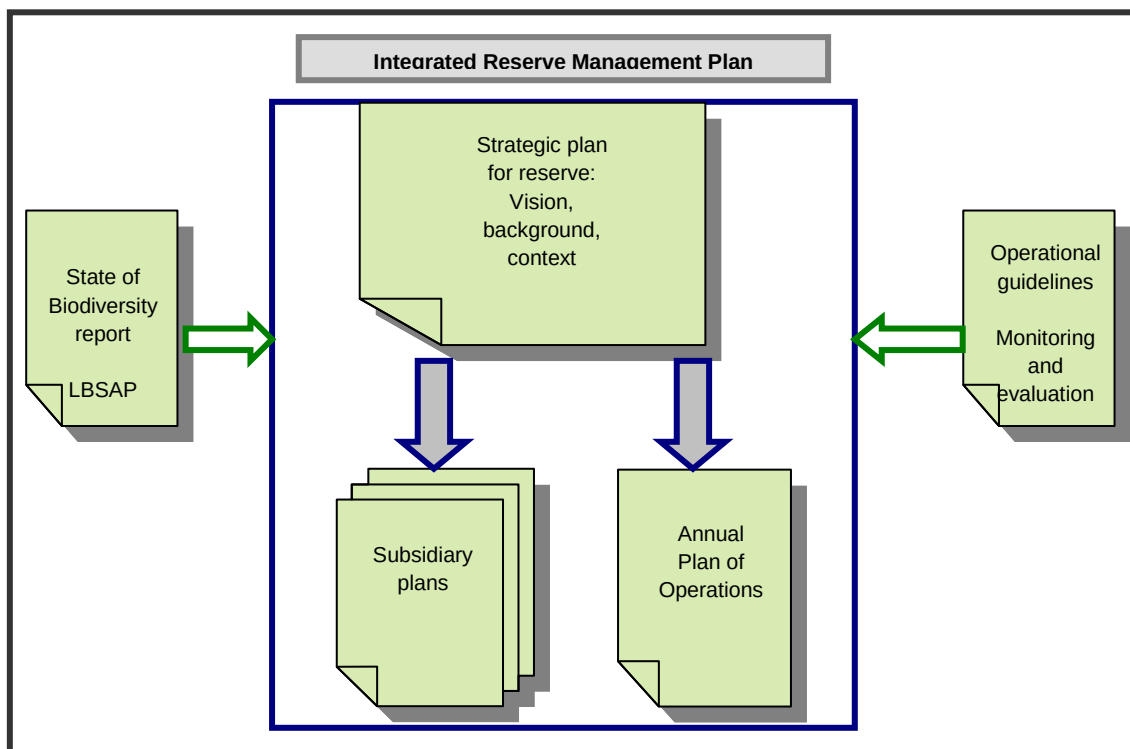


Figure 2: Elements of the IRMP

The IRMP for Zandvlei Estuary Nature Reserve forms part of a tiered series of policies, legislation and related planning documents at the sector, institutional, agency and local levels (see figure 3).

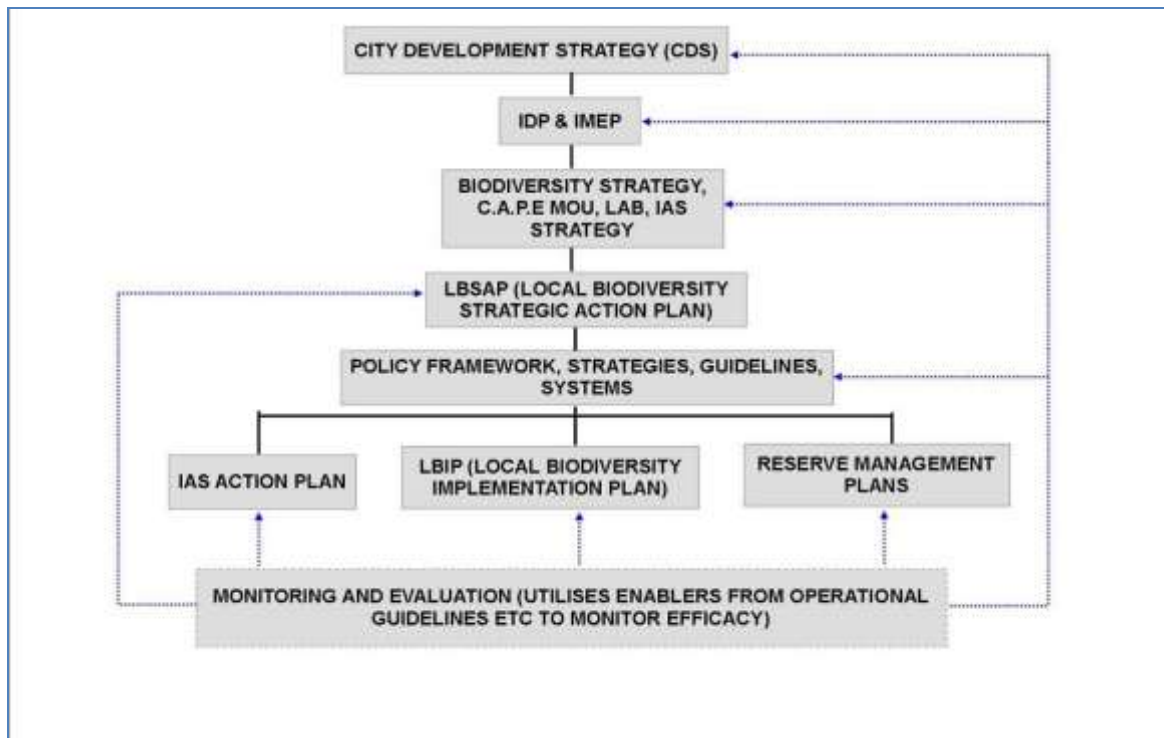


Figure 3: Legal and planning framework for the IRMP

Where possible, emphasis has been placed on the following:

- Assigning responsibility for management interventions
- Scheduling said management interventions
- Quantifying management costs

This approach is specifically intended to create a mechanism whereby management intervention can be monitored and audited on an annual basis.

The drafting of this IRMP has been guided by a small interdisciplinary Reserve Planning Committee (RPC) comprising the branch manager, the regional manager, the area manager, various specialists, and other interested and affected persons. Repeated drafts of the IRMP were presented to, and discussed by, the RPC before broader circulation for public participation.

Pre-engagement workshops were held with community partners from September to November 2010 with two public meetings to showcase the objectives. This afforded key community partners an opportunity to provide their input at an early stage. Where practical, the ideas and outputs from the workshops have been incorporated into the IRMP.

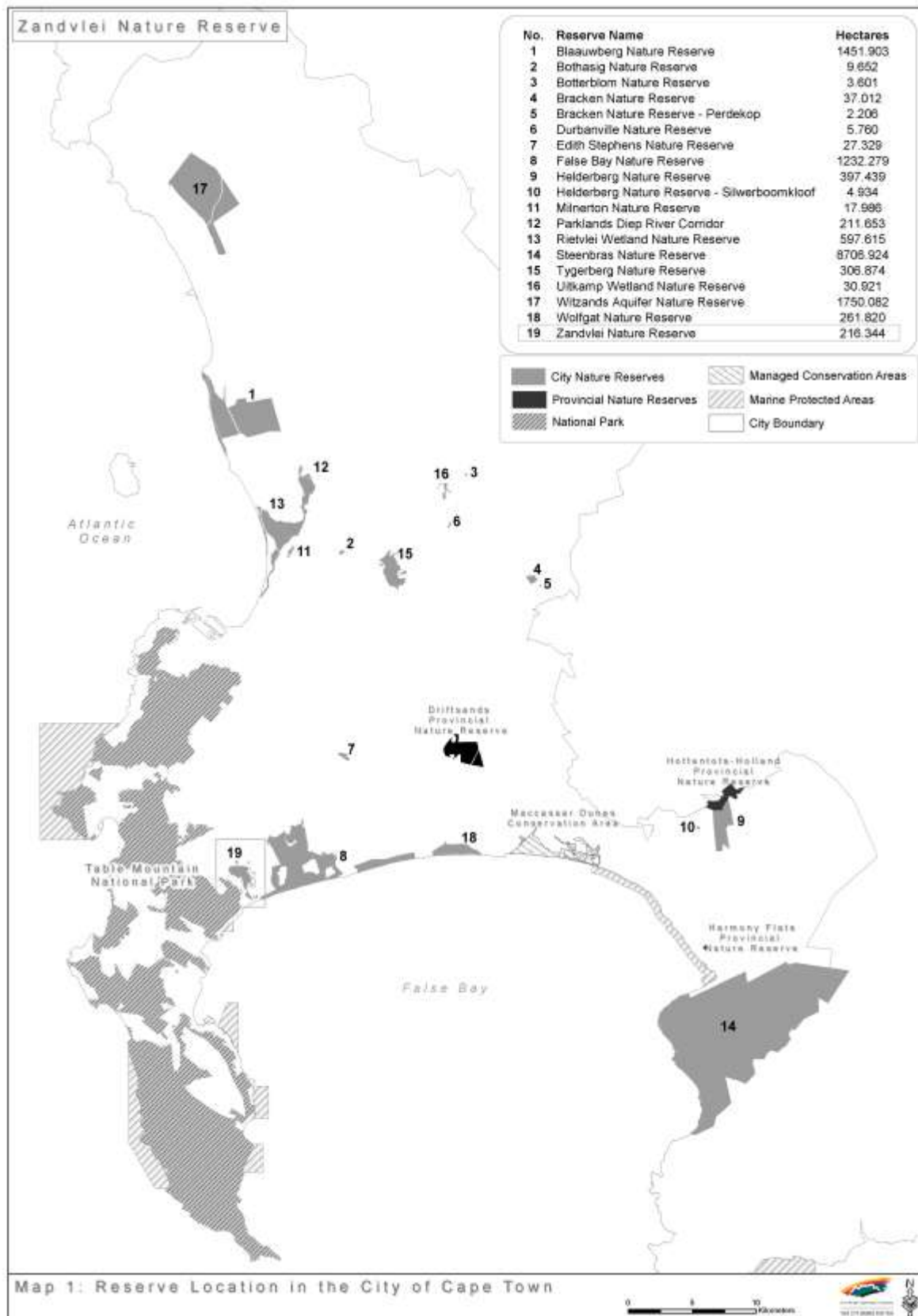
1.2 Location and extent

Zandvlei is located in the south-western corner of the Cape Flats, near Muizenberg, a small coastal town on the False Bay coastline (map 1 and 2). The reserve was started with the proclamation of Zandvlei Bird Sanctuary of 22ha along the northern shore of the vlei in 1978. This was enlarged to 204ha with the proclamation of the Greater Zandvlei Estuary Nature Reserve (the expansion of the boundaries) on 26 October 2006 in terms of Provincial Gazette 6389/27, October 2006 (PN 344/2006). The reserve lies some 20,4km from Cape Town.

The centre of the reserve lies at the following grid coordinates:

34 05 28.43 S

18 28 08.28 E



Map 1: Reserve location in Cape Town



Map 2: Reserve boundaries

2. DESCRIPTION OF LANDHOLDINGS AND OWNERSHIP

2.1 Property details and title deed information

The property comprising Zandvlei Estuary Nature Reserve is owned by the City of Cape Town.

Table 1: Erf numbers for Zandvlei Estuary Nature Reserve

Reserve	Category	Ownership	Erf number	Hectares
Zandvlei Nature Reserve	Protected	City of Cape Town	00-85352	131,94948470800
Zandvlei Nature Reserve	Protected	City of Cape Town	00-124684	2,26811400008
Zandvlei Nature Reserve	Protected	City of Cape Town	00-123602	0,77991227007
Zandvlei Nature Reserve	Protected	City of Cape Town		0,04014018738
Zandvlei Nature Reserve	Protected	City of Cape Town		0,05624808712
Zandvlei Nature Reserve	Protected	City of Cape Town		0,01788562323
Zandvlei Nature Reserve	Protected	City of Cape Town	00-156599	0,07769097414
Zandvlei Nature Reserve	Protected	City of Cape Town	00-85351	24,35781984680
Zandvlei Nature Reserve	Protected	City of Cape Town	00-0000-27	0,53410778664
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83070	0,60057457822
Zandvlei Nature Reserve	Protected	City of Cape Town	00-111669	1,14476785416
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83068	4,03632551592
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83066	3,70717940494
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83067	0,13527593306
Zandvlei Nature Reserve	Protected	City of Cape Town	00-84811-2	3,29365394254
Zandvlei Nature Reserve	Protected	City of Cape Town	00-84816	0,97634046867
Zandvlei Nature Reserve	Protected	City of Cape Town	00-84811-1	1,71007232452
Zandvlei Nature Reserve	Protected	City of Cape Town	00-84817	0,54171905756
Zandvlei Nature Reserve	Protected	City of Cape Town	00-84818	0,53078945775
Zandvlei Nature Reserve	Protected	City of Cape Town	00-84819	0,56170503776
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83049-1	4,02698997203
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83061	0,64063212232
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83054	0,12883326989
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83049-2	0,47439994492
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83045	1,08511694577
Zandvlei Nature Reserve	Protected	City of Cape Town	00-93541	3,30010013179
Zandvlei Nature Reserve	Protected	City of Cape Town	00-93602	0,55322411663
Zandvlei Nature Reserve	Protected	City of Cape Town	00-93404	2,67788510857
Zandvlei Nature Reserve	Protected	City of Cape Town	00-93391	0,63557547974
Zandvlei Nature Reserve	Protected	City of Cape Town	00-94080	1,15826248261
Zandvlei Nature Reserve	Protected	City of Cape Town	00-93873	1,07301916461
Zandvlei Nature Reserve	Protected	City of Cape Town	00-112587	1,05022306626
Zandvlei Nature Reserve	Protected	City of Cape Town	00-93942	1,64418467140
Zandvlei Nature Reserve	Protected	City of Cape Town	00-93688	0,81375582485
Zandvlei Nature Reserve	Protected	City of Cape Town	00-112586	0,37084738644
Zandvlei Nature Reserve	Protected	City of Cape Town	00-83078	0,57181901054
Zandvlei Nature Reserve	Protected	City of Cape Town	00-145079	1,57073262854
Zandvlei Nature Reserve	Protected	City of Cape Town	00-87402-1	1,86839106885
Zandvlei Nature Reserve	Protected	City of Cape Town	00-93527	0,52924248633
Zandvlei Nature Reserve	Protected	City of Cape Town	00-94078	2,90715459829
Zandvlei Nature Reserve	Protected	City of Cape Town	00-85350	0,99103887641
Zandvlei Nature Reserve	Protected	City of Cape Town	00-145080	1,81067057901

Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86195	0,07539308615
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86205	0,07192112978
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86232	0,07104709953
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86222	0,06478426998
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86215	0,06390078640
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86207	0,06610144313
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86240	0,07606138438
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86261	0,06016920979
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86241	0,07254386524
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86220	0,08431195110
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86213	0,07540335810
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86202	0,07133172398
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86194	0,07796841560
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86243	0,06699457936
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86218	0,06237416527
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86219	0,06562031301
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86197	0,06912211613
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86209	0,08943891252
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86196	0,06631180587
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86242	0,07324995910
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86201	0,09734212455
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86223	0,06628233646
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86199	0,07148997017
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86206	0,08012773748
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86221	0,06883094890
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86260	0,03567221694
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86204	0,06939486289
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86203	0,06200782732
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86216	0,07086942899
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86198	0,06267097618
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86214	0,06894626527
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86200	0,07308485806
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86259	0,01755627353
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86233	0,08144577338
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86208	0,07713110225
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86217	0,06320731181
Zandvlei Nature Reserve	CMNA	City of Cape Town	CA920-0-2	0,87238117392
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86210	0,10176707026
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86224	0,07269399218
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86212	0,08659454864
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-86211	0,11325758695
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-167864	0,87255885090
Zandvlei Nature Reserve	CMNA	City of Cape Town	00-166091	0,08490512534
Zandvlei Nature Reserve	CMA	City of Cape Town	00-82622	5,60485400838

Appendix 1 indicates the Surveyor-General diagrams for the various portions of property.

2.2 Landscape perspective

The reserve falls within the Cape Floristic Region (CFR). The CFR is the smallest yet richest of the world's six floral regions, and the only one to be found entirely within one country. This rich biodiversity is under serious threat for a variety of reasons, including conversion of natural habitat to permanent agricultural area, inappropriate fire management, rapid and insensitive development, overexploitation of water resources, and infestation by alien species. The region has been identified as one of the world's 'hottest' biodiversity hotspots (Myers *et al.* 2000).

In response to this challenge, a process of extensive consultation involving various interested parties, including local government and non-governmental organisations, resulted in the establishment of a strategic plan (CAPE Project Team 2000) referred to as the Cape Action Plan for the Environment, which identified the key threats and root causes of biodiversity losses that need to be addressed in order to conserve the floral region. This resulted in a spatial plan identifying areas that need to be conserved and a series of broad programme activities that need to take place over a 20-year period. Based on the situation assessment and analysis of threats, three overarching, mutually complementing and reinforcing themes were developed:

- To establish an effective reserve network, enhance off-reserve conservation, and support bioregional planning
- To strengthen and enhance institutions, policies, laws, cooperative governance and community participation
- To develop methods to ensure sustainable yields, promote compliance with laws, integrate biodiversity concerns with catchment management, and promote sustainable eco-tourism

The Cape Action for People and the Environment (C.A.P.E) partnership was formed and works together to implement the C.A.P.E vision and plan by strengthening institutions, supporting conservation efforts, enhancing education, developing tourism benefits, and involving people in conservation. The City of Cape Town was one of the 19 founding signatories of the C.A.P.E memorandum of understanding (MOU).

Zandvlei Estuary Nature Reserve is a key node of the City of Cape Town's biodiversity network.

Future linkages with False Bay Nature Reserve to the east and Table Mountain National Park to the west are a priority for the City of Cape Town, as these form part of the biodiversity network that joins larger protected areas and nature reserves with corridors to provide for the movement of species.

2.3 Physical environment

2.3.1 Climate

The South-western Cape, where Zandvlei is situated, has what is described as a Mediterranean climate, characterised by cool, wet winters and warm, dry summers. The reserve lies a few metres above sea level, with the water body of the vlei being kept between 0,6 and 0,7 metres above sea level during the winter months and 0,8 during summer. The average rainfall, as measured at Muizenberg, is 529 mm per year. The south-easterly wind prevails during summer, with north-westerly and westerly winds during the winter months.

Table 2.1: Average monthly rainfall as measured at Muizenberg weather station

(World Weather Online 2011)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9mm	15mm	15mm	63mm	64mm	79mm	94mm	68mm	44mm	37mm	24mm	17mm

Table 2.2: Actual monthly rainfall measured at Park Island Zandvlei 2005 to 2011

Month	2005	2006	2007	2008	2009	2010	2011
Jan	26	1	3.5	13	2.5	0.5	7
Feb	4.5	13.5	24.5	16	6	7	1.5
Mar	7	8	22.5	5.5	1	9.5	10.5
April	171	34.5	58.5	13.5	34.5	20.5	28
May	83.5	139	111	91.5	101	181	85
June	126	76.5	182	125	132	111	117
July	59	111	158	224	140	55	31
Aug	139	86.5	145	123	119	38.5	68
Sept	46	27	39	179	65.5	26.5	42
Oct	22.5	23	28	22	43	32.5	22.5
Nov	22.5	27	55	57.5	103	31	
Dec	2	25	15.5	16.5	8	18.5	
Total	710	572	843	888	756	533	

2.3.2 Geology, geomorphology, soils and land types

Zandvlei is largely covered by sand of marine origin. The surrounding landscape is underpinned by granite rocks of the Cape granite group. Above the granites are sandstone cliffs of the neighbouring Muizenberg mountain that consist of rocks from the Peninsula formation of the Table Mountain sandstones. These sandstones can be described as coarse-grained quartzitic sandstones of the Silurian age (based on fossils elsewhere), and are probably about 400 million years old.

The soils at Zandvlei are characteristically alkaline, having been deposited with marine shell fragments. As a result of erosion processes, the topography of these soils is very flat, with very little elevation across the reserve. Higher points, such as Park Island, have been artificially created during the construction process of Marina da Gama.

The Boyes Drive section of the reserve lies at 52m above sea level, and, being on a mountain slope, has a different geo-morphological character to the rest of the reserve. This is the highest point of the reserve, consisting of sand and rocks derived from decomposed sandstone.

2.3.3 Hydrology and aquatic systems

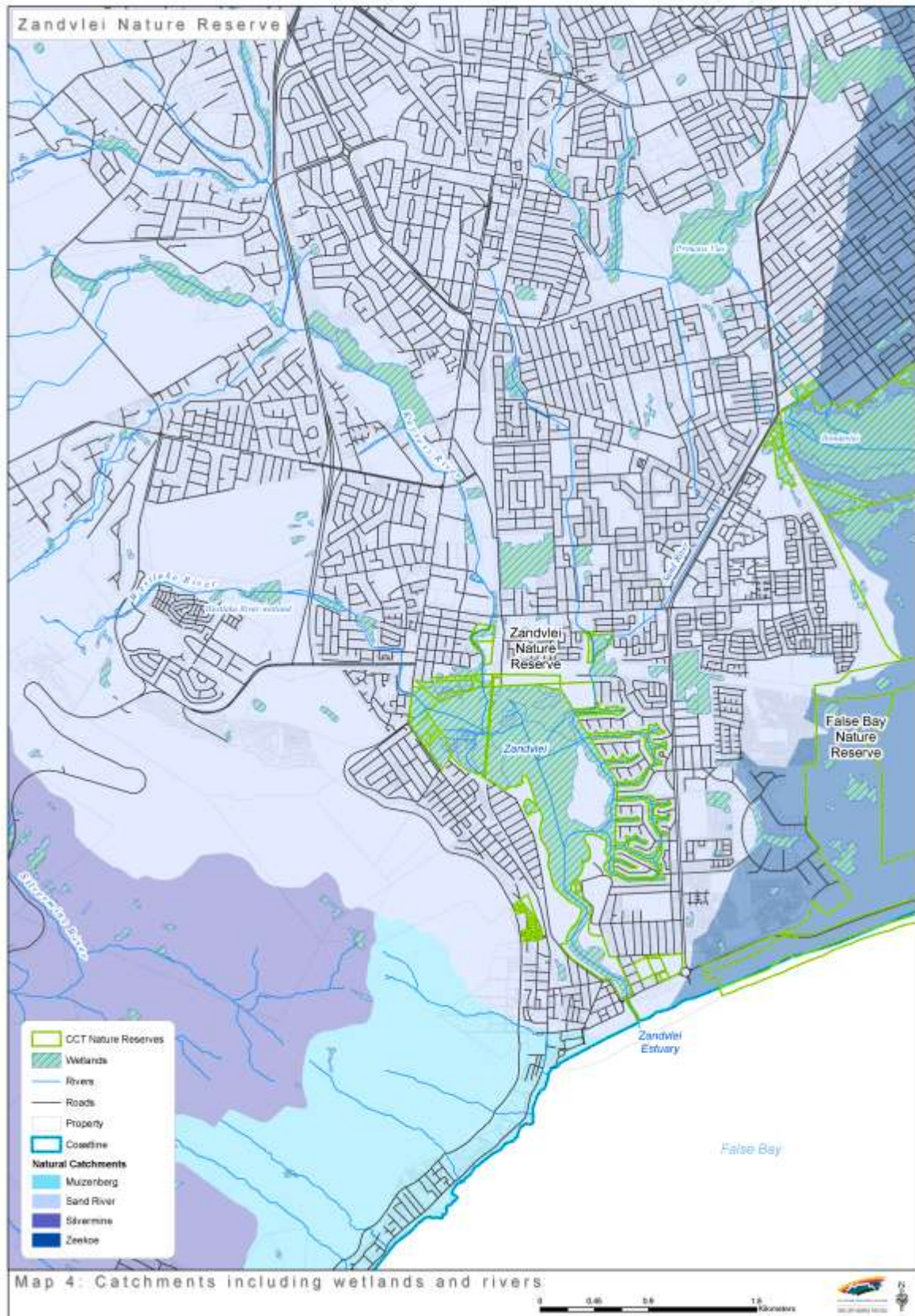
The Zandvlei catchment falls entirely within the boundaries of the City of Cape Town (map 4), and is bordered by the Muizenberg mountain, Silvermine plateau, Constantia mountain, Cecilia Ridge, Wynberg Hill and a less conspicuous watershed along the eastern boundary. It is a relatively small catchment, comprising an area of 92 km², or 9,655 ha, and is drained by a number of rivers and streams, of which the main ones are the Little Princess Vlei stream, Westlake stream, the Keysers river, Langvlei canal and the Sand river canal/Diep river.

These rivers converge on Zandvlei, with the Keysers river and Westlake stream entering it through an extensive reed bed on its north-western margin, while the Sand river canal enters the vlei east of Wildwood Island. The wetland area covers some 60 ha, while the main body of the vlei is 56 ha. In addition, the system includes a marina of 31 ha along its eastern margin, and an outlet channel of 9 ha, which links to the sea on the north-western shore of False Bay.

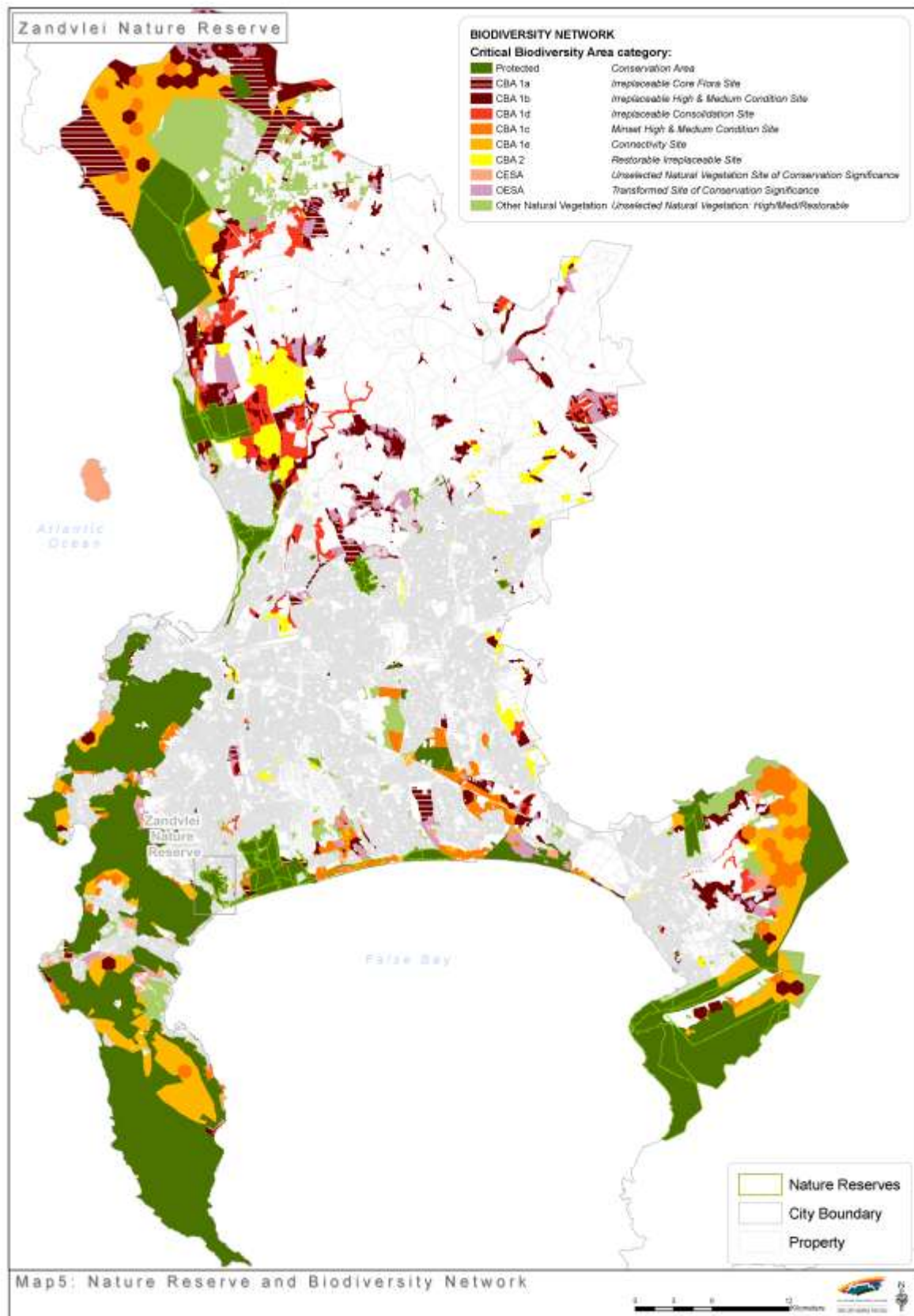
For purposes of the estuary management plan, the estuary is defined as the area from the estuary mouth to the upstream end of the wetlands. Both the northern and lateral boundaries comprise the 100-year flood line, as shown in figure 1.

Landuse in the catchment is highly varied, ranging from light industry to housing, agriculture, forestry and conservation. In general, the more heavily urbanised areas – including industrial and commercial areas and middle to lower-income housing – are situated in the eastern part of the catchment (42%), centring on the Diep and Sand rivers and Langvlei canal. Agricultural land, forested areas and middle to high-income housing are located in the west of the catchment (58%) along the Keysers river and Westlake stream and their tributaries. The light industrial area of Retreat, however, is adjacent to the Keysers river, a short distance upstream of where it discharges into Zandvlei. A map of the catchment, reproduced from the Sand river catchment management plan, is shown in Map 4.

Despite the modifications that have taken place, Zandvlei remains highly valued for its natural attributes and the recreational opportunities it affords. Recreational use includes various boating activities, picnicking, bird-watching, walking and a limited amount of fishing, although bait collection is not permitted. It is regarded as being of regional importance in recreational terms, and hosts a number of sports events, including an international kite-flying competition, provincial canoe championships, and various yachting events.



Map 4: Catchments, including wetlands and rivers



Map 5: Biodiversity network

2.4 Biological environment

2.4.1 Vegetation

Zandvlei has two primary vegetation types, namely Cape Flats Dune Strandveld on the lowland areas, and Cape Peninsula Granite Fynbos on the higher Boyes Drive area. In the extreme north of the reserve and Westlake wetlands area, the vegetation type is in a transition area to Cape Flats Sand Fynbos. There are currently 440 identified plant species at Zandvlei, of which over 150 are alien species (see appendix 2).

Ecosystem status for these vegetation types is as follows:

- Cape Flats Dune Strandveld – Endangered
- Cape Peninsula Granite Fynbos – Endangered
- Cape Flats Sand Fynbos – Endangered

Of note is that all three of the vegetation types mentioned are classified as Endangered by the South African National Biodiversity Institute's (SANBI) national assessment, which underlines the importance of conservation areas in general on the Cape Town lowlands.

A complete description of the vegetation communities within Zandvlei Estuary Nature Reserve, compiled by Dr Patricia Holmes and Dr Tony Rebelo, follows below.

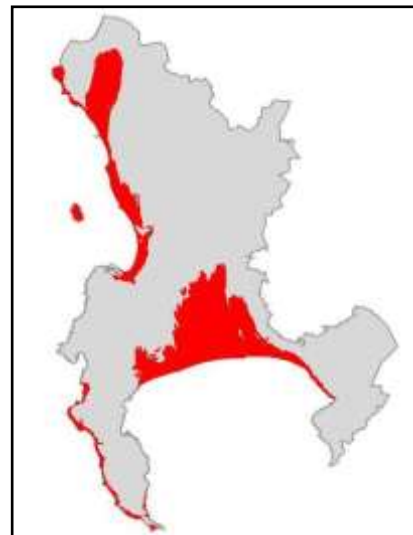
2.4.1.1 Cape Flats Dune Strandveld (Dune Thicket) (Rebelo *etal.* 2006)

Distribution: Endemic to Cape Town; mainly coastal, altitude 0–80m, but reaching 200m in places.

Vegetation and landscape: Flat to slightly undulating dune field landscape, covered by tall, evergreen, hard-leaved shrubland, with abundant grasses and annual herbs in gaps. Structurally, strandveld is a tall, evergreen, hard-leaved shrubland, with abundant grasses, annual herbs and succulents in the gaps. Examples of prominent shrub

species include *Euclea racemosa*, *Metalasia muricata*, *Olea exasperata*, *Chrysanthemoides monilifera* and *Roepera flexuosum*. Strandveld has few endemic species compared to fynbos. All of this vegetation type occurs within the City of Cape Town area, and 56% is transformed.

Geology and soil: Tertiary to recent calcareous sand of marine origin; outcrops of limestone found on the False Bay coast.



Climate: Mean annual rainfall 350mm in north, to 560mm in south

Conservation: Endangered, target 24%; 6% conserved

Cape Flats Dune Strandveld historically covered an area of 401km² within the City of Cape Town jurisdiction. Today, only 180km² of this vegetation type remains, of which 64km² is conserved under formal conservation management.

2.4.1.2 Peninsula Granite Fynbos (Rebelo *et al.* 2006)

Distribution: Endemic to the City of Cape Town area; lower slopes on the Cape Peninsula from Lion's Head to Smitswinkel Bay almost completely surrounding Table Mountain, Karbonkelberg and Constantia mountain, through to the Kalk Bay mountains. South of the Fish Hoek gap, it is limited to the eastern (False Bay) side of the Peninsula from Simon's Bay to Smitswinkel Bay, with a few small patches between Fish Hoek and Ocean View.

Altitude: 0–450 m

All of this vegetation type occurs within the Cape Town area, and 65% is transformed.



Vegetation and landscape features: Steep to gentle slopes below the sandstone mountain slopes, and undulating hills on the western edge of the Cape Flats. Medium-dense to open trees in tall, dense proteoid shrubland. A diverse type, dominated by asteraceous and proteoid fynbos, but with patches of restio and ericaceous fynbos in wetter areas. Waboomveld is extensive in the north, and heavily encroached by afrotemperate forest in places. South of Hout Bay, the dwarf form of *Protea nitida* is dominant, so that there are no emergent proteoids. Groves of Silver Trees (*Leucadendron argenteum*) occur on the wetter slopes.

Geology and soils: Deep, loamy, sandy soils, red-yellow apedal or Glenrosa and Mispah forms, derived from Cape Peninsula pluton of the Cape granite suite

Endemic taxa: Low shrubs *Cliffortia carinata*, *Gnidia parvula*, *Hermannia micrantha*, *Leucadendron grandiflorum*; succulent shrubs – *Erepsia patula*, *Lampranthus curvifolius*; herb – *Polycarena silenoides*; geophytic herb – *Aristea pauciflora*; graminoid – *Willdenowia affinis*.

Conservation: Endangered; target 30%; conserved in Table Mountain National Park as well as on the premises of Kirstenbosch National Botanical Garden. However, much of the conserved fynbos has been transformed into afrotemperate forest due to fire protection

policies at Orangetkloof and Kirstenbosch, and a reluctance to use fire in green belts and on the urban fringe. The effective fynbos area conserved is thus much smaller. A total of 56% has been transformed, mostly in Cape Town urban areas (40%) on low-lying flat landscapes, including vineyards and pine plantations (13%). The most common alien woody species include *Acacia melanoxylon*, *Pinus pinaster* and numerous other, more localised invasive alien species, reflecting the long history of colonisation and the relatively fertile soils.

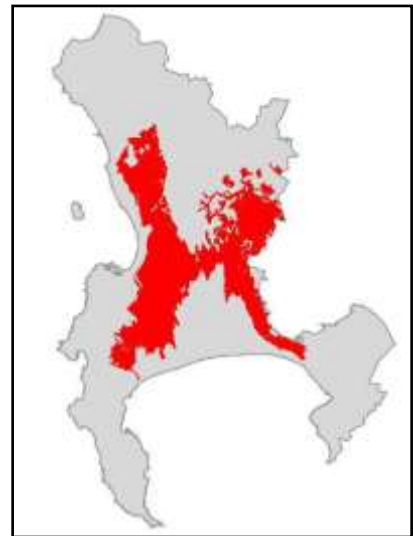
2.4.1.3 Cape Flats Sand Fynbos (Sand Plain Fynbos) (Rebelo *et al.* 2006)

Distribution: Largely endemic to the City of Cape Town area: Cape Flats from Blouberg and Koeberg Hills west of the Tygerberg Hills, to Lakeside and Pelican Park in the south near False Bay; from Bellville and Durbanville, to Klapmuts and Joostenberg Hill in the east, and to the south-west of the Bottelary Hills to Macassar and Firgrove in the south.

Altitude: 20–200 m.

Nearly 100% of this vegetation type occurs within the City of Cape Town area, and 85% is transformed.

Vegetation and landscape features: Moderately undulating and flat plains, with dense, moderately tall, ericoid shrubland



containing scattered emergent tall shrubs. Proteoid and restioid fynbos are dominant, with asteraceous and ericaceous fynbos occurring in drier and wetter areas respectively.

Geology and soils: Acid, tertiary, deep, grey regic sands, usually white, often Lamotte form.

Climate: Winter-rainfall regime, with precipitation peaking from May to August; mean annual rainfall 580–980 mm (mean: 575 mm). Mists occur frequently in winter. Mean daily maximum and minimum monthly temperatures 27,1°C and 7,3°C measured in February and July respectively. Frost occurs about three days per year. This is the wettest and coolest of the West Coast sand fynbos types.

Cape Flats Sand Fynbos endemic taxa: Low shrubs – *Erica margaritacea*, *Aspalathus variegata* (probably extinct), *Athanasia capitata*, *Cliffortia ericifolia*, *Erica pyramidalis*, *E. turgida*, *E. verticillata*, *Leucadendron levisanus*, *Liparia graminifolia*, *Serruria aemula*, *S. foeniculacea*, *S. furcellata*; succulent shrub – *Lampranthus stenus*; geophytic herb – *Ixia versicolor*; graminoids – *Tetraria variabilis*, *Trianoptiles solitaria*.

Conservation: Critically endangered; target 30%; less than 1% statutorily conserved as small patches in Table Mountain National Park as well as some private conservation areas such as Platteklouf and Blaauwberg Hills. This is the most transformed of the sand fynbos types: More than 85% of the area has already been transformed by urban sprawl (Cape Town

metropolitan area) and for cultivation. Hence the conservation target remains unattainable. Most remaining patches are small pockets surrounded by urban areas, for example Rondevlei, Kenilworth, Milnerton, 6 BOD, Platteklouf and Rondebosch Common. Most of these patches have been identified as 'core conservation sites'. They are mismanaged by mowing, fire protection and alien plant invasion. Mowing eliminates serotinous and taller species, while fire protection results in a few common thicket species (e.g. *Carpobrotus edulis*, *Chrysanthemoides monilifera*) replacing the rich fynbos species. Alien woody species include *Acacia saligna*, *A. cyclops* and species of *Pinus* and *Eucalyptus*. Dumping and spread of alien grasses (both annual and Kikuyu, or *Pennisetum clandestinum*) are also a major problem. Alien acacias result in elevated nutrient levels and a conversion to *Eragrostis curvula* grassland and near-annual fires. Some 94 Red List sand fynbos plant species occur on the remnants within Cape Town. The endemics include six species listed as extinct in the wild, some of which are being re-introduced from botanical gardens.

Cape Flats Sand Fynbos historically covered an area of 547 km² within the City of Cape Town area. Today, only 77 km² of this vegetation remains, of which only 5 km² is conserved or formally managed for conservation.

(see appendix 2 for complete plant list)

2.4.2 Mammals

Some 23 mammal species have been recorded at Zandvlei (see appendix 3) of which 4 are aliens or domestic species. The mammal fauna comprise species that are linked to the wetland and associated dune habitats of the Cape Flats. This includes *Aonyx capensis* (Cape Clawless Otter) and *Atalapha paludinosus* (Water Mongoose) in the wetlands, and *Galerella pulverulenta* (Small Grey Mongoose), *Genetta tigrina* (Large Spotted Genet) and *Raphicerus melanotis* (Grysbok) on the dune flats. Of note among mammals is the presence of *Felis caracal* (Caracal) during 2010, which have presumably moved down the Boyes Drive area onto the reserve.

2.4.3 Birds

Some 168 bird species have been recorded at Zandvlei (see appendix 4) of which 9 are alien, and of which ten indigenous species are listed in the Red Data book. One of these, *Circus ranivorus* (African Marsh Harrier), is listed as a threatened species. Bird species associated with wetlands make up a large percentage of the species list. The reserve also provides habitat for migrant Palaearctic wader species, a number of which have declining populations. Of concern is the large population of *Anas platyrhynchos* (Mallard Duck) that have taken residence in the canals of Marina da Gama. This species interbreeds with

indigenous waterfowl species such as *Anas undulate* (Yellow-billed Duck) creating fertile hybrids.

2.4.4 Reptiles

Twenty-four reptile species have been recorded on the reserve, none of which are presently listed as threatened (see appendix 5). One of these, (*Ramphotyphlops braminus*) the Flower Pot Snake is an alien species.

2.4.5 Amphibians

Seven amphibian species have been recorded (see appendix 6), including two species listed as threatened. Importantly, among these is a breeding population of *Amietophrynus pantherinus* (Western Leopard Toad). This endangered amphibian forages away from water, and, as a result, moves from the reserve into the urban environment. It breeds in deep water pools during the wet winter months of August and September, and several breeding sites have been found in the north-western corner of the reserve.

2.4.6 Invertebrates

Although no exhaustive invertebrate list is available for the site, 17 butterfly and 4 dragonfly species have been recorded (see Appendix 7).

Of note are two butterfly species, the *Kedestes lenis* (Unique Ranger) and *Kedestes barberae bunta* (Barber's Ranger), which are both listed as endangered. The latter species is a localised endemic, occurring between Muizenberg and Strandfontein on the False Bay coastline. Having been described in the 1950s, it is now probably extinct in the Zandvlei area, and persists only at Strandfontein.

Ficopomatus enigmaticus, a species of tube worm is an important component of the wetland community due to its water-filtering capabilities. Zandvlei also supports a healthy population of *Callinassa krausii* (sand prawn), which also has filtering activities that contribute to good water quality.

2.4.7 Fish

Zandvlei is the last functioning estuary on the False Bay coastline, and, as such, is connected to the sea during high-tide events. Some 30 fish species occur in the vlei, with 24 indigenous species and six alien (see Appendix 8).

There is only one threatened species, namely *Lithognathus lithognathus* (white steenbras). Zandvlei contributes towards the protection of this species by providing valuable nursery habitat for fingerlings that are recruited from the sea into the nursery.

Lichia amia (Leervis) are often found in the estuary as adults, and angling records of up to 18.9kg of fish have been recorded.

Of possible concern in the future is the population of *Galaxia zebratus* (Cape Galaxia), of which the taxonomic status is in flux. Future reclassification of this group of fish may result in a localised species with threatened status.

2.5 Socio-political context

2.5.1 History

As early as the 1600s (but probably also before that), Khoi people used the Muizenberg area as a pastoral home. With the advent of the Dutch at the Cape in 1652, the Dutch East India Company established a cattle farm in the area in 1670. From 1743, the area became one of the first military outposts under the command of Sergeant Wynand Muys, and was originally named Muysenburg (Muys' stronghold) (see <http://www.capetown.dj/Regions/SouthPeninsula/Muizenberg/History.html>).

The area around the reserve was also part of the Battle of Muizenberg between the Dutch and British forces in 1795. During the late 1800s, Muizenberg became a popular seaside resort for holiday makers, with a train line linking it with Cape Town and Simon's Town. In the 1970s, the eastern shore was transformed through the creation of Marina da Gama as a residential area. As a result, banks were fixed with concrete, and excess material was used to create Park Island. Apartheid-era planning has resulted in white-dominated suburbs along the east and west banks, and coloured suburbs on the northern boundary. See Appendix 9 for historical aerial photographs of Zandvlei.

In 1978, the then Cape Town city council proclaimed 22ha of the northern shore as the Zandvlei Bird Sanctuary. On 26 October 2006, City of Cape Town, who had taken over municipal functions, enlarged the reserve with the proclamation of the Greater Zandvlei Estuary Nature Reserve (Provincial Gazette 6389/27, October 2006, PN 344/2006) (www.biodiversity.co.za).

2.5.2 Socio-economic context

The economic activities within the Zandvlei catchment area have an influence on the reserve. These include agriculture in the form of vineyards in the upper reaches, and limited cattle and vegetable farming in the middle section. A light industrial and commercial area is located immediately upstream from the reserve, in the lower reaches. The catchment is small, comprising 92 km², or 9,655 ha, and is fortunate in not having a sewage treatment works discharging into it.

Middle to upper-income residential suburbs surround the vlei, with formal commercial activities taking place near the mouth. Informal trading occurs along the mouth of the vlei, with trading markets operating on Sundays.

2.6 Protected-area expansion

Zandvlei forms an important link in a conservation network connecting the Peninsula mountain chain with the False Bay coastline. The present round of proclamations incorporates most of the conservation-worthy land that can be linked to Zandvlei Estuary Nature Reserve. A notable exception, however, is a strip of east-west orientated land along the northern boundary. This area has high conservation value, supporting Cape Flats Dune Strandveld, which transitions into Cape Flats Sand Fynbos. The last local population of the *Kedestes lenis* (unique ranger) occurs on this site. A road linking the M4 and M5 has been mooted for this strip of land.

3. PURPOSE, VISION/MISSION, SIGNIFICANCE/VALUE

3.1 Purpose of the protected area

Zandvlei Estuary Nature Reserve is located in the CFR, an area of global biodiversity significance, which contains a unique combination of habitats, ecosystems and species, many of which are either rare or endemic to the area.

Zandvlei conserves the last functioning estuary along the False Bay coastline, as well as surrounding fragments of terrestrial habitat. As such, Zandvlei plays a vital role as a fish nursery area, providing habitat for fish to mature and so replenish fish stocks in False Bay. The three vegetation types represented on the reserve are classified as threatened in terms of the national vegetation assessment.

The purposes of a protected area are described in section 17, chapter 3 of the National Environmental Management: Protected Areas Act.

The purposes of declaring areas as protected areas are as follows:

- To protect ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes in a system of 30 protected areas
- To preserve the ecological integrity of those areas
- To conserve biodiversity in those areas
- To protect areas representative of all ecosystems, habitats and species naturally
- To protect South Africa's threatened or rare species
- To protect an area that is vulnerable or ecologically sensitive
- To assist in ensuring the sustained supply of environmental goods and services
- To provide for the sustainable use of natural and biological resources
- To create or augment destinations for nature-based tourism
- To manage the interrelationship between natural environment and development

3.2 Vision and mission

3.2.1 Vision

Integrated Development Plan vision

The vision of the City of Cape Town remains as follows:

- To be a prosperous city that creates an enabling environment for shared growth and economic development
- To achieve effective and equitable service delivery
- To serve the citizens of Cape Town as a well-governed and effectively run administration

To achieve this vision, the City recognises that it must:

- actively contribute to the development of its environmental, human and social capital;
- offer high-quality services to all who live in, do business in, or visit the city as tourists; and
- be known for its efficient, effective and caring government.

C.A.P.E vision

We, the people of South Africa, are proud to be the custodians of our unique Cape Floral Region and share its full ecological, social and economic benefits now and in the future.

Environmental Resource Management Department vision

To ensure that sustainable and equitable development is combined with sound environmental practice for a healthy local environment that sustains people and nature, provides protection for our unique resources, and results in an enhanced quality of life for all.

City of Cape Town's biodiversity strategy vision

To be a City that leads by example in the protection and enhancement of biodiversity; a City within which biodiversity plays an important role, and where the right of present and future generations to healthy, complete and vibrant biodiversity is entrenched; a City that actively protects its biological wealth, and prioritises long-term responsibility over short-term gains.

Zandvlei Estuary Nature Reserve vision

Zandvlei is a beautiful and important component of Cape Town's natural assets. It is valued by the local community and visitors alike for recreational, educational and other uses. It is also home to a rich diversity of flora and fauna, and is used in a way that balances conservation with the needs of users for the benefit of present and future generations.

3.2.2 Mission

City of Cape Town's biodiversity strategy mission

- To manage biodiversity proactively and effectively
- To ensure an integrated approach to biodiversity between City of Cape Town line functions and departments, and actively pursue external partnerships
- To adopt a long-term approach to biodiversity
- To ensure the sustainability of our rich biodiversity
- To adopt a holistic and multifaceted approach to biodiversity
- To continue to measure and monitor the City of Cape Town's performance in the protection and enhancement of biodiversity
- To continue to measure and monitor the state of biodiversity in Cape Town

3.3 Significance of property (biodiversity, heritage and social)

The reserve has been identified as an important node in the biodiversity network, not just in terms of its position and connectivity with other conservation areas, but also due to its biodiversity attributes.

The reserve is an important link between the Cape Peninsula mountain chain, which makes up Table Mountain National Park, and conservation areas along the False Bay coastline. The estuary is unique in being the only functioning estuary in False Bay, and contributes significantly to fish recruitment in the area.

All three vegetation types that are represented in the reserve are classified as endangered in SANBI's national vegetation assessment.

The reserve also supports several species listed as threatened in terms of the International Union for Conservation of Nature (IUCN) Red Data book protocols. Nine plant, one bird, one fish and two amphibian species are presently listed as threatened in one way or another.

PART 2

MANAGEMENT POLICY FRAMEWORK

4. ADMINISTRATIVE AND LEGAL FRAMEWORK FOR THE MANAGEMENT AUTHORITY

4.1 Legal framework

Table 3: Legal Framework The following is a list of legislation applicable to the management of the City of Cape Town's Biodiversity Management Branch. Repealed legislation has been included in greyed-out text for information purposes only.

Legislation: Acts, ordinances, bylaws	Relevance: Description	Amendment: Latest amendment date	Comment: Other notes
Constitution of the Republic of South Africa, Act 108 of 1996	Lists South African citizens' environmental rights	N/A	Chapter 2: Bill of Rights assigns citizens with particular rights
ENVIRONMENTAL LEGISLATION			
National legislation			
National Environmental Management Act (NEMA), Act 107 of 1998	One of the most important environmental laws relating to most aspects of the environment, including environmental impact assessments (EIAs), environmental information and legal standing, etc.	- Amendment Act 56 of 2002 - Amended by GN 26018, Vol 464 of 13 February 2004	Provides for cooperative environmental governance
National Environmental Management: Biodiversity Act, Act 10 of 2004	The objectives of the Act are to provide for: - the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; - the protection of species and ecosystems that warrant national protection; - the sustainable use of indigenous biological resources; - the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources; and - the establishment and functions of a South African National Biodiversity Institute. In essence, the Act was put in place to safeguard the important biodiversity attributes in the country, while allowing people to benefit	N/A	The development of the IRMP will assist in ensuring that the objectives of this Act are achieved in the reserve.

	equally from the natural resources. In order to achieve these goals, the Act made provision for the South African National Biodiversity Institute (SANBI), which has been designated certain functions and afforded powers and duties in respect of this Act.		
National Environmental Management: Protected Areas Act, Act 57 of 2003	To provide for: - the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes and seascapes; - the establishment of a national register of all national, provincial and local protected areas; - the management of those areas in accordance with national norms and standards; - intergovernmental cooperation and public consultation on matters concerning protected areas; and - matters in connection therewith.	- Amendment Act 62 of 2008 - Amendment Act 15 of 2009	Regulations Notice 1029 of 2009 lists specific regulations for reserves proclaimed by the Member of the Executive Council (MEC) (draft August 2009).
Conservation of Agricultural Resources Act (CARA), Act 43 of 1983	The CARA regulations contain a list of alien invasive vegetation categorised according to their legal status. The Act regulates the sale, position and use of listed species.	Amended by GN R 2687 of 6 December 1985 and GN R 280 of 30 March 2001	Alien invasive plant legislation to be included under the Biodiversity Act in future
National Veld and Forest Fire Act, Act 101 of 1998	Relates to veld fire prevention, fire protection associations, fire danger indexing, enforcement of fire legislation, and the fighting of fires	N/A	A detailed fire management plan will be developed.
Marine Living Resources Act, Act 18 of 1998	Regulates conservation of the marine ecosystem and the long term sustainable utilisation of marine living resources		
Environment Conservation Act, Act 73 of 1989	The Environment Conservation Act is the other law that relates specifically to the environment. Although most of this Act has been replaced by NEMA, some important sections still remain in operation. These sections relate to: - protected natural environments; - littering; - special nature reserves; - waste management; - limited-development areas;	- Environment Conservation Amendment Act 98 of 1991 - Environment Conservation Amendment Act 79 of 1992 - Environment Conservation Second Amendment Act 115 of 1992 - Environment Conservation Amendment Act 94 of 1993 - Environment Conservation	

	- regulations on noise, vibration and shock; and - EIAs.	Second Amendment Act 52 of 1994 - Proclamation R27 of 1995 - Proclamation R43 of 1996 - National Environment Management Act 107 of 1998	
National Water Act, Act 36 of 1998	Relates to all use of water and the management of all water resources in South Africa	•	
National Environmental Management: Air Quality Act, Act 39 of 2004	To provide for enhancing the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of the people		Promulgated to give effect to section 24(b) of the Constitution. The South African Air Quality Information System is a web-based system that provides information on the quality of ambient air across the country.
Animal Protection Act, Act 71 of 1962	To consolidate and amend the laws relating to the prevention of cruelty to animals	Animal Matters Amendment Act, Act 42 of 1993	
Animal Diseases Act, Act 35 of 1985	Provides for control measures relating to animal diseases		
Animal Health Act, Act 7 of 2002	Regulates animal health		
Game Theft Act, Act 105 of 1991	Regulates the ownership and protection of game		
Mountain Catchment Areas Act, Act 63 of 1970	Provides for catchment conservation		Administered under the Western Cape Nature Conservation Board Act, Act 15 of 1998
National Heritage Resources Act 25 of 1999	Provides for the protection of heritage resources		N/A
World Heritage Conservation Act 49 of 1999	Incorporates the World Heritage Convention into South African law		N/A
Problem Animal Control Ordinance, Ordinance 26 of 1957	Regulates problem animals		Administered under the Western Cape Nature Conservation Board Act, Act 15 of 1998
Mineral and Petroleum Resources Development Act, Act 28 of 2002	Provides for equitable access to, and sustainable development of, mineral and petroleum resources		
Atmospheric Pollution Prevention Act, Act 45 of 1965		Entire Act repealed on 1 April 2010 in favour of the National Environmental Management: Air	

		Quality Act, Act 39 of 2004	
Provincial legislation			
Land Use Planning Ordinance, Ordinance 15 of 1985	The purpose of the Ordinance is to regulate land use and to provide for incidental matters related to land use.	- Assented to on 22 November 1985 - Western Cape Land Use Planning Ordinance, 1985, Amendment Act, 2004	Although it might not have a direct application in the management of nature reserves, it does affect the surrounding properties, and could possibly be used to control activities/developments around the reserves to minimise negative effects, for example in applying zoning restrictions.
Cape Nature and Environmental Conservation Ordinance, Ordinance 19 of 1974	The purpose of this Ordinance is to regulate wild animals and plants, and the establishment of nature reserves.	Publication date 1 September 1975	Administered under the Western Cape Nature Conservation Board Act, Act 15 of 1998
Western Cape Nature Conservation Board Act, Act 15 of 1998	The purpose of this Act is to promote and ensure nature conservation, render services and provide facilities for research and training and to generate income		Biodiversity agreements are signed under this Act.
Municipal legislation			
Integrated Metropolitan Environmental Policy (IMEP), 2001	Envisages a set of Citywide aligned strategies dealing with all aspects of the environment.		Influenced the Biodiversity Strategy, 2003
Biodiversity Strategy, 2003	To be a city that leads by example in the protection and enhancement of biodiversity	Draft amendment for 2009–2019	Influenced the development of the IRMP
City of Cape Town Bylaw relating to Stormwater Management, LA 31420	To provide for the regulation of stormwater management in the area of the City of Cape Town, and to regulate activities that may have a detrimental effect on the development, operation or maintenance of the stormwater system	Publication date 23 September 2005	Communication strategy and action plan will take effect to address the issues with the relevant departments
City of Cape Town Air Pollution Control Bylaw, LA 12649	The purpose of this bylaw is to give effect to the right contained in section 24 of the Constitution of the Republic of South Africa Act (Act 108 of 1996) by controlling air pollution within the area of the Council's jurisdiction; to ensure that air pollution is avoided, or, where it cannot be altogether avoided, is minimised and remedied.	Publication date 4 February 2003	

Bylaw relating to Community Fire Safety, Province of the Western Cape, LA 11257	The purpose and scope of the bylaw is to promote the achievement of a fire-safe environment for the benefit of all persons within the municipality's area of jurisdiction, and to provide for procedures, methods and practices to regulate fire safety within the municipal area.	• Publication date 28 February 2002	A fire management plan to be designed
City of Cape Town Draft Animal Bylaw, 2009	The purpose of the Bylaw is to formulate a new single bylaw, including ten different municipal dog bylaws and the Animal Protection Act of 1962. The Bylaw includes chapters on dogs, cats, poultry and working equines.	• Draft, 2009	
HUMAN RESOURCES/ADMINISTRATION LEGISLATION			
National legislation			
Occupational Health and Safety Act, 1993	To provide for the health and safety of persons at work, and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety, and to provide for matters connected therewith.	Occupational Health and Safety Amendment Act, No 181 of 1993	
Basic Conditions of Employment Act, Act 3 of 1997	Provides for control measures pertaining to employment	• Amendment Act 11 of 2002	
Labour Relations Amendment Act, Act 66 of 1995	The Act aims to promote economic development, social justice, labour peace and democracy in the workplace.	• Labour Relations Amendment Act, 42 of 1996 • Afrikaans Labour Relations Amendment Act, 1998 • Labour Relations Amendment Act, 127 of 1998 • Labour Relations Amendment Act, 2000 • Amendment Act 12 of 2002	
Local Government Municipal Systems Act,	Establishes core principles, processes and mechanisms relating to		

Act 32 of 2000	local government		
Promotion of Equality/Prevention of Unfair Discrimination Act, Act 4 of 2000	Provides for the prevention of discrimination and other related matters		
Criminal Procedure Act, Act 51 of 1977	Makes provision for procedures and related matters in criminal proceedings	• Criminal Procedure Amendment Act, Act 65 of 2008	
Firearms Control Act, Act 60 of 2000	To establish a comprehensive and an effective system of firearms control and, to provide for matters connected therewith		
Civil Aviation Act, Act 13 of 2009			
Fencing Act, Act 31 of 1963	Regulates all matters relating to fencing		
Hazardous Substances Act, Act 15 of 1973	Controls substances that may cause injury or ill health to, or death of, human beings by reason of their toxic nature		
Land Survey Act, Act 8 of 1997	Regulates land surveying, beacons and other related matters		
Promotion of Access to Information Act, Act 2 of 2000	Promotes access to information		
Promotion of Administrative Justice Act, Act 3 of 2000	Provides for the promotion of administrative justice	• Amendment Act 53 of 2002	
Regional Services Council Act, Act 109 of 1985	Regulates and controls land, land use and other related matters		
Skills Development Act, Act 97 of 1998	Promotes the development of skills		
State Land Disposal Act, Act 48 of 1961	Regulates the disposal of state-owned land		
Subdivision of Agricultural Land Act, Act 70 of 1970	Regulates the subdivision of agricultural land		
Tourism Act, Act 72 of 1993	Provides for the promotion of tourism, and regulates the tourism industry		A tourism strategy is envisaged.
Public Resorts Ordinance, Ordinance 20 of 1971	Regulates nuisance and pollution control		
Municipal Ordinance, Ordinance 20 of 1974	Regulates pollution and waste management		
South African National Road Agency Limited and National Roads Act, Act 7 of 1998			
Aviation Act, Act 74 of 1962	Provides for the control, regulation and encouragement of aviation activities in the Republic of South Africa	• Repealed in favour of the Civil Aviation Act, Act 13 of 2009	

Provincial legislation			
Western Cape Land Administration Act, Act 6 of 1998	Regulates land and land use		
Western Cape Planning and Development Act, Act 7 of 1999	Regulates planning and development within the province		
Municipal legislation			
City of Cape Town Bylaw relating to Filming, LA30441	The purpose of the Bylaw is to regulate and facilitate filming in Cape Town.	Provincial Gazette 6277, 24 June 2005	
City of Cape Town Bylaw relating to Streets, Public Places and the Prevention of Noise Nuisances, 2007	The purpose of the Bylaw is to regulate activities in streets and public places, and to prevent excessive noise nuisance	Promulgated 28 September 2007, PG 6469; LA 44559	
City of Cape Town Bylaw relating to signage			

4.2 Administrative framework

Zandvlei Estuary Nature Reserve is managed by the City of Cape Town's Biodiversity Management Branch in the Strategy and Planning Department. The reserve falls under the oversight of the district manager, and is the management responsibility of an area manager, who is assisted by one operational staff member. The operational management of Zandvlei Estuary Nature Reserve is supported by various other City of Cape Town departments, including, but not limited to, Law Enforcement, Roads and Stormwater Management, Catchment Management, Water & Sanitation, Information Systems & Technology, City Parks, Sport and Recreation, Public Amenities, Human Resources, and Finance.

Table 4: Current staffing complement of Zandvlei Estuary Nature Reserve

Designation	Number of staff	Workweek	Supervisor
Area manager	1	40 hours, Monday–Friday	Regional manager
Senior field ranger	1	40 hours, Monday–Friday	Area manager
People & conservation officer	1	40 hours, Monday–Friday	Area manager
Mechanical plant operator	1	40 hours, Monday–Friday	Area manager
Experiential training student	Varies	40 hours, Monday–Friday	Area manager

5. PROTECTED-AREA POLICY FRAMEWORK & GUIDING MANAGEMENT PRINCIPLES

5.1 Management objectives

5.1.1 Biodiversity and heritage objectives

The following table lists the management objectives for Zandvlei Estuary Nature Reserve:

Table 5: Management objectives for Zandvlei Estuary Nature Reserve

<i>High-level objective</i>	<i>Objective</i>	<i>Sub-objective</i>	<i>Initiative</i>	<i>Low-level plan</i>
CONSERVATION OF REPRESENTATIVE, FUNCTIONAL ECOSYSTEMS To conserve a representative sample of the region's ecosystems in a linked landscape, and maintain or restore environmental processes to enable natural spatial and temporal variation in structural, functional and compositional components of biodiversity	Representative ecosystems To incorporate a spectrum of viable aquatic and terrestrial ecosystems characteristic of Zandvlei Estuary Nature Reserve, and to re-introduce missing elements where possible	Consolidation and expansion of land areas Consolidate protected areas, focusing on underrepresented ecosystems, functional linkages and processes	(1) Identify underrepresented habitats/ecosystems (2) Consolidate reserve boundaries (3) Incorporate untransformed vegetation (4) Establish corridors linking the Peninsula mountain chain and the False Bay coastline	Reserve expansion plan (needs to be developed)
		Re-introduction of biota Where possible, re-establish locally extinct or depleted biodiversity components and populations in accordance with IUCN principles and guidelines	(1) Re-establish indigenous fauna complement within constraints of reserve size and urban setting	Faunal management plan (management guidelines for larger wildlife and their habitats)
		Fire management Apply appropriate fire regime in strandveld and fynbos areas (frequency, season, intensity, size)	(1) Implement a fire management plan in accordance with objectives of conserving biodiversity and threatened biota (2) Monitor impact of fire management regime	Fire management plan

	Threatened biota Maintain viable populations of threatened species in order to meet obligations in terms of international agreements and conventions	(1) Maintain viable populations of rare/threatened plant and animal species (identify, locate and monitor populations of priority species)	Threatened-biota plan (needs to be developed)
	Monitoring plan Implement and maintain an approved monitoring plan for the reserve	(1) Implement and maintain a biological monitoring programme for the reserve	Monitoring plan (exists in part)
Rehabilitation Rehabilitate degraded areas, including the re-establishment of natural biodiversity patterns, and the restoration of key processes that support the long-term persistence of biodiversity	Vegetation Re-establish physical, chemical and biological processes in degraded vegetation areas	(1) Rehabilitate all old, degraded sites	Vegetation rehabilitation plan (needs to be developed in consultation with biospecialist)
	Alien plants and other alien biota Control and, where possible, eliminate alien biota to facilitate re-establishment of natural biodiversity patterns and process in invaded areas	(1) Establish the distribution and density of invasive species (2) Prioritise areas for alien removal, focusing on biodiversity restoration (3) Implement removal programmes for priority species and areas	Invasive-plant management plan Invasive-animal management plan APO (exists)

		Estuary functioning Establish protocols maintaining estuary functioning	1) Establish estuary protocols for breaching of estuary mouth	Estuary breaching protocols (done)
MITIGATE INTERNAL and EXTERNAL PRESSURES To reduce threats and pressures and limit environmental impacts resulting from non-biodiversity management aspects and operations on surrounding land and resource use	Reconciling biodiversity with other reserve objectives To ensure that non-biodiversity management aspects of reserve operations (revenue generation, including visitor, resource use, developments, management activities, etc.) are informed and constrained by biodiversity conservation objectives, and that the impacts of these activities on biodiversity are minimised	Internal developments Minimise the impacts associated with the development and maintenance of visitor and reserve management infrastructure, and ensure that such developments do not compromise biodiversity objectives	(1) Reserve zoning (2) Develop and implement Conservation Development Framework (CDF) (3) Develop in accordance with environmental impact assessment (EIA) process (NEMA) and corporate policies (4) Establish visitor carrying capacities (5) Implement green standards and environmental best practice based on corporate policy	CDF (exists in part)
		Internal activities Minimise the impacts associated with visitor and reserve management activities, and ensure that such activities do not compromise biodiversity objectives		
		Extractive resource use Minimise the impacts of extractive resource use, and ensure that such activities are aligned with corporate guidelines, are within management capacity constraints, and do not compromise biodiversity objectives	(1) Quantify current extractive resource activities (2) Define opportunities and constraints in line with corporate guidelines (3) Regulate resource use according to adaptive management process	Sustainable resource use management plan (needs to be developed) Note: This is a long-term process, as research into sustainable yields needs to be conducted first.

	Reconciling biodiversity with external threats To reduce external threats and pressures, and limit impacts of surrounding land and resource use on biodiversity conservation within the reserve	External developments Minimise the impacts associated with inappropriate developments outside the reserve	(1) Engage regional land management authorities, including IDPs and spatial development frameworks at local and regional level (2) Align with bioregional planning, including explicitly identified areas for the maintenance of important biodiversity patterns and processes with appropriate land use guidelines (3) Provide input into planning and decision-making processes for external development that may compromise reserve and biodiversity network objectives (4) Negotiate to ensure that external developments are not visually obtrusive or out of character with the reserve	Branch-wide communication strategy and action plan
		External activities Negotiate to ensure that external resource and land use do not detrimentally affect ecological processes within the reserve	(1) Negotiate to mitigate or improve the management of external, potentially detrimental impacts (2) Encourage eco-friendly resource use and land management practices on adjacent properties (3) Mitigate the impacts of oil, sewage, chemical and other pollution events through appropriate contingency planning	Emergency spill contingency plan (cooperative governance and communication plan) (Environmental Resource Management Department plan)

		Illegal harvesting of resources: Prevent the illegal collection, removal and destruction of physical and biological resources	(1) Public liaison and awareness campaigns (2) Law enforcement	Reserve protection plan Safety and security plan
WILDNESS/REMOTENESS To maintain and restore wildness/remoteness in Zandvlei Estuary Nature Reserve so that the spiritual and experiential qualities of wildness are maintained, enhanced or, where necessary, restored	Range of experiences Provide a range of visitor experiences		(1) Reserve zoning (2) Develop CDF and sensitivity-value analysis	(1) CDF (2) Reserve expansion plan (3) Draft invasive-species management plan
	Sense of place Maintain or restore appropriate sense of place		(1) Implement and update CDF (2) Establish and apply appropriate visitor carrying capacity (3) Negotiate to ensure that external developments are not visually obtrusive or out of character with the reserve	
CULTURAL HERITAGE MANAGEMENT To investigate and manage all cultural assets	Conserve and manage cultural heritage assets	N/A	(1) Develop a database of all tangible and intangible cultural assets, including inventory, maps and relevant documentation (2) Develop site management plans for each cultural heritage site, with monitoring systems in place for management priorities and prescriptions (3) Facilitate appropriate interpretation of cultural heritage	Cultural heritage management plan (needs to be developed in consultation with heritage authorities)

			associated with the reserve	
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5.1.2 Socio-economic objectives:

Table 6: Socio-economic objectives for Zandvlei Estuary Nature Reserve

<i>High-level objective</i>	<i>Objective</i>	<i>Sub-objective (where required)</i>	<i>Initiative</i>	<i>Low-level plan</i>
<i>Nurture productive and mutually beneficial partnerships that will result in gains in economic and biodiversity equity</i>	Enhance socio- economic benefits to local communities	Develop partnerships with external and internal stakeholders to facilitate opportunities, such as tourism, local economic development, Working for Water/fire brigade	(1) Contribute to local community development by supporting the Expanded Public Works Programme/poverty relief initiatives (2) Contribute to local skills development by supporting the skills and learnership programmes (3) Identify and facilitate the creation of business opportunities in association with the reserve (4) Support community-based social development initiatives	Local socio-economic development plan (to-be-developed branch-wide plan)

	Increase environmental awareness, and encourage participation in conservation initiatives	Inspire visitors and communities to consider the environment as an interrelated and interdependent system, of which they are an integral part	(1) Develop and implement an interpretation plan that feeds into both the education and zoning plans (2) Implement environmental education and youth development programmes suited to the needs of each focus group (i.e. tailor-made programmes for each focus group)	Education development plan (southern region's to be developed)
		Educate learners, educators and other community focus groups to be able to take environmental action		
		Support educators and community leaders with resource and information materials	(1) Establish and market an environmental resource centre and outdoor classrooms, with a range of interpretive and information resources	
Support cooperative governance that will build custodianship	Maintain good reserve/community/stakeholder relations	N/A	(1) Identify and involve all relevant stakeholders in the reserve advisory forum. (2) Develop effective communication mechanisms and responsibilities for representatives (3) Actively support the ongoing involvement of Zandvlei Trust	Stakeholder relationship plan (to-be-developed branch-wide plan)
	Effective cooperative governance	Minimise degrading impact and consequences of inappropriate development and actions in and around the reserve	(1) Establish and maintain good working relationships with relevant government departments as well as internal City of Cape Town departments	
		Ensure support/buy-in for management decisions through	(1) Define roles and responsibilities with stakeholder groups, partnerships and	

		participatory decision-making processes	government through written agreements/terms of reference (TOR) and MOUs	
<i>Enhance the reserve as a nature-based visitor destination</i>	Develop, manage and enhance a range of sustainable visitor products		(1) Design customer satisfaction survey (2) Analyse current product usage, and identify opportunities	Visitor plan and infrastructure programme
			(3) Plan for visitor infrastructure and facilities, as identified by the CDF, business framework and business plan (4) Develop and implement the infrastructure management plan (in compliance with State of Infrastructure report) (5) Compile a State of Infrastructure report	
	Conserve and manage cultural heritage assets		(1) Develop a database of all tangible and intangible cultural assets, including inventory, maps and relevant documentation (2) Develop management plans for each cultural heritage site, with monitoring systems in place for management priorities and prescriptions (3) Facilitate appropriate interpretation of cultural heritage associated with the reserve	Cultural heritage management plan (to be developed in conjunction with the Environmental Heritage Branch)

<i>Grow the domestic visitor profile to be representative of South African society</i>	Grow the domestic visitor profile of the reserve to be representative of regional demographics	N/A	(1) Promote and manage access to the reserve (2) Actively market reserve resources and services	Marketing plan (to-be-developed branch-wide plan)
<i>Enhance the City of Cape Town's reputation</i>	Enhance the reserve's reputation	N/A	(1) Develop and implement a communication plan to promote reserve activities	Communication strategy and action plan (branch-wide)
<i>Advance strategic human resource management</i>	Ensure good human resource management	N/A	(1) Implement and support learnerships and volunteer programmes (2) Ensure that all staff have access to training initiatives, as per the Workplace Skills Plan (3) Ensure that all corporate human resource policies are adhered to	Staff capacity-building programme/institutional development and staff capacity-building programme
<i>Financial management</i>	Ensure sound financial management practices are applied to and underpin the reserve	N/A	(1) Manage cost spending appropriately (2) Ensure that adequate budgets are apportioned to the reserve in light of the developments required to ensure its ongoing operation	Financial sustainability programme
<i>Achieve good corporate governance/management</i>	Manage risk profile effectively	N/A	Conduct legal review	Risk management programme

5.2 SWOT analysis

Table 7 contains a preliminary strengths-weaknesses-opportunities-threats (SWOT) analysis for Zandvlei Estuary Nature Reserve.

Table 7. Preliminary SWOT analysis

STRENGTHS	WEAKNESSES
Conservation strengths: Existing long-standing local-authority nature reserve	Lack of public awareness: Vision of the reserve, information about the management, relevant environmental legislation
Ecosystem strengths: Encompassing a functional tidal estuary, seasonal wetlands, wetland linkages, connectivity corridors and catchment-to-coast benefits	Fragmentation of natural areas: Bisections of roads, railways, developments, bulk services and canals
Regional strengths: Linkages with the Peninsula mountain chain, river corridor systems and False Bay coastline	Site integrity weaknesses: Site integrity compromised by canals bringing in solid waste and pollution; public open space producing solid waste
Biodiversity strengths: Home to 440 plants, 23 mammals, 167 birds, 24 reptiles, seven amphibians and 30 fish. Protecting three national vegetation types: Cape Flats Sand Fynbos, Cape Flats Dune Strandveld and Peninsula Granite Fynbos.	Compliance management capacity weakness: Insufficient capacity to patrol current area; insufficient capacity to provide 24 x 7 coverage
Institutional strengths: Managed by the City of Cape Town, which has diverse support and ancillary line functions	Present inadequate office, administrative and operational facilities
Planning strengths: Forming part of the City of Cape Town's biodiversity network, promoting the City of Cape Town's biodiversity strategy, and aligning with C.A.P.E and the C.A.P.E estuaries programme	Shortage of experienced, qualified environmental and/or conservation staff in the industry
Administrative strengths: Section-specific management objectives and management committees (Zandvlei Action Committee)	Lack of public support for conservation objectives
Usage strengths: Utilisation for environmental education purposes, by Friends groups, residents and recreational groups, including water sports, bird-watching and fishing	Access control: Large portion of reserve boundaries is not easily secured or fenced, preventing control over access and use
Resource strengths: Permanent staff, dedicated budget, facilities secured, fixed and movable assets in place,	Existing bylaws and legislation inadequate for current use

communications	
OPPORTUNITIES	THREATS
Awareness-raising opportunities: Media releases, open days, public forums, informative signage, printed publications and internet platforms	Impacts of bulk services on environment: Stormwater, sanitation, wastewater reticulation, road lighting and water pipelines
Connectivity opportunities: Corridors to Peninsula mountain chain, along river corridors and the False Bay coastline	Uncontrolled access: Persons, domestic animals and watercraft
Training opportunities: Workplace Skills Plan, cooperative training, internships and skills development programmes	Edge effects from developments: Dumping, littering, poor water quality and alien fauna and flora
Partnership building with other law enforcement agencies, government agencies and Council line functions	Alien and invasive infestations: Established populations of alien invasive fauna and flora
Management facilities: Upgrade of office and environmental education facilities	Unnatural fire regime: Either too often, or completely lacking
Career-streaming opportunities for students and interns	Negative public perceptions: Nuisance of excessive pondweed, seeds, pollen, insects and smoke from fires
Liaison with Friends groups, and supportive relationships	Safety and security: Illegal occupation, theft of infrastructure, arson, poaching, burglaries, assault of visitors, and vagrancy
Stewardship opportunities for nearby landowners that share in the biodiversity network	Increasing development: Population growth, more bulk services, more recreational pressure and more pollution of environment
Creation of an overarching advisory board	Irregular funding: Students, interns, operating and capital budgets
Revision of old bylaws, and drafting of a new Recreational Water Areas Bylaw	Loss of biodiversity: Development of adjacent areas causing 'hardening' of urban landscape, over-utilisation of biodiversity resources
Liaison and advice to managing lines functions of the caravan park and picnic areas	Changing political structures: Discontinuity in political support

5.3 Protected-area management policy framework and guiding principles

5.3.1 Community participation

Zandvlei Estuary Nature Reserve will strive to facilitate productive and mutually beneficial partnerships, which will result in appropriate and sustainable recreational and educational activities. This will be achieved through engaging with the various users, line functions, residents and interested parties that utilise the estuary and environs.

The reserve will conduct an environmental education programme in order to raise local environmental awareness and encourage participation in conservation initiatives. This will be done through an environmental education plan that will aim to achieve the following:

- To inspire visitors and communities to consider the environment as an interrelated and interdependent system, of which they are an integral part
- To educate students, educators and community focus groups, and support such groups with resources and information materials
- To develop and implement environmental education programmes suited to the needs of various focus groups
- To develop and implement an interpretation plan that complements the environmental education plan

The programme will be based at the Zandvlei Environmental Education Centre, and will use the greater Zandvlei area. The programme will make use of permanent staff, volunteers and community members in order to present its programmes.

In order to develop and maintain good reserve/community/stakeholder relations, the Zandvlei Action Committee meets quarterly to deal with operational issues. This committee comprises all relevant stakeholders from Council, civil society and recreational groups.

Formal recreational organisations presently lease land adjacent to the reserve, where two facilities for yachting, rowing, wind surfing and sea cadets have been erected.

5.3.2 Safety and security

A safety and security audit aimed at completing a rapid and verifiable analysis of the current security situation, risk zones, security services, infrastructure, staffing and social context has been carried out on Zandvlei Estuary Nature Reserve. See appendix 10 for an executive summary of this report.

5.3.3 Culture-historical, archaeological and paleontological management

Our present understanding is that, although the Muizenberg area is rich in culture-historical assets, nothing of significance is to be found within the boundaries of Zandvlei Estuary Nature Reserve. However, the City of Cape Town's Cultural Resources Department should review the area, and a culture-historical, archaeological and paleontological zoning should be developed.

5.3.4 Tourism development and management

The Muizenberg area has a variety of economic tourism activities that are currently pursued. A number of these, such as the western-shore picnic area, braai area and caravan park, are located immediately adjacent to the reserve. A fully integrated precinct plan should be developed for Zandvlei Estuary Nature Reserve, which would indicate suitable tourism and recreational development nodes, and will be guided by the infrastructure and zoning plans.

5.3.5 Infrastructure management

The reserve presently has limited infrastructure, with offices, a works building, bridges and three bird hides. However, there are sizable structures, such as roads, bridges, railway lines and bulk services, immediately adjacent to the reserve. Various departments within the City of Cape Town and National Government share responsibility for these structures.

A five-year maintenance plan should be drawn up, and derelict infrastructure with no use should be demolished and the sites rehabilitated.

5.3.6 Biodiversity conservation management

5.3.6.1 Community-based natural resource management

Zandvlei Estuary Nature Reserve presently provides a range of goods and services, varying from direct consumptive use to non-consumptive, passive use. The presence of the water body and estuary positively affects the aesthetic, recreational and therefore also the commercial value of the surrounding area.

Direct-use values: These values comprise the use of the natural resources of the estuary for commercial or subsistence purposes. These can be consumptive uses – for example, the use of fish as food – or non-consumptive, such as the use of the estuary for recreation.

Consumptive uses: Fishing is the primary form of consumptive use, with an unknown quantity of fish being removed from Zandvlei annually. These are primarily alien fish, such as *Cyprinus carpio* (carp), as well as indigenous estuarine species, such as *Liza* and *Mugil* species (harders) and *Lichia amia* (leervis). Fishing activities are regulated through the issuance of provincial and national fishing permits. Awareness raising campaigns are

needed to educate the general public on the permit requirements, the bag and size limits applicable and the identification of fish species.

Callinassa krausii (Sand prawn) is often illegally harvested by means of pumping on the submerged sand flats at the estuary mouth.

From available knowledge, a limited amount of plant material is illegally harvested. This is primarily for the cut flower and gardening trade.

Non-consumptive uses: The wide variety of recreational activities that take place on the vlei would fall into this category. These include wind surfing, yachting, rowing, canoeing and kite surfing. Adjacent recreational activities, such as picnics, braais, walking and camping, are all as a result of the presence of the vlei.

Recreational fishing on a catch-and-release basis, a common pastime at Zandvlei, would also fall into this category.

5.3.6.2 Fire management

Fire plays an essential ecological role in the lifecycle of fynbos species. Fire is crucial to the long-term conservation of species in Zandvlei Estuary Nature Reserve, and is therefore considered an important component of nature reserve management. Fire management involves varying the season, frequency and intensity of fires, and reconciling ecological and practical requirements. Too frequent fires, or fires that burn out of phase with the natural burning regime, present a threat to slower-growing species, which may be eliminated entirely. If fire is excluded from the area, encroachment may result in species losses. Conversely, if vegetation is allowed to burn too frequently, the area becomes degraded, and alien species, especially grasses, could invade. Grasses maintain a shorter fire cycle, and permanently change the vegetation structure and biodiversity value of the area.

The fire management programme for Zandvlei Estuary Nature Reserve involves the monitoring of large wildfires as well as smaller fires, whether natural or unnatural (see appendix 11 for fire management plan). Historic records of fire events in the reserve area as well as post-fire monitoring records assist in the documentation of veld ages, which, in turn, influence fire management. Minimal interference takes place when naturally ignited fires occur. In cases where human-induced fires occur that would simulate a natural fire, the same management responses would apply. Natural fires are limited in spread within the constraints of ecological, project and public safety requirements. All possible actions are taken to prevent the spread of fire onto the adjacent properties. All unnatural fires that

threaten the reserve ecologically, or pose a threat to infrastructure and/or public safety, are controlled (Sheasby 2009).

Prescribed burning of vegetation is a management option in areas where vegetation becomes senescent (old) and there is a risk of species loss. The use of prescribed burning practices would assist in maintaining a vegetation mosaic that promotes plant and animal diversity. Accurate fire records and post-fire monitoring data will facilitate the initiation of prescribed burns in the core area of the reserve. The decision to administer prescribed burns is considered on an annual basis and, if required, planned and implemented accordingly including newspaper articles and letter drops of neighbouring properties to increase awareness. Fire may be used to keep fuel loads low, so as to reduce the risk of uncontrolled fires, particularly on the urban edge and in areas that pose a potential risk to infrastructure and public safety. Firebreaks and other fire control measures required by law will be implemented where necessary and feasible (Sheasby 2009).

The nature of the area's terrain, property boundaries and extensive areas of natural veld increase the chances of fire spreading both into and out of the reserve. Reasonable pre-fire protection measures are necessary, as well as a plan of action in the event of wildfire. The interaction with various City of Cape Town departments and independent stakeholders, and continuous public and private landowner involvement are essential. The development of fire protection and response plans is an important component of the reserve's fire management.

Fire management implementation in Zandvlei Estuary Nature Reserve involves the following:

- Application of guidelines on seasonal burning intervals and species requirements acquired from relevant documentation and biophysical specialists
- Accurate record keeping of all fires, including details and maps
- Use of fire data and geographic information systems for recording and mapping
- Application of post-fire monitoring programmes
- Application of fire data to determine prescribed burning needs
- Development and implementation of a fire protection and response plan, including affected stakeholders, such as additional City of Cape Town departments and private landowners neighbouring the reserve

5.3.6.3 Soil erosion and control

Due to the flat topography of Zandvlei, there is very limited soil movement. However, upper portions of the catchment, in particular the Keyzers river, are on the slopes of Constantia mountain. This steep terrain, coupled with the agricultural activities and urbanised hardening of the catchment, results in sediment being carried by these rivers. The rate of sedimentation in Zandvlei is presently unknown, and requires investigation in terms of its long-term impacts.

Natural erosion events from flooding, wave action or the natural depositing of banks are monitored annually but are not treated unless they pose a risk to adjacent residential property.

5.3.6.4 Invasive-species management

The management of invasive species is a priority within Zandvlei Estuary Nature Reserve. Alien biota need to be controlled and, where possible, eliminated in order to facilitate the re-establishment of natural biodiversity and processes in invaded areas.

Invasive species are plants and animals occurring outside their natural distribution ranges, establishing themselves, spreading, and outcompeting and replacing indigenous species. Alien species are species introduced to areas outside their natural distribution range – alien to a country or region.

Invasive alien species are introduced species, alien to the country/region, which establish, spread, and outcompete/replace indigenous species.

Invasive and alien-species management within the reserve is applied in accordance with the City of Cape Town's invasive alien species strategy and in coordination with various government-funded initiatives, including Working for Water and Working for Wetlands. Invasive alien plant species could spread rapidly should management fail to continue to implement a properly planned and coordinated programme.

Until recently, invasive species management had focused mainly on woody alien plant species, such as *Acacia saligna* and *Acacia cyclops*. Herbaceous weeds had been largely ignored. Recent monitoring and the development of an extensive herbaceous weed and grass species survey for the reserve have however shown that some herbaceous species already pose a risk to biodiversity in the area, while others could become one.

In order to protect indigenous species from invasive aliens, the following is required:

- Prioritisation of areas for alien removal, focusing on biodiversity restoration
- The implementation of removal programmes for priority species and areas
- The development and implementation of an invasive and alien management plan as well as a management plan for alien biota

Note: Section 76 of the National Environmental Management Biodiversity Act refers to the need for an invasive-species control and eradication strategy:

In terms of section 76 of the National Environmental Management Biodiversity Act - <i>(1) The management authority of a protected area preparing a management plan for the area in terms of the Protected Areas Act must incorporate into the management plan an invasive species control and eradication strategy.</i> The definition of 'invasive species' should be noted. An invasive species is any species that establishes and spreads outside its natural distribution range: <i>(4) An invasive species monitoring, control and eradication plan must include-</i> <i>(a) a detailed list and description of any listed invasive species occurring on the relevant land;</i> <i>(b) a description of the parts of that land that are infested with such listed invasive species;</i> <i>(c) an assessment of the extent of such infestation;</i> <i>(d) a status report on the efficacy of previous control and eradication measures;</i> <i>(e) the current measures to monitor, control and eradicate such invasive species; and</i> <i>(f) measurable indicators of progress and success, and indicators of when the control plan is to be completed.</i>

Invasive and alien faunal species are also controlled in the reserve. Formal plans outlining the monitoring of removal of identified species are however required.

Catchment management and invasive species management need to work in partnership in the riverine and wetland areas. Of concern is the eutrophication of the waterways due to urban stormwater runoff and nutrient loading from agricultural areas. This is causing increased siltation leading to shallow wetlands and expansion of reedbeds.

5.3.6.5 Species introductions

Species that were historically indigenous to the Zandvlei area, and for which suitable habitat and eco-niches are available, may be re-introduced. Several fauna species that previously occurred in Zandvlei are no longer present or down to small numbers.

Prior to the re-introduction of any species, a full proposal is required. Investigation into the availability of suitable habitat for the species with reference to public utilisation of areas is required, as is an investigation into the historical occurrence and status of the species. The effect of re-introducing species to the area must also be researched. Re-introduction of

potentially dangerous and problematic species may also require a public participation process. An investigation of suitable sources is also necessary.

All proposed re-introductions need to be recommended and approved by the flora and fauna management committees as well as provincial authorities before implementation. The implementation of any re-introduction programmes must be specified in a plan of action, and documented accurately.

5.3.6.6 Strategic research

The collection of baseline data is essential for determining the presence of species, and to determine the extent to which management actions should take place. Monitoring is required to determine the success of management actions as well as to provide an indication of long-term change. Research on the property is vital for obtaining more knowledge on the environment.

CapeNature has numerous manuals on monitoring and baseline data collection, for further reference and guidance.

5.4 Sensitivity analysis of Zandvlei Estuary Nature Reserve

Zandvlei Estuary Nature Reserve is a considerable asset to the City of Cape Town and significantly contributes to national vegetation targets of threatened vegetation types, as listed in the National Spatial Biodiversity Assessment (Driver *et al.* 2005), as well as providing a service and facilities to local residents and schools.

The development of the sensitivity and zoning plan is one of the steps required in compiling a CDF for Zandvlei Estuary Nature Reserve. CDFs are tools to reconcile the various landuse needs, and to delineate visitor user zones and the positioning and nature of new infrastructure, access points, roads and facilities.

The CDF process has grown in response to the requirements of the National Environmental Management Biodiversity Act of 2004, and seeks to comply with the spatial planning requirements of the Act. The CDFs will ensure that best practice and sustainable development principles are integrated with spatial planning in protected areas.

The sensitivity-value analysis is the landscape analysis portion of the broader CDF. It is a multi-criteria decision-support tool for spatial planning, designed to present the best available information in a format that enables defensible and transparent decision making. The

sensitivity-value process is based on the principle that the acceptability of a development (or placement of a structure) at a site is based on that site's value (arising from the site's biodiversity, heritage, aesthetic or other values) and its sensitivity or vulnerability to a variety of disturbances (Holness 2005).

The sensitivity-value analysis, the CDF and the associated zoning plan should form part of an adaptive management system, and will grow and change over time as the understanding of the landscapes and ecosystems improves. However, they will never replace the need for detailed site and precinct planning and EIA compliance at site level.

The methodology used for both the sensitivity-value analysis and the zoning process was adapted from Holness and Skowno (2008) and SRK Consulting (2008¹; 2008²). All geographic information work was carried out in ESRI's ArcMap, version 9.3.1, using the ArcInfo licence level, with Spatial Analyst and 3D Analyst extensions. See appendix 12 for the complete sensitivity-value analysis and zoning process (Purves 2010).

5.5 Zoning plan of Zandvlei Estuary Nature Reserve

5.5.1 Zoning informants

This section briefly outlines the values underlying the identification of broad tourism use zones. It is important to remember that the landscape/biodiversity analysis is just one of the informants in the zoning process. Although the biodiversity analysis is intrinsically a relatively objective scientific process, other informants to the zoning process are not.

Although every attempt is made to place high sensitivity-value sites into more protected zones where possible, the zoning process is essentially a compromise between environment and development. In particular, the identified high-value sites are often the key biodiversity assets that need to be made available to the eco-tourism market in an appropriate manner. The biodiversity layers and the spatial management of the reserve are directly linked during the identification of special management areas. Even within broad high-tourist use zones, some areas are likely to be subject to very tight conservation controls (potentially including complete exclusion of human impacts from an area).

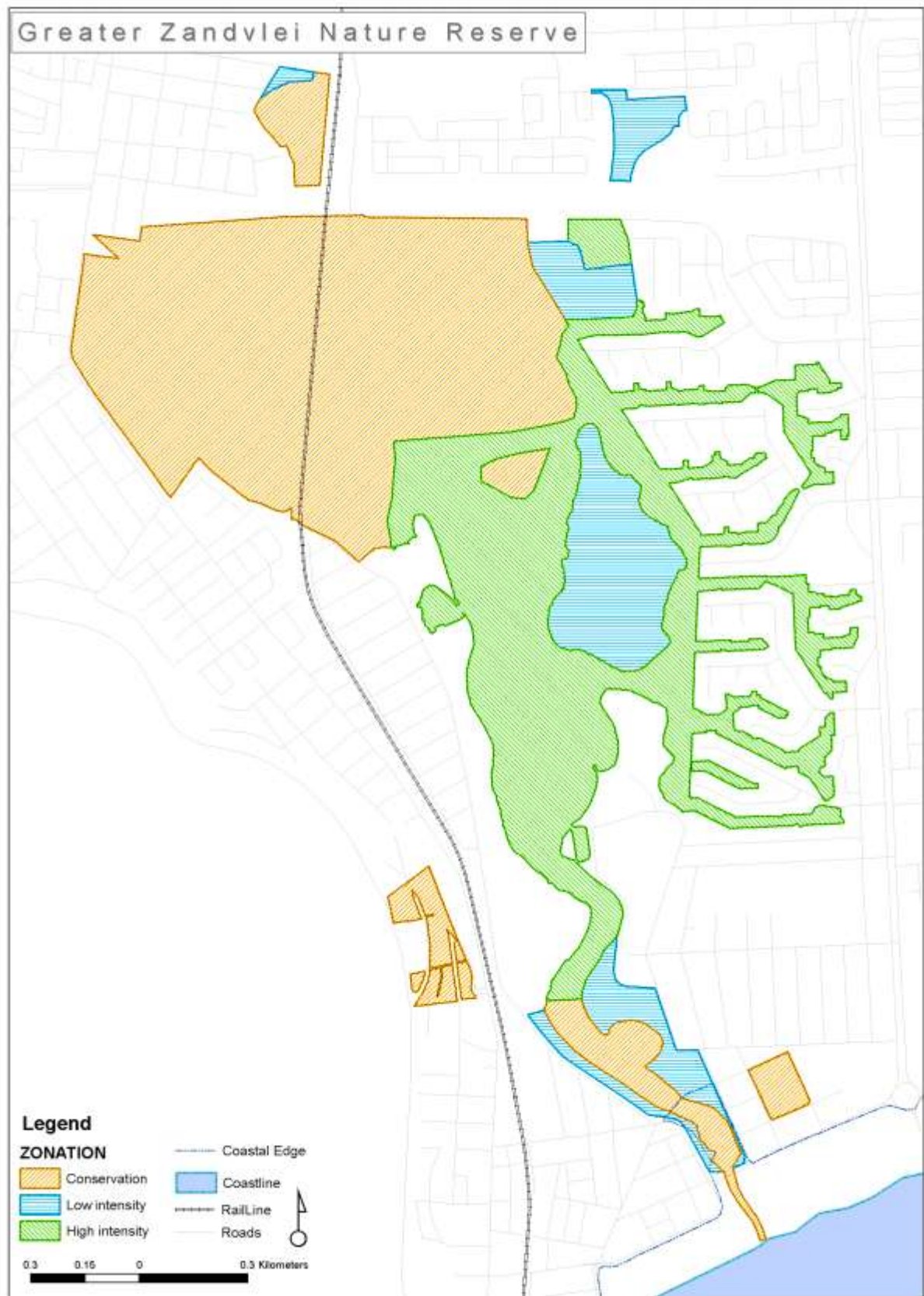
Underlying decision-making rules used in the zoning process

- The zoning process is aimed at striking a balance between environmental protection and the development required to meet the broader economic and social objectives of the reserve.

- The zoning process takes into account existing development footprints and tourism access routes.
- This is based on the underlying principle that, all else being equal, an existing transformed site is preferable to a green-field site, from a biodiversity perspective.
- Infrastructure costs are dramatically increased when developments take place away from existing infrastructure.
- Existing tourism nodes and access routes are a reality of the economic landscape, and it would not be possible to shut down existing tourism sites that compromise the development objectives of the reserve.
- Where existing development nodes, tourist sites and access routes occur in areas with high sensitivity-value, the broad-use zoning aims to keep the development footprint as small as is realistically possible, preferably within the existing transformed site.
- Where possible, sites with high biodiversity sensitivity-value are put into stronger protection zones.
- Peripheral development is favoured and should, where possible, be located outside the conservation area.
- The designation of a broad-use zone does not imply that all sites within that zone would be suitable for all the development types anticipated. Detailed site-level planning is still required, and many sites may prove to be unsuitable at a site/precinct/EIA level of planning.
- Special management areas/overlays need to be formalised and linked to the management plans.

5.5.2 Zoning definitions and descriptions

The zoning definitions and descriptions were workshopped with area and regional managers. Four categories were decided on, namely primary conservation zone, conservation zone, low-intensity leisure zone and high-intensity leisure zone. Appendix 12 outlines the proposed zoning and zone descriptions within the Sensitivity and value analysis report. Map 6 outlines the zoning for Zandvlei Estuary Nature Reserve. The process is still linked to the zoning used for the CapeNature reserves (Holness & Skowno 2008), as there should be general alignment of the broader use zones to enable comparison and integration if provincial documents so require.



Map 6: Reserve zoning

6. DEVELOPMENT PLAN

The development plan is still to be completed within the detailed precinct planning for the high-intensity use zone. This plan will indicate suitable development nodes, and will be guided by the infrastructure and zoning management plans.

7. COSTING PLAN

Table 8: Broad costing management plan for the reserve

The costing plan details the broad-category breakdown for management interventions for Zandvlei Estuary Nature Reserve for the period 2011–2016.

Management action	Funding source	Approximate costs 2011–2012	Approximate costs 2012–2013	Approximate costs 2013–2014	Approximate costs 2014–2015	Approximate costs 2015–2016
1. Invasive alien plant programme						
Clearing of important alien plants 1 & 2	Grant funding	R20 000	R21 000	R22 050	R23 153	R24 310
2. Fire management						
Maintenance of fire belts	Operating	R15 000	R15 750	R16 000	R16 537	R17 364
3. Road and trail maintenance						
Road repairs	Operating	R4 750	R4 987	R5 236	R5 498	R5 773
Footpath maintenance	Operating	R5 000	R5 250	R5 512	R5 788	R6 077
4. Fencing						
Repairs and maintenance	Operating	R15 000	R15 750	R16 000	R16 537	R17 364
New fence reserve development	Capital expenditure	R123 000	-	-	-	-
5. Infrastructure development						
Zandvlei, office complex	Capital expenditure	R300 000	-	-	-	-

6. Human resources						
• Direct human resources costs	Operating	R1 250 000	R1 350 000	R1 458 000	R1 574 640	R1 700 611
7. General expenses						
• General operating costs	Operating	R825 000	R866 250	R909 562	R955 040	R1 002 792
8. Special projects						
• Zandvlei Trust	Operating	R10 000	R10 500	R11 025	R11 576	R12 155
• Signage and interpretation	Capital expenditure	R20 000	-	-	-	-
Note: Human resources costs are escalated at 8% per annum. Operating expenditure is escalated at 5% per annum.						

PART 3

MONITORING & AUDITING

8. MONITORING & AUDITING

8.1 Annual audit procedure

8.1.1 METT-SA – Management Effectiveness Tracking Tool South Africa

The METT-SA is a rapid, site-level assessment tool adapted from the World Bank and Worldwide Fund for Nature (WWF) system (second edition, 2007). The system is based on the idea that good protected-area management follows a process comprising six distinct stages or elements:

It begins with understanding the **context** of existing values and threats (where are we now?), then progress through **planning** (where do we want to be?), followed by allocation of resources (**inputs**) (what do we need?). As a result of management actions (**processes**) (how do we go about it?), it eventually produces products and services (**outputs**) (what were the results?), which result in impacts or **outcomes** (what did we achieve?).

This version has been compiled so that it can be applied to the full range of protected areas managed by all C.A.P.E partners. It also applies to protected areas in other regions, and, with minor adaptations, could be applied outside of South Africa as well. It may also be used for marine protected areas (MPAs) and islands, but, in the long run, it may become necessary to amend the system to be more specific to these areas. In addition, a system for off-reserve conservation areas, such as conservancies or stewardships, may need to be developed.

When applying METT-SA, it is important for the following to be kept in mind:

- The METT-SA is intended to report on the reserve's progress. Thus, the score is the baseline against which future assessments are made to see if there has been an improvement.
- It is site-specific and must therefore not be used to compare scores between different protected areas.
- It is a useful tool to give indications of management trends. In this version, the six elements of the management process, as defined in the original version, are scored as subsets of the total. This gives an indication of where management should strive for improvement.
- It is not intended to replace more detailed assessments as part of adaptive management systems.
- The METT-SA has limitations in the quantitative measurement of outcomes, and these should be measured by more objective and quantitative systems.
- This version adjusts the total score where questions are irrelevant.

- Often, low scores on some questions could be a reflection on the organisation as a whole, and do not necessarily point to issues over which the protected-area manager has control. **The performance of managers should therefore under no circumstances be measured against the METT-SA results.**

Tracking the trends of management effectiveness is a long-term process, and instant improvements are unlikely. Generally, the METT-SA is applied at three-year intervals, but an annual application is acceptable if it is understood that changes may only be slight. The METT-SA for Zandvlei Estuary Nature Reserve was undertaken in 2007, and the results are presented in appendix 13. The METT-SA will be repeated in approximately September 2011.

8.1.2 Protected-area review

The protected-area review is an internal review conducted annually to assist managers in reviewing their sites, and to allow for adaptive management actions to be taken where required (and within managers' control).

8.2 Management plan review

Every five years, this IRMP should be reviewed, and adjusted where necessary. To achieve this, the following questions (and others as needed) should be addressed:

- Did this management plan make a meaningful contribution to the management of Zandvlei Estuary Nature Reserve?
- Were individual management 'prescripts' realistic and achievable? Were they written unambiguously or was there room for misunderstanding?
- Were budgets for each management activity realistic? Were the allocated budgets too much or too little?
- Were sufficient staff members of the right qualifications allocated to each management activity?

There will be some overlap between the review and the audit, and they should therefore be done on the same day, by the same team.

8.3 Biodiversity monitoring

Table 9 indicates the current monitoring arrangements that are in place at Zandvlei Estuary Nature Reserve. These arrangements are backed up by planned monitoring protocols.

Table 9. Current monitoring arrangements at the Zandvlei Estuary Nature Reserve

Action	Responsible party	Data collecting	Frequency
Water-bird census	Reserve management	Visual surveys	Quarterly
Bird count	Reserve management	Visual surveys	Weekly
Water quality status	Reserve management and Scientific Services	Collection of samples and in-field measurement	Monthly
Weather data	South African Weather Service	Muizenberg site observation	Daily
Daily rainfall	Zandvlei Inventory Monitoring Programme (Peter Grey)	Rain guage samples	Daily
Antelope surveys	Reserve management	Night count	Quarterly
Small-mammal surveys	Reserve management	Pitfall traps, Sherman traps, trap cages and collections	Annually
Reptile and amphibian surveys	Reserve management	Pitfall traps, Sherman traps, trap cages and collections	Annually
Fish surveys	Reserve management, and Oceans and Coasts	Trek net	Quarterly

PART 4

REFERENCES

9. REFERENCES

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PART 5

10. APPENDICES

Appendix 1: Surveyor General diagrams for Zandvlei Estuary Nature Reserve

Appendix 2: Plant species list

Species Name	Common Name	Red Book Status	Alien
Acacia cyclops	Rooikrans		Yes
Acacia longifolia	Long-leafed Wattle		Yes
Acacia mearnsii			Yes
Acacia saligna	Port Jackson		Yes
Adenogramma glomerata			No
Agave americana~			Yes
Agave sisalana			Yes
Alisma plantago-aquatica			Yes
Amaryllis belladonna	March Lily		No
Anagallis arvensis~			Yes
Androcymbium capense			No
Androcymbium eucomoides	Men in a Boat		No
Annesorhiza macrocarpa			No
Anredera cordifolia			Yes
Anthospermum aethiopicum			No
Aponogeton distachyos			No
Araujia sericifera			Yes
Arctotheca calendula			No
Arctotheca populifolia			No
Arctotis hirsuta			No
Aristea africana			No
Aspalathus forbesii			No
Aspalathus hispida~			No
Asparagus aethiopicus			No
Asparagus africanus			No
Asparagus asparagoides			No
Asparagus capensis			No
Asparagus lignosus			No
Astephanus triflorus			No
Athanasia crithmifolia			No
Athanasia dentata			No
Avena barbata			Yes
Avena sativa			Yes
Azolla filiculoides	Red Water Fern		Yes

Babiana ambigua			No
Babiana tubulosa			No
Berula erecta~			No
Bidens pilosa			Yes
Bolboschoenus maritimus			No
Brachylaena discolor			No
Briza maxima	Large quaking grass		Yes
Briza minor	small quaking grass		Yes
Bromus catharticus			Yes
Bromus diandrus	ripgut brome; predikantsluis		Yes
Brunsvigia orientalis	Candelabera Flower		No
Canna indica	Canna		Yes
Cannabis sativa~			Yes
Carex clavata			No
Carex ecklonii			No
Carissa macrocarpa			No
Carpobrotus acinaciformis			No
Carpobrotus edulis			No
Cassytha ciliolata			No
Centella asiatica			No
Centranthus ruber			Yes
Cestrum laevigatum			Yes
Chasmanthe aethiopica	Suurkanol		No
Chenopodium glaucum			Yes
Chenopodium phillipsianum			Yes
Chenopodium polyspermum			Yes
Chironia baccifera			No
Chironia decumbens			No
Chondropetalum nudum			No
Chrysanthemoides incana			No
Chrysanthemoides monilifera	Bitoubos		No
Chrysanthemum coronarium			Yes
Chrysocoma coma-aurea			No
Cineraria geifolia			No
Cirsium vulgare			Yes
Cissampelos capensis			No
Cladium mariscus jamaicense			No

Cliffortia ericifolia			No
Cliffortia obcordata			No
Cliffortia stricta			No
Cliffortia strobilifera			No
Commelina benghalensis	Blouselblommetjie		Yes
Convolvulus farinosus			Yes
Conyza bonariensis			Yes
Conyza pinnatifida			No
Conyza scabrida			No
Cortaderia selloana	Pampas Grass		Yes
Corycium bicolorum			No
Corycium orobanchoides			No
Cotula coronopifolia			No
Cotula filifolia		Critically Endangered (CR)	No
Cotula nigellifolia~			Yes
Cotula turbinata			No
Cotula vulgaris		Critically Endangered (CR)	No
Cotyledon orbiculata	Plakkies, Varkoor		No
Cotyledon orbiculata~			No
Crassula decumbens			No
Crassula dichotoma			No
Crassula glomerata			No
Crassula ovata			Yes
Crotalaria capensis			Yes
Cuscuta nitida			No
Cynanchum africanum			No
Cynanchum obtusifolium			No
Cynodon dactylon	couch grass; kweekgras; kweek		No
Cyperus esculentus~			No
Cyperus longus~			No
Cyperus sphaerospermus			No
Cyperus textilis			No
Cyperus thunbergii			No
Cysticapnos vesicaria			No
Dasispermum suffruticosum			No
Dimorphotheca pluvialis			No
Disa bracteata			No
Dischisma arenarium			No
Dischisma ciliatum~			No

Dittrichia graveolens			No
Dorotheanthus apetalus			No
Echium plantagineum			Yes
Ehrharta calycina			No
Ehrharta villosa~			No
Eichhornia crassipes	Water Hyacinth		Yes
Ekebergia capensis			Yes
Elegia microcarpa			No
Elegia tectorum			No
Elegia vaginulata			No
Epilobium hirsutum			No
Epilobium tetragonum			No
Eragrostis curvula			No
Eriocephalus africanus~			No
Erodium cicutarium			Yes
Euclea racemosa			No
Euphorbia helioscopia			Yes
Euphorbia marlothiana			No
Euphorbia peplus			Yes
Euryops linearis			No
Exomis microphylla~			No
Felicia echinata			No
Felicia tenella~			No
Ferraria crispa			No
Ferraria crispa~			No
Festuca scabra			No
Ficinia argyropa			No
Ficinia bulbosa			No
Ficinia capitella			No
Ficinia dunensis			No
Ficinia indica			No
Ficinia lateralis			No
Ficinia nodosa			No
Ficinia ramosissima			No
Ficinia trichodes			No
Fuirena coerulescens			No
Fuirena hirsuta			No
Fumaria muralis~			Yes
Galium tomentosum			No
Geissorhiza aspera			No
Geranium incanum~			No
Geranium molle			Yes
Geranium purpureum			Yes

Gladiolus angustus			No
Gladiolus carinatus	Blou Afrikaner		No
Gladiolus cunonius			No
Gladiolus undulatus			No
Gnidia spicata			No
Gomphocarpus fruticosus~	Wild cotton		No
Gomphocarpus physocarpus			Yes
Gymnosporia buxifolia			No
Haemanthus coccineus			No
Hebenstretia repens			No
Helianthus annuus			Yes
Helichrysum crispum			No
Helichrysum dasyanthum			No
Helichrysum indicum			No
Helichrysum litorale			No
Helichrysum niveum			No
Helichrysum pandurifolium			No
Helichrysum patulum			No
Helictotrichon dodii			No
Hellmuthia membranacea			No
Hemimeris sabulosa			No
Hermannia pinnata			No
Hesperantha falcata			No
Hibiscus diversifolius~			Yes
Holcus lanatus			No
Holothrix villosa			No
Hydrocotyle verticillata			No
Hymenolepis parviflora			No
Hyparrhenia hirta			No
Hypochaeris radicata			Yes
Imperata cylindrica	Sword Grass, Sword Grass; cotton wool grass		No
Ipomoea cairica			Yes
Ipomoea purpurea			Yes
Ischyrolepis eleocharis			No
Isolepis cernua~			No
Isolepis marginata			No

Isolepis prolifera		No
Ixia paniculata		No
Jordaaniella dubia		No
Juncus bufonius		No
Juncus capensis		No
Juncus capitatus		No
Juncus dregeanus~		No
Juncus effusus		No
Juncus kraussii		No
Juncus punctorius		No
Juncus scabriusculus		No
Kedrostis nana~		No
Lachenalia bulbifera		No
Lachenalia reflexa		No
Lachenalia rubida		No
Lactuca serriola		No
Lagurus ovatus	Hare's tail	Yes
Lampranthus explanatus		No
Lampranthus reptans		No
Lantana camara		Yes
Lavatera arborea		Yes
Lavatera cretica		Yes
Lemna gibba		No
Leonotis leonurus		No
Leptospermum laevigatum		Yes
Lessertia fruticosa		No
Leucadendron coniferum		No
Leucadendron levisanus	Cape Flats Conebush	No
Leucospermum conocarpodendron viridum		No
Limonium equisetinum		No
Limonium scabrum		No
Lobelia anceps		No
Lobelia erinus		Yes
Lobularia maritima		Yes
Lolium multiflorum	Italian ryegrass; annual ryegrass	Yes
Lolium perenne		Yes
Lophochloa cristata		No
Ludwigia adscendens diffusa		Yes
Lycium afrum		No
Lycium ferocissimum		No
Lyperia lychnidea		No
Lyperia tristis		No

Manulea tomentosa			No
Maurocena frangula			No
Medicago polymorpha			Yes
Medicago sativa			Yes
Melasphaerula ramosa			No
Melianthus major			No
Melica racemosa			No
Melilotus albus			Yes
Melilotus indicus			Yes
Mercurialis annua			No
Metalasia muricata			No
Mirabilis jalapa			Yes
Monopsis lutea			No
Montinia caryophyllacea			No
Moraea bulbilifera~			No
Moraea collina			No
Moraea flaccida			No
Moraea fugax			No
Moraea gawleri			No
Moraea setifolia			No
Morella cordifolia			No
Muraltia mitior	Cape Flats tybos		No
Myoporum tenuifolium	Manatoka		Yes
Myosotis discolor			Yes
Myriophyllum aquaticum			Yes
Nasturtium officinale	Watercress		Yes
Nemesia versicolor~			No
Nidorella foetida			No
Nothoscordum gracile	Fragrant False Garlic		Yes
Nylandtia spinosa	Skilpadbessie Bos, Tortoise Berry Bush		No
Olea europaea africana			No
Olea exasperata			No
Ornithogalum flaccida	Albuca flaccida		No
Orobanche ramosa~			Yes
Orphium frutescens			No
Osyris compressa			No
Otholobium bracteolatum			No
Otholobium virgatum			No
Othonna coronopifolia			No

Oxalis caprina			No
Oxalis eckloniana~			No
Oxalis hirta~			No
Oxalis obtusa			No
Oxalis pes-caprae~			No
Oxalis purpurea			No
Panicum repens			No
Paraserianthes lophantha~			Yes
Paspalum vaginatum			Yes
Passerina corymbosa			No
Passerina paleacea			No
Passerina paludosa	Cape Flats gonnabos		No
Passerina rigida			No
Pelargonium betulinum			No
Pelargonium capitatum			No
Pelargonium cucullatum~			No
Pelargonium grossularioides			No
Pelargonium multiradiatum			No
Pennisetum clandestinum	Kikuyu grass		Yes
Pennisetum macrourum			No
Pennisetum setaceum			Yes
Pentaschistis barbata			No
Pentaschistis pallida			No
Persicaria decipiens			Yes
Pharnaceum lineare			No
Phoenix canariensis	Canary Palm Tree		Yes
Phragmites australis			No
Phyllis ericoides~			No
Phyllobolus canaliculatus			No
Picris echioides			Yes
Pistia stratiotes			Yes
Plantago crassifolia			No
Plantago crassifolia~			No
Plantago lanceolata			Yes
Plecostachys serpyllifolia			No
Podalyria sericea			No

<i>Polygala garcinii</i>			No
<i>Polygala myrtifolia</i> ~			No
<i>Polygonum aviculare</i>			Yes
<i>Polypogon monspeliensis</i>	Rabbit's Foot Grass		Yes
<i>Polypogon strictus</i>			Yes
<i>Polypogon viridis</i>			Yes
<i>Potamogeton pectinatus</i>			No
<i>Psoralea ensifolia</i>			No
<i>Psoralea glaucina</i>	Muizenburg fountainbush		No
<i>Psoralea pinnata</i>			No
<i>Psoralea repens</i>		Near Threatened (NT)	No
<i>Pterocelastrus tricuspidatus</i>			No
<i>Pycreus mundii</i>			No
<i>Pycreus nitidus</i>			No
<i>Pycreus polystachyos</i> ~			No
<i>Quercus ilex</i>			Yes
<i>Ranunculus multifidus</i>			Yes
<i>Raphanus raphanistrum</i>	Wild Mustard		Yes
<i>Rhus laevigata</i> var. <i>villosa</i>			No
<i>Ricinus communis</i> ~			Yes
<i>Romulea flava</i> ~			No
<i>Romulea hirsuta</i> ~			No
<i>Romulea minutiflora</i>			No
<i>Romulea rosea</i> ~			No
<i>Romulea tabularis</i>			No
<i>Rumex conglomeratus</i>			Yes
<i>Rumex crispus</i>			Yes
<i>Ruppia maritima</i>			No
<i>Ruschia macowanii</i>			No
<i>Salsola kali</i>			No
<i>Salvia africana-caerulea</i>			No
<i>Salvia africana-lutea</i>			No
<i>Salvinia molesta</i>			Yes
<i>Sambucus nigra</i>	Black Elder, Elderberry		No
<i>Samolus porosus</i>			No
<i>Samolus valerandi</i>			No
<i>Sarcocornia capensis</i>			No
<i>Sarcocornia littorea</i>			No
<i>Sarcocornia natalensis</i> ~			No
<i>Satyrium carneum</i>			No

Satyrium coriifolium			No
Satyrium odorum			No
Schinus terebinthifolius			Yes
Schoenoplectus scirpoides			No
Schoenoplectus triqueter			Yes
Schoenus nigricans			No
Searsia crenata	Blink Taaibos, Turkeyberry		No
Searsia glauca	Blou Taaibos		No
Searsia laevigata			No
Searsia lucida~			No
Sebaea aurea			No
Sebaea minutiflora			No
Senecio arenarius			No
Senecio burchellii			No
Senecio elegans			No
Senecio halimifolius	Tabakbos		No
Senecio littoreus~			No
Senecio maritimus			No
Senecio pterophorus			Yes
Senecio rigidus			No
Senecio tamoides			Yes
Seriphium plumosum			No
Sesbania punicea			Yes
Sideroxylon inerme inerme			No
Sideroxylon inerme~			No
Silene bellidioides			Yes
Silene gallica			Yes
Sisyrinchium micranthum			Yes
Solanum africanum			No
Solanum guineense			No
Solanum linnaeanum			No
Solanum nigrum			Yes
Solanum tomentosum~			No
Sonchus oleraceus			Yes
Sonderina hispida			No
Sparaxis grandiflora			No
Spartium junceum			Yes
Spergularia media			No
Sporobolus africanus			No
Sporobolus virginicus			No
Stellaria media	Common Chickweed		Yes
Stenotaphrum	Buffalo Grass		No

secundatum			
Struthiola striata			No
Sutherlandia frutescens			No
Syzygium paniculatum	Eugenia berry		Yes
Taraxacum officinale			No
Tarchonanthus camphoratus			No
Tecoma capensis	Cape Honeysuckle		Yes
Tetragonia decumbens			No
Tetragonia fruticosa			No
Thamnochortus erectus			No
Thamnochortus spicigerus			No
Themeda triandra			No
Thesium aggregatum			No
Thesium frisea~			No
Thesium spicatum			No
Thinopyrum distichum			No
Torilis arvensis			Yes
Trachyandra ciliata			No
Trachyandra divaricata			No
Trachyandra flexifolia			No
Trachyandra revoluta			No
Tribolium hispidum			No
Tribulus terrestris			No
Trichogyne repens			No
Trifolium angustifolium~			Yes
Trifolium arvense~			Yes
Trifolium campestre~			Yes
Trifolium repens			Yes
Trifolium resupinatum~			Yes
Trifolium tomentosum~			Yes
Triglochin bulbosa	Arrow Grass		No
Tropaeolum majus	Garden Nasturtium		Yes
Typha capensis	Bulrush, Papkuil		No
Ursinia anthemoides~			No
Vellereophyton dealbatum			No
Vicia benghalensis			Yes
Vicia hirsuta			Yes

Vicia sativa nigra			Yes
Viscum capense			No
Wachendorfia paniculata			No
Wahlenbergia androsacea			No
Wahlenbergia capensis			No
Wahlenbergia procumbens			No
Watsonia borbonica			No
Watsonia tabularis			No
Willdenowia glomerata			No
Willdenowia teres			No
Wimmerella bifida			No
Wolffia arrhiza			No
Yucca gloriosa			Yes
Zaluzianskya villosa			No
Zantedeschia aethiopica	Arum Lily		No
Zygophyllum flexuosum			No

Appendix 3: Mammal species list

Species Name	Common Name	Red Book Status	Alien
<i>Aonyx capensis</i>	Cape Clawless Otter	Least Concern (LC)	No
<i>Arctocephalus pusillus</i>	Cape Fur Seal	Least Concern (LC)	No
<i>Atilax paludinosus</i>	Water Mongoose	Least Concern (LC)	No
<i>Bathergus suillus</i>	Cape Dune Molerat	Least Concern (LC)	No
<i>Canis lupus familiaris</i>	Domestic dog		Yes
<i>Cryptochloris asiatica</i>	Cape Golden Mole	Data Deficient (DDD)	No
<i>Felis caracal</i>	Caracal	Least Concern (LC)	No
<i>Felis silvestris catus</i>	Domestic cat		Yes
<i>Galerella pulverulenta</i>	Small Grey Mongoose	Least Concern (LC)	No
<i>Genetta genetta</i>	Smallspotted Genet	Least Concern (LC)	No
<i>Genetta tigrina</i>	Large-spotted Genet, Large Spotted Genet	Least Concern (LC)	No
<i>Georychus capensis</i>	Cape Molerat	Least Concern (LC)	No
<i>Hystrix africaeaustralis</i>	Porcupine	Least Concern (LC)	No
<i>Lepus capensis</i>	Cape Hare	Least Concern (LC)	No
<i>Mus minutoides</i>	Desert Pygmy Mouse, African Pygmy Mouse	Least Concern (LC)	No
<i>Mus musculus</i>	House Mouse		Yes
<i>Myosorex varius</i>	Forest Shrew	Data Deficient (DDD)	No
<i>Otomys irroratus</i>	Vlei Rat	Least Concern (LC)	No
<i>Raphicerus melanotis</i>	Cape Grysbok	Least Concern (LC)	No
<i>Rattus rattus</i>	House Rat, Black Rat	Not Evaluated (NE)	Yes
<i>Rhabdomys pumilio</i>	Striped Mouse, Striped Field Mouse	Least Concern (LC)	No
<i>Tatera afra</i>	Cape Gerbil	Least Concern (LC)	No
<i>Vulpes chama</i>	Cape Fox	Least Concern (LC)	No

Appendix 4: Bird species list

Species Name	Common Name	Red Book Status	Alien
<i>Accipiter melanoleucus</i>	Black Sparrowhawk		No
<i>Accipiter rufiventris</i>	Rufous-chested Sparrowhawk		No
<i>Accipiter tachiro</i>	African Goshawk		No
<i>Acrocephalus baeticatus</i>	African Reed-Warbler		No
<i>Acrocephalus gracilirostris</i>	Lesser Swamp-Warbler		No
<i>Actitis hypoleucos</i>	Common Sandpiper		No
<i>Alcedo cristata</i>	Malachite Kingfisher		No
<i>Alopochen aegyptiacus</i>	Egyptian Goose, Kolgans		No
<i>Amaurornis flavirostris</i>	Black Crake		No
<i>Anas capensis</i>	Cape Teal		No
<i>Anas erythrorhyncha</i>	Red-billed Teal		No
<i>Anas platyrhynchos</i>	Mallard		Yes
<i>Anas smithii</i>	Cape Shoveler		No
<i>Anas undulata</i>	Yellow-billed Duck		No
<i>Anhinga rufa</i>	African Darter		No
<i>Anthobaphes violacea</i>	Orange-breasted Sunbird		No
<i>Anthus cinnamomeus</i>	African Pipit		No
<i>Apalis thoracica</i>	Bar-throated Apalis		No
<i>Apus affinis</i>	Little Swift		No
<i>Apus barbatus</i>	African Black Swift		No
<i>Apus caffer</i>	White-rumped Swift		No
<i>Aquila pennatus</i>	Booted Eagle		No
<i>Ardea cinerea</i>	Grey Heron		No
<i>Ardea melanocephala</i>	Black-headed Heron		No
<i>Ardea purpurea</i>	Purple Heron		No
<i>Ardeola ralloides</i>	Squacco Heron		No
<i>Batis capensis</i>	Cape Batis		No
<i>Bostrychia hagedash</i>	Hadedda Ibis		No
<i>Bradypterus baboecala</i>	Little Rush-Warbler		No
<i>Bubo africanus</i>	Spotted Eagle-Owl		No
<i>Bubulcus ibis</i>	Cattle Egret		No
<i>Burhinus capensis</i>	Spotted Thick-knee, Spotted Dikkop		No
<i>Burhinus vermiculatus</i>	Water Thick-knee, Water Dikkop		No
<i>Buteo vulpinus</i>	Steppe Buzzard		No
<i>Cairina moschata</i>	Muskovy Duck		Yes
<i>Calandrella cinerea</i>	Red-capped Lark		No
<i>Calidris ferruginea</i>	Curlew Sandpiper		No
<i>Caprimulgus pectoralis</i>	Fiery-necked Nightjar		No
<i>Centropus burchellii</i>	Burchell's Coucal		No
<i>Cercotrichas coryphoeus</i>	Karoo Scrub-Robin		No

<i>Ceryle rudis</i>	Pied Kingfisher		No
<i>Charadrius pecuarius</i>	Kittlitz's Plover		No
<i>Charadrius tricollaris</i>	Three-banded Plover		No
<i>Chlidonias hybrida</i>	Whiskered Tern		No
<i>Chrysococcyx caprius</i>	Diderick Cuckoo		No
<i>Chrysococcyx klaas</i>	Klaas's Cuckoo		No
<i>Ciconia ciconia</i>	White Stork		No
<i>Cinnyris chalybeus</i>	Southern Double-collared Sunbird		No
<i>Circus ranivorus</i>	African Marsh-Harrier	Vulnerable (VU)	No
<i>Cisticola juncidis</i>	Zitting Cisticola		No
<i>Cisticola subruficapilla</i>	Grey-backed Cisticola		No
<i>Cisticola tinniens</i>	Levaillant's Cisticola		No
<i>Colius colius</i>	White-backed Mousebird		No
<i>Colius striatus</i>	Speckled Mousebird		No
<i>Columba arquatrix</i>	African Olive-Pigeon		No
<i>Columba guinea</i>	Speckled Pigeon		No
<i>Columba livia</i>	Feral Pigeon, Rock Dove		Yes
<i>Corvus albicollis</i>	White-necked Raven		No
<i>Corvus albus</i>	Pied Crow		No
<i>Corvus splendens</i>	Indian House Crow		Yes
<i>Cossypha caffra</i>	Cape Robin-Chat		No
<i>Crithagra flaviventris</i>	Yellow Canary		No
<i>Crithagra sulphuratus</i>	Brimstone Canary		No
<i>Cygnus atratus</i>	Black Swan		Yes
<i>Dendrocygna bicolor</i>	Fulvous Duck		No
<i>Dendrocygna viduata</i>	White-faced Duck		No
<i>Egretta garzetta</i>	Little Egret		No
<i>Egretta intermedia</i>	Yellow-billed Egret		No
<i>Egretta thula</i>	Snowy Egret		No
<i>Elanus caeruleus</i>	Black-shouldered Kite		No
<i>Estrilda astrild</i>	Common Waxbill		No
<i>Euplectes capensis</i>	Yellow Bishop		No
<i>Euplectes orix</i>	Southern Red Bishop		No
<i>Falco biarmicus</i>	Lanner Falcon	Near Threatened (NT)	No
<i>Falco peregrinus</i>	Peregrine Falcon	Near Threatened (NT)	No
<i>Falco rupicolus</i>	Rock Kestrel		No
<i>Fulica cristata</i>	Red-knobbed Coot		No
<i>Gallinago nigripennis</i>	African Snipe, Ethiopian Snipe		No
<i>Gallinula chloropus</i>	Common Moorhen		No
<i>Haliaeetus vocifer</i>	African Fish-Eagle		No
<i>Himantopus himantopus</i>	Black-winged Stilt		No

Hirundo albigularis	White-throated Swallow		No
Hirundo cucullata	Greater Striped Swallow		No
Hirundo dimidiata	Pearl-breasted Swallow		No
Hirundo fuligula	Rock Martin		No
Hirundo rustica	Barn Swallow		No
Ixobrychus minutus	Little Bittern		No
Laniarius ferrugineus	Southern Boubou		No
Lanius collaris	Common Fiscal, Fiscal Shrike		No
Larus cirrocephalus	Grey-headed Gull		No
Larus dominicanus	Kelp Gull		No
Larus hartlaubii	Hartlaub's Gull		No
Macronyx capensis	Cape Longclaw, Orange throated Longclaw		No
Megaceryle maximus	Giant Kingfisher		No
Milvus migrans	Black Kite, Yellow-billed Kite		No
Morus capensis	Cape Gannet	Vulnerable (VU)	No
Motacilla capensis	Cape Wagtail		No
Muscicapa adusta	African Dusky Flycatcher		No
Nectarinia famosa	Malachite Sunbird		No
Netta erythrophthalma	Southern Pochard		No
Numida meleagris	Helmeted Guineafowl		Yes
Nycticorax nycticorax	Black-crowned Night-Heron		No
Onychognathus morio	Red-winged Starling		No
Oxyura maccoa	Maccoa Duck	Near Threatened (NT)	No
Passer domesticus	House Sparrow		Yes
Passer melanurus	Cape Sparrow		No
Pavo cristatus	Common Peacock		Yes
Pelecanus onocrotalus	Great White Pelican, Wit Pelikan	Near Threatened (NT)	No
Phalacrocorax africanus	Reed Cormorant		No
Phalacrocorax capensis	Cape Cormorant	Near Threatened (NT)	No
Phalacrocorax lucidus	White-breasted Cormorant		No
Phoenicopterus minor	Lesser Flamingo	Near Threatened (NT)	No
Phoenicopterus ruber	Greater Flamingo	Near Threatened (NT)	No
Platalea alba	African Spoonbill		No
Plectropterus gambensis	Spur-winged Goose		No
Plegadis falcinellus	Glossy Ibis		No
Ploceus capensis	Cape Weaver		No
Ploceus velatus	Southern Masked-Weaver		No

<i>Pluvialis squatarola</i>	Grey Plover		No
<i>Podiceps cristatus</i>	Great Crested Grebe		No
<i>Podiceps nigricollis</i>	Black-necked Grebe		No
<i>Polyboroides typus</i>	African Harrier-Hawk, <i>Gymnogene</i>		No
<i>Porphyrio madagascariensis</i>	African Purple Swampphen		No
<i>Porphyrio martinicus</i>	American Purple Gallinule		No
<i>Porzana pusilla</i>	Baillon's Crake		No
<i>Prinia maculosa</i>	Karoo Prinia		No
<i>Psalidoprocne holomelaena</i>	Black Saw-wing		No
<i>Pternistis capensis</i>	Cape Spurfowl		No
<i>Puffinus griseus</i>	Sooty Shearwater		No
<i>Pycnonotus capensis</i>	Cape Bulbul		No
<i>Rallus caerulescens</i>	African Rail		No
<i>Recurvirostra avosetta</i>	Pied Avocet		No
<i>Riparia paludicola</i>	Brown-throated Martin		No
<i>Riparia riparia</i>	Sand Martin		No
<i>Rostratula benghalensis</i>	Greater Painted-snipe	Near Threatened (NT)	No
<i>Scleroptila africanus</i>	Grey-winged Francolin		No
<i>Serinus canicollis</i>	Cape Canary		No
<i>Sigelus silens</i>	Fiscal Flycatcher		No
<i>Sphenoeacus afer</i>	Cape Grassbird		No
<i>Sterna albifrons</i>	Little Tern		No
<i>Sterna bergii</i>	Swift Tern		No
<i>Sterna caspia</i>	Caspian Tern	Near Threatened (NT)	No
<i>Sterna hirundo</i>	Common Tern		No
<i>Sterna paradisaea</i>	Arctic Tern		No
<i>Sterna sandvicensis</i>	Sandwich Tern		No
<i>Streptopelia capicola</i>	Cape Turtle-Dove		No
<i>Streptopelia semitorquata</i>	Red-eyed Dove		No
<i>Streptopelia senegalensis</i>	Lag Duifie, Laughing Dove		No
<i>Sturnus vulgaris</i>	Common Starling, European Starling		Yes
<i>Sylvietta rufescens</i>	Long-billed Crombec		No
<i>Tachybaptus ruficollis</i>	Little Grebe		No
<i>Tachymarptis melba</i>	Alpine Swift		No
<i>Tadorna cana</i>	South African Shelduck		No
<i>Telophorus zeylonus</i>	Bokmakierie		No
<i>Terpsiphone viridis</i>	African Paradise-Flycatcher		No
<i>Thalassornis leuconotus</i>	White-backed Duck		No
<i>Threskiornis aethiopicus</i>	African Sacred Ibis		No
<i>Tricholaema leucomelas</i>	Acacia Pied Barbet		No

Tringa glareola	Wood Sandpiper		No
Tringa nebularia	Common Greenshank		No
Tringa stagnatilis	Marsh Sandpiper		No
Turdus olivaceus	Olive Thrush		No
Tyto alba	Barn Owl		No
Upupa africana	African Hoopoe		No
Urocolius indicus	Red-faced Mousebird		No
Vanellus armatus	Blacksmith Lapwing, Blacksmith Plover		No
Vanellus coronatus	Crowned Lapwing		No
Vidua macroura	Pin-tailed Whydah		No
Zosterops virens	Cape White-eye		No

Appendix 5: Reptile species list

Species Name	Common Name	Red Book Status	Alien
Acontias meleagris meleagris	Cape Legless Skink		No
Afrogecko porphyreus	Marbled Leaf-toed Gecko, Marbled Leaftoed Gecko		No
Bitis arietans arietans	Puff Adder		No
Bradypodion pumilum	Cape Dwarf Chameleon		No
Caretta caretta	Loggerhead Turtle		No
Chersina angulata	Angulate Tortoise		No
Cordylus niger	Black Girdled Lizard		No
Dasypeltis scabra	Common Eggeater		No
Dispholidus typus	Boomslang		No
Duberria lutrix lutrix	Common Slugeater		No
Lamprophis aurora	Aurora House Snake		No
Lamprophis inornatus	Olive House Snake		No
Lycodonomorphus rufulus	Common Brown Water Snake		No
Meroles knoxii	Knox's Desert Lizard		No
Naja nivea	Cape Cobra		No
Pelomedusa subrufa	Marsh Terrapin		No
Psammophis crucifer	Cross-marked Grass Snake, Crossmarked Grass Snake		No
Psammophylax rhombeatus	Rhombic Skaapstekker		No
Pseudaspis cana	Mole Snake		No
Ramphotyphlops braminus	Flower-pot Snake, Flowerpot Snake		Yes
Scelotes bipes	Silvery Dwarf Burrowing Skink		No
Tetradactylus seps	Short-legged Seps, Shortlegged Seps		No
Trachylepis capensis	Cape Skink		No
Trachylepis homalocephala	Red-sided Skink, Redsided Skink		No

Appendix 6: Amphibian species list

Species Name	Common Name	Red Book Status	Alien
Amietia fuscigula	Cape River Frog		No
Amietophrynus pantherinus	August Toad, Panther Toad, Snoring Toad, Western Leopard Toad	Endangered (EN)	No
Breviceps gibbosus	Cape Rain Frog	Vulnerable (VU)	No
Cacosternum platys	Caco sp., Flat Caco		No
Strongylopus grayii grayii	Clicking Stream Frog		No
Tomopterna delalandii	Cape Sand Frog		No
Xenopus laevis	Common Platanna		No

Appendix 7: Invertebrate species list

Species Name	Common Name	Red Book Status	Alien
Anax imperator	Blue Emperor		No
Cacyreus marshalli	Common Geranium Bronze		No
Colias electo electo	African Clouded Yellow		No
Crocothemis erythraea	Broad Scarlet		No
Danaus chrysippus aegyptius	African Monarch		No
Dira clytus clytus	Cape Autumn Widow		No
Gegenis niso niso	Common Hottentot		No
Ischnura senegalensis	Common Bluetail		No
Lampides boeticus	Lucerne Blue		No
Leptotes brevidentatus	Short-toothed Blue		No
Leptotes pirithous	Common Pea Blue		No
Mylothris agathina	Common Dotted Border		No
Orthetrum julia	Julia Skimmer		No
Papilio demodocus demodocus	Citrus Swallowtail		No
Pieris brassicae	Cabbage White		Yes
Pontia helice helice	Meadow white		No
Pseudonympha magus	Silver- bottom Brown, silver bottomed brown		No
Vanessa cardui	Painted lady		No
Zizeeria knysna	Sooty Blue		No
Zophopetes dysmephila	Palm-tree Nightfighter		No

Appendix 8: Fish species list

Species Name	Common Name	Red Book Status	Alien
Amblyrhynchotes honkenii	Evil-eyed Blaasop		No
Anguilla marmorata	Madagascar Mottled eel		No
Argyrosomus hololepidotus	Kob		No
Atherina breviceps	Cape silverside		No
Caffrogobius multifasciatus	Prison goby		No
Caffrogobius nudiceps	Barehead goby		No
Clarias gariepinus	Sharp-tooth Catfish		Yes
Cyprinus carpio	Carp		Yes
Galaxias zebratus	Cape Galaxia		No
Gambusia affinis	Mosquito Fish		Yes
Gilchristella aestuarius	Estuarine Round-herring		No
Heteromycteris capensis	Cape sole		No
Lichia amia	Garrick		No
Lithognathus lithognathus	White steenbras		No
Liza dumerilii	Groovy mullet		No
Liza richardsonii	Southern mullet		No
Liza tricuspidens	Striped mullet		No
Micropterus salmoides	Largemouth Bass		Yes
Monodactylus falciformis	Cape moony		No
Mugil cephalus	Flathead mullet		No
Oreochromis mossambicus	Mozambique tilapia		Yes
Pomatomus saltatrix	Elf		No
Psammogobius knysnaensis	Knysna goby		No
Rhabdosargus globiceps	White stumponose		No
Rhabdosargus holubi	Cape stumponose		No
Rhinobatos annulatus	Lesser guitarfish		No
Sandelia capensis	Cape Kurper		No
Solea bleekeri	Blackhand sole		No
Syngnathus acus	Longsnout pipefish		No
Tilapia sparrmanii	Banded Tilapia		Yes

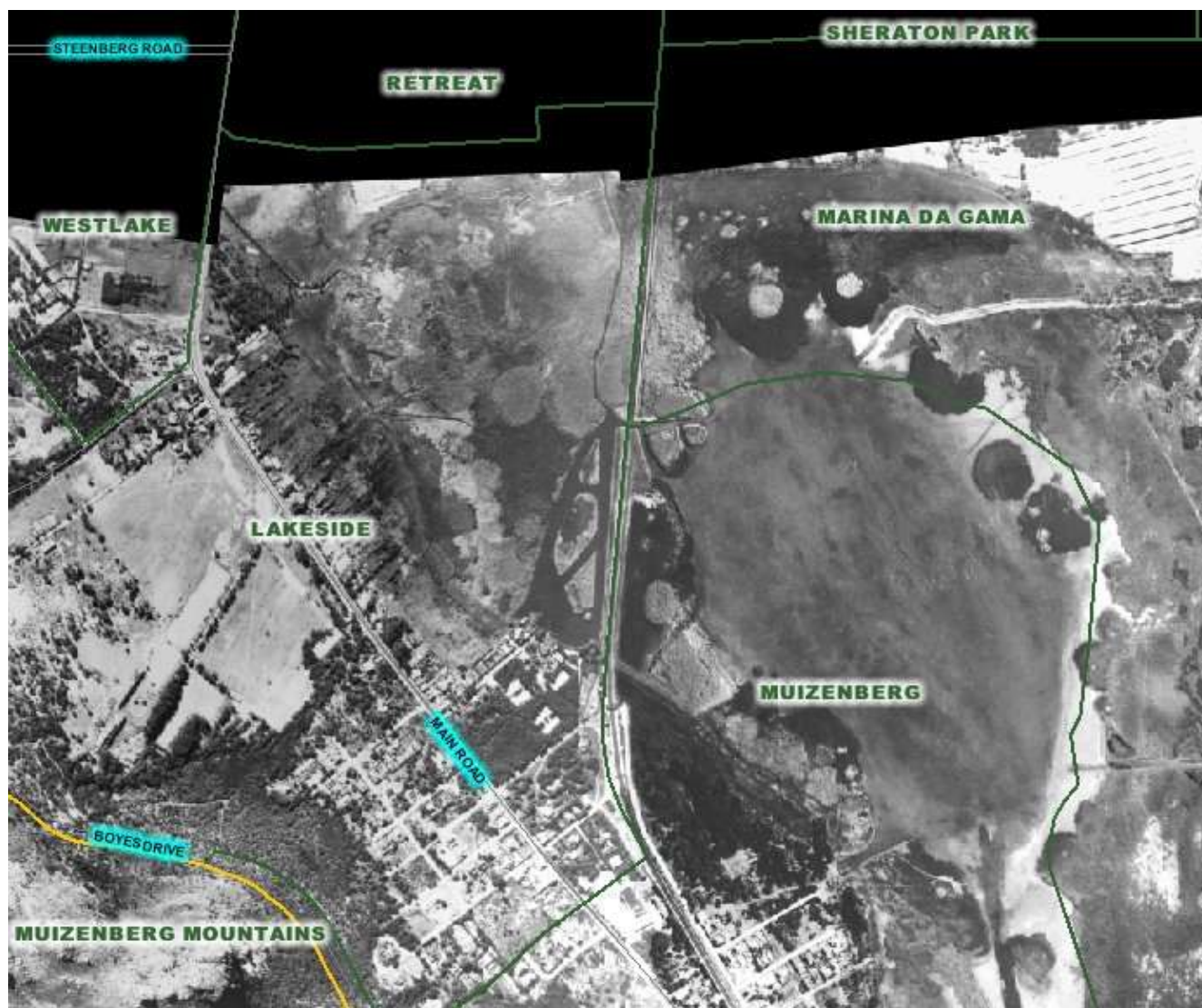
Appendix 9: Historical aerial photographs of Zandvlei



Zandvlei 1945 aerial photography



Zandvlei 1945



Westlake wetlands 1945

CITY OF CAPE TOWN

BIODIVERSITY MANAGEMENT BRANCH

Executive Brief

Comprehensive Security Audit of the Biodiversity Management Branch of the City of Cape Town

MARCH 2010



THORN-EX

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- **INTRODUCTION**

The City of Cape Town' Biodiversity Management Branch, in wishing to ensure the safety of visitors and staff, requested assistance on conducting a security audit of all (25) its managed (and envisaged) Nature Reserves.

The need was based on the following assumptions:

- That the areas are poorly managed
- Security Agencies are inefficient in their operations
- The lack of tools to measure management effectiveness
- Safety and security of visitors as well as that of personnel are threatened.

Plan-It, in collaboration with Thorn-Ex and Titan Security, agreed to undertake the project. Owing to the budgetary constraints, it was agreed that the audit would encompass 12 priority Reserves, as selected by the Biodiversity Management Branch.

The following outcomes were proposed and accepted:

- A desktop exercise to evaluate existing information and identify gaps
- A physical Audit of the listed facilities
- Consultation with public user groups
- Recommendations in respect of security technology and infrastructure
- A comprehensive report on all findings
- A basic entry level conservation security training session for staff

The project was to be completed by the end of April 2010.

- **APPROACH**

The focus was to be on the safety and security of staff working in the different reserves, of visitors to these reserves and of the biodiversity within the reserves.

The audit was to involve the reserve managers, site managers and any other staff the Biodiversity Management Branch deemed necessary to provide information for the audit.

The Project commenced with the Branch being approached to supply maps of each reserve with as much information as possible on all types of infrastructure, bio-physiographic information etc e.g. boundaries of reserves and kind of fence along these, access points, roads, tracks, paths, power lines, telephone lines, buildings, cell phone towers, masts, aerials, bridges, streams, rivers, contours, vegetation, adjacent land use, habitation or settlements in close proximity.

Questionnaires were then drawn up and sent to all the Reserve Managers as well as separate questionnaires which were sent to the various public interest groups, via the Reserve Managers.

Upon receipt of the above the project team drafted a preliminary working document to guide and focus the audit.

The audit commenced on the 15th of February 2010 with a workshop with the various Managers and a presentation of the findings from the questionnaires to the Biodiversity Branch.

The audits commenced on the 16th of February 2010 with a visit to each Reserve..

During each audit the manager and staff were interviewed and a physical inspection of infrastructure was conducted. The audits focused on existing security systems, security infrastructure, activities, incidents, job descriptions, training and manpower

In addition to the audits workshops were scheduled, via the Reserve Manager with relevant external safety and security institutions and public interest groups. The workshops were then held with various District and Reserve-specific public interest groups.

On conclusion of the audit phase, the security technology specialist visited the Reserves to inspect the systems and infrastructure in place at each reserve. Based on and with reference to the initial draft Audit Report, the specialist undertook an assessment of technology short-comings in order to arrive at feasible recommendations for practicable improvements.

The completed report was then circulated to all the Reserve Managers as a Draft Report for comment, prior to the Final Comprehensive Report incorporating such comment being presented to the Branch.

The Project was then concluded with a basic entry level security training session for nominated staff covering aspects such as:

- Information gathering and reporting
- Patrol structuring, planing and safety
- Preparedness and response
- Handling of transgressors (armed or un-armed)
- Incident handling
- Charge office procedures
- Evidence and Statements
- Record keeping and dossier development

• **EXECUTIVE SUMMARY**

A safety and security audit was carried out on twelve Reserves under the jurisdiction of the Biodiversity Branch of the Directorate Environmental Resource Management.

The Audit was aimed at doing a rapid and verifiable analysis of the current security situation, security services, infrastructure, staffing, and social contexts. The information allowed for a “threat” level to be determined for each reserve.

Information acquired through a questionnaire survey with the Reserve Mangers, and information provided by the Branch was used as a baseline to guide and provide focus for the individual Reserve audits.

The Audits very quickly revealed that the location of the various reserves with their own unique social contexts primarily dictated the level of threat of each Reserve.

Some Reserves perceived as being “dangerous” were found to be “safe” with very low key incidents actually occurring. Although social ills do tend to spill over into Reserves the occurrence thereof is very localised and relate to prostitution, substance abuse, theft and illegal plant harvesting for the muti trade.

General security observations revealed that any metal infrastructure or equipment and solar panels are at greatest risk and are stolen on a regular basis. Trespassing, vagrants traversing the reserves and the harvesting of plants for the commercial flower industry and commercially driven herbal medicine /”muthi” industry are linked to an associated threat to staff and visitors. However incidents of visitors and staff being accosted by vagrants are rare.

Security activities were generally viewed as an add-on function when incidents are reported, with some Reserve Managers and Field staff trying to fit security patrols and activities into their management work schedule. The Visitor Controller Officers, on the other hand are essentially Access Control Officers who may be called on to perform some Law Enforcement function if their training enables them to do so. However staff does carry out combined operations with Law Enforcement bodies like Marine and Coastal Management, SAPS or City Law Enforcement when activities in the vicinity of the reserves warrant this in the interests of conservation.

One of the most evident security shortcomings found was that Reserves were “abandoned”, for all practical purposes, after hours, on weekends and on public holidays.

The investigation also found that very few Reserves actively patrol the Reserve and fences on a regular basis.

The Findings of each audit, including the responses received from the public interest groups were used to determine the threat level of each Reserve. The threat levels are based on a combination of factors which may affect security to the reserve, its staff and visitors as well as these threats in relation to other reserves.

The threat levels low, medium, and high reflects the safety threat to visitors, staff, and infrastructure. Further to which the threat level provides an indication in respect of intervention priority (staffing, infrastructure, equipment).

The results were as follow:

Reserve	Threat Level	Threat	Primary Cause
Witzands ACA	Medium	Illegal Access / Trespassing	Lack of fencing
Blaauwberg CA	Medium	Illegal Access / Trespassing	Lack of coverage
Rietvlei WR	Low	Illegal Access / Trespassing	Lack of coverage
Durbanville NR	Low	Theft	Lack of presence

Bracken NR	Low	Trespassing	Lack of coverage
Tygerberg NR	High	Trespassing / poaching	Lack coverage
Zandvlei NR	Low	Illegal Access / Trespassing	State of infrastructure
Falls Bay EP	High	Violent crime	Lack of fencing /coverage
Edith Stephens WP	Low	Theft	Lack of fencing
Wolfgat & Macassar NR	Severe	Violent crime	Location & Social
Kogelberg NR	Medium	Illegal Access / Trespassing	Extent / coverage
Helderberg NR	Low	Illegal Access / Trespassing	Lack coverage

Understaffing and poor or non-existent boundaries were found to be the primary cause of compromised Reserve security. The provision of “feet on the ground” or a management presence is therefore viewed as the first step towards improving the current situation.

The Investigation did conclude that technology solution options entailed fairly low key equipment such as Day-Night or Peak Inversion monitoring cameras, basic building alarm systems, external building detection beams, lighting, etc.

Infrastructure requirements were predominantly in respect of fencing.

Fencing is not always the preferred solution for safeguarding and demarcating an urban Reserve. However, it is suggested that failure to demarcate the boundaries of a Reserve compromises the authority’s ability to manage a designated area and severely limits the authority’s ability to prosecute transgressors. Simple in-expensive measures such as signage and markers will greatly aid in addressing these matters.

The relative “newness” of the Branch was found create various generic management challenges which negatively affect the efficiency and effective of Reserve management.

The aforesaid institutional matters included:

- Lack in consistency of staff designations
- Lack of consistency in functional content (job descriptions)
- Lack of career pathing and skills development program
- Lack of measurable performance standards
- Lack of training and capacity building
- Lack of uniform operational procedures and protocols
- Un-clear performance objectives of Advisory Boards
- Jurisdictional uncertainties in respect of cooperation with other environmental law enforcement agencies
- Lack of memorandums of Understanding with Utility Service Branches active in Reserves

The apparent absence of a clear and definitive Branch Policy on Reserve Safety and Security was viewed as a contributing shortcoming. Further to which, no consistency was found in respect of operational procedures or protocols. Some stations had a Management Plan whilst others were still going to develop such plans. Some stations had developed their own safety procedures.

In respect of Procedures and Protocols it is suggested that the Biodiversity branch consider the developing the following procedures and protocols;

- Incident response (poaching, trespassing, theft, fire, attack, medical emergency, land invasion, pollution, un-wanted pets)
- Reserve patrols
- Fence and gate security
- Visitor control

It is suggested that the above procedures and protocols be developed in conjunction with an auditable reserve management system which is linked to the personnel and finance performance requirements. It is also recommended that the Branch conduct an Institutional “Governance Audit” to guide the above protocols, relationships with other government institutions and law enforcement bodies as well as the Branch’s legal obligations.

Consultation with public interest groups and reserve managers highlighted the benefits of “friend” groups. Some stations financial ability and conservation maintenance activities were greatly enhanced by such “friends” groups. Further to which, the social role that urban reserves play as “safe areas” for people to walk their pets, have picnics or conduct social functions was highlighted at several public meetings. It was also mentioned that in some areas where “gang turf” issues were dominant the reserves were viewed as “neutral” territories.

Advisory Boards are a requirement in terms of reserves proclaimed under the Protected Areas Act although no clarity could be defined with respect to the extent, role and responsibilities of the various Reserves Advisory Boards. Some Reserves indicated that they played an active role whilst others were not aware of their existence. The development of clear responsibilities and objectives for each Board is viewed as imperative to contributing to the achievement of the Reserve objectives whilst providing a formal link to neighbouring communities and local government.

Most Reserves have other City Utility Departments executing functions within the Reserve, share boundaries with them, or manage large tracts of land under their jurisdiction. None of the Reserves were aware of any Memorandums of Understanding which clarify joint management matters. This was viewed as institutional shortcoming requiring attention at higher level.

A variety of Security Service providers render various levels of security to Reserves. These services vary from private security firms providing uniformed guards to provide a static or gate control service to services where such guards are used as Bushrangers. It was the investigation’s conclusion that each District or Reserve negotiates their own contract conditions with such service providers, a situation which does not contribute to clear and measurable security service provisioning.

The City Law Enforcement Services and structures were generally viewed as not being able to respond to conservation related incidents. Only a few Reserves reported adequate responses to call-outs or incidents with most Reserves saying they rely on the local SAPS for assistance.

Reserves which have installed alarm systems linked to the City Law Enforcement Control Rooms, reported that in the event of alarm activation the Reserve manager is phoned to investigate. No direct service benefit could be found in respect City Law Enforcement.

What was most evident during the investigation was the risk posed by staff acting outside their areas of jurisdiction. These transgressions are not through ill intent and staff is not necessarily aware that they are exceeding their authority. Urgent attention should be paid to the authority necessary for the role staff plays in enforcing provincial conservation laws, fisheries laws, and National laws. This should be done in cognisance of the criminal Procedures Act. It is further suggested that cooperation agreements and execution delegations be formalised with other environmental and conservation agencies.

Due to several reserves having a coastal boundary and the ever present activities of highly organised and dangerous Abalone poaching gangs the involvement of staff in curbing these activities need to clearly defined and coordinated. It is suggested that this should be the preserve of a highly trained and well equipped District based Law Enforcement Component conducting their duties in collaboration with other authorities and with the necessary jurisdiction.

It is the opinion of this investigation team that the establishment of a District based Law Enforcement Component will greatly contribute in addressing some of the security shortcomings highlighted. In addition, such a component will also alleviate some of the external enforcement requirements placed on Reserve staff thus allowing them to focus on reserve management and security.

- **CONCLUSION AND GENERIC RECOMENDATIONS**

The audit results correlated closely with the location and management capacity of each Reserve. High concentrations of un-employed people living in dense informal settlements adjacent to reserves do pose a greater risk to the Reserves. Staff was found to be more exposed to violent crimes in such circumstances than those located in rural or medium to high income areas.

Although social ills do tend to spill over into Reserves the occurrence thereof is very localised and relates to prostitution, substance abuse, theft and illegal plant harvesting for the muti trade.

The Findings of each audit, including the responses received form the public interest groups were used to determine the threat level of each Reserve.

The threat levels low, medium, and high reflects the safety threat to visitors, staff, and infrastructure. Further to which the threat level provides an indication in respect intervention priority (staffing, infrastructure, equipment).

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Helderberg NR	Low	Illegal Access / Trespassing	Lack coverage

Understaffing and poor or non-existent boundaries were found to be the primary cause of compromised Reserve security. The provision of “feet on the ground” or a management presence is therefore viewed as the first step towards improving the current situation.

The Investigation did conclude that technology solutions entail fairly low key equipment such as Day-Night or Peak Inversion monitoring cameras, basic building alarm systems, external building detection beams, lighting, etc.

Infrastructure requirements were predominantly in respect of fencing.

Fencing is not always the preferred solution for safeguarding and demarcating an urban Reserve. However, it is suggested that failure to demarcate the boundaries of a Reserve compromises the authority’s ability to manage a designated area and severely limits the authority’s ability to prosecute transgressors. Simple in-expensive measures such as signage and markers will greatly aid in addressing these matters.

In areas where fencing is vandalised on a regular basis the use of electric fencing (long distances, or Diamond Razor Mesh (short distances) is recommended. However it is recommended that spring-steel barb wire be used in all other instances.

The relative “newness” of the Branch was found to create various generic management challenges which negatively affect the efficiency and effective of Reserve management.

The apparent absence of a clear and definitive Branch Policy on Reserve Safety and Security was viewed as a contributing shortcoming.

A great inconsistency was found in staff designations, with some staff fulfilling similar conservation functions being called Conservation Officers whilst others were called Site Managers or Assistant Managers. The same problem was evident within the junior staff ranks. On some stations “labourers” conducted similar duties to those of Bushrangers.

The appointment and use of Contract staff was found to be a management challenge to most Reserves. Contract staff are generally employed by an external service provider whilst The Branch is responsible for the day to day management of said staff including the provision of uniforms and training. The opinion is held that the cost of these services could very well be such that the Branch could employ these contract staff directly to a greater benefit.

Several instances were found of junior staff being employed for several years as “Small Plant operators” or “Foreman” and having developed a keen interest and expertise in various conservation matters. The provision of career pathing opportunities to staff will not only contribute to the goals of the Branch but also provide an incentive to junior staff.

No evidence was found of a clear skills development program for officers and the impression was created that each officer arranges and sees to his or her own training. This was especially evident with some officers having been trained as Peace officers and appointed whilst others had been trained but not appointed and some still needed to be trained. Some Officers were also expressing the need to be appointed as Fisheries Officers whilst others believed they should be trained and appointed as Environmental Inspectors.

Most reserves had Conservation Students and Interns fulfilling a variety of roles and responsibilities, in some instances un-paid. The rotation of Students and interns was thought to be a good means of exposing them to various experiences and opportunities.

The investigation also found that most staff lacked basic equipment such as binoculars, handcuffs, batons or mace thereby limiting their ability to execute their duties.

The apparent lack of a dress code was viewed as a factor which contributed to the public’s sense of security or respect when coming into contact with officers. The wearing of T-shirts, overalls, or golf shirts should not be promoted whilst on duty in the public eye.

No consistency was found in respect of operational procedures or protocols. Some stations had a Management Plan whilst others were still going to develop such plans. Some stations had developed their own safety procedures.

One of the most evident security shortcomings found was that Reserves were “abandoned”, for all practical purposes, after hours, on weekends and on public holidays. It is understood that staff work standard working hours. However, the provision of accommodation, which most Reserves have, to either Site managers or Bushrangers are seen as a simple cost effective measure. Where there are operational staff resident on the Reserves (mostly students) it acts as a definite deterrent to illegal activities. Staff stationed on Reserves can then work on a “conservation standard” shift schedule of 20 days on 5 days off.

The investigation also found that very few Reserves actively patrol the Reserve and fences on a regular basis. Although staff shortage is a contributing factor, careful planning and allocation of available resources will ensure that Reserves are patrolled on a regular basis. It is further suggested that the sharing of resources between Reserves will allow for more frequent patrols.

With regard to Procedures and Protocols it is suggested that the Biodiversity branch consider developing the following;

- Incident response (poaching, trespassing, theft, fire, attack, medical emergency, land invasion, pollution, un-wanted pets)
- Reserve patrols
- Fence and gate security
- Visitor control

It is suggested that the above procedures and protocols be developed in conjunction with an auditable Reserve management system which includes a personnel and finance performance aspect.

Consultation with public interest groups and reserve managers highlighted the benefits of “friend” groups. Some stations’ financial ability and conservation maintenance activities were greatly enhanced by such “friends” groups. It is accepted that not all Reserves have the opportunity to have well capacitated “friends”. However, the neighbouring community’s sense of ownership was found to be a primary contributor to a Reserves state of security.

Further to which the social role that urban reserves play as “safe areas” for people to walk their pets, have picnics or conduct social functions was highlighted at several public meetings. It was also mentioned that in some areas where “gang turf” issues was dominant the reserves were viewed as “neutral” territories.

Advisory Boards are a requirement in terms of reserves proclaimed under the Protected Areas Act. The aim of which is to allow participation by interested parties and to ensure their continual engagement. With regard to reserves not yet proclaimed under the Protected Areas Act but which have Advisory Boards their role is much the same with the possible addition of raising and allocation of funds. This investigation could not clearly define the extent, role and responsibilities of the various Reserves Advisory Boards. Some Reserves indicated that they played an active role whilst others were not aware of their existence. The development of a clear responsibilities and objectives for each Board is viewed as imperative to contributing to the achievement of the Reserve objectives whilst providing a formal link to neighbouring communities and local government.

The removal of Spare tyres from Reserve vehicles by the Transport Sections should be halted as it poses a significant risk to staff operating in remote areas or providing law enforcement services.

Most Reserves have other City Utility Departments executing functions within the Reserve, share boundaries with them, or manage large tracts of land under their jurisdiction. None of the Reserves were aware of any Memorandums of Understanding which clarify joint management matters. This was viewed as institutional shortcoming requiring attention at higher level.

A variety of Security Service providers render various levels of security to Reserves. These services vary from private security firms providing uniformed guards to providing a static or gate control service to services where such guards are used as Bushrangers. It was the investigations conclusion that each District or Reserve negotiates their own contract conditions with such service providers, a situation which does not contribute to clear and measurable security service provisioning.

The City Law Enforcement Services and structures were generally viewed as not being able to respond to conservation related incidents. Only a few Reserves reported adequate responses to call-outs or incidents with most Reserves saying they rely on the local SAPS for assistance.

Reserves which have installed alarm systems linked to the City Law Enforcement Control Rooms, reported that in the event of an alarm activation, the Reserve manager is phoned to investigate. No direct service benefit could be found in respect of City Law Enforcement.

What was most evident during the investigation was the risk posed by staff acting outside their areas of jurisdiction. These transgressions are not through ill intent and staff are not necessarily aware that they are exceeding their authority. Urgent attention should be paid to necessary authority and the role staff play in enforcing provincial conservation laws, fisheries laws, and National laws. This should be done in cognisance of the criminal Procedures Act. It is further suggested that cooperation agreements and execution delegations be formalised with other environmental and conservation agencies.

Due to several reserves having a coastal boundary and the ever present activities of highly organised and dangerous Abalone poaching gangs, the involvement of staff in curbing these activities need to be clearly defined and coordinated. It is the opinion of this team that this should be the preserve of a highly trained and well equipped District based Law Enforcement Component conducting their duties in collaboration with other authorities and with the necessary jurisdiction.

It is the opinion of this investigation team that the establishment of a District based Law Enforcement Component will greatly contribute in addressing some of the security shortcomings highlighted. In addition, such a component will also alleviate some of the external enforcement requirements placed on Reserve staff thus allowing them to focus on reserve management and security. The current practice of Law enforcement staff working a daily night shift is questioned as no evidence could be found on its effectiveness. It is suggested that through information gathering, coordination with other authorities and planning, such nightly activities could take place on a sporadic basis with much greater successes.

The investigation team was also of opinion that the management requirements of the various Reserves need to be included in the Municipal Spatial Development Framework so as to ensure that the Reserve - Neighbourhood interface receive adequate attention.

SUMMARY OF RECOMMENDATIONS

INSTITUTIONAL		
Aspect	Issue	Recommendation
Governance	1. Relationship with other National & Provincial Conservation/Environmental institutions 2. Relationship with other City Institutions 3. Obligations in respect of By-laws, Municipal Systems Act (2000) and the Municipal Finance Management Act (2003) 4. Working agreements with other Utility Services	1. Conduct Institutional Governance Audit 2. Draft MOU's
Policy & Procedures	1. Management Policies, Goals, Objectives 2. Operational Procedures & Protocols	1. Develop management Policies Goals & Objectives 2. Develop Procedures and Protocols
Management	1. Consistency in personnel designations 2. Consistency in personnel functional content 3. Career pathing 4. Skills development 5. Reserve Management Standards	1. Develop consistent Job Descriptions 2. Develop Skills Development and career pathing Protocol 3. Develop Auditable Reserve Management System linked to Personnel & Financial Performance Management System

Reserve	Additional Staffing	Security and Equipment	Infrastructure
NORTH			
Witzands	1. 3x Bushrangers 2. Small labor team 3. Staff must be trained in 4 wheel driving 4. Officers appointed as Peace Officers	1. Establish a MOU with Bulk Water 2. Replace damaged fences 3. Monitor Wood cutter activities 4. Permits must contain more information 5. Reserve map required 6. Curb illegal access 7. Regular perimeter patrols.	1. 4x4 vehicle in good condition 2. Office Trellidor and burglar bars 3. Demarcation of boundaries 4. Erect signage 5. Electric fence along north and north-eastern boundary 6. Basic staff equipment
Blaauwberg	6. 6x Bushrangers (2 x3-member teams) 7. 2 x Permanent Visitor	4. Staff be appointed as Peace Officers 5. Law Enforcement	1. Link present alarm system to security service

	Controller Off's 8. Officers appointed as Peace Officers 9. Station District Law Enforcement Component	Component duties expanded to cover "hot spots" in district. 6. Daily night shifts limited to conduct patrols across district and do ad hoc night time	provider. 2. Mount Day-Night camera to cover main resort area. 3. Active Monitor to monitor activities during peak periods. 4. Erect signage 5. Basic staff equipment
Rietvlei	1. 2 x Bushrangers 2. Officers appointed as Peace Officers	1. Regular perimeter patrols 2. Co-ordinate with MCM	1. Fence along R27 road. 2. Alarm systems at new facilities 3. Peak Inversion camera with recording facility for main gate 4. Fence open residential property boundaries 5. Patrol boat 6. Basic staff equipment
CENTRAL			
Bracken	1. 1x EE Officer/Community Officer. 2. 1x Labourer	1. Visible patrols 2. Liaison with Everite Hostel.	1. Ablutions at gate 2. Day-night camera for main access area. 3. Removal of derelict buildings 4. Guard monitoring 5. Clear alien vegetation along fences 6. Basic staff equipment
Durbanville	1. 2x Visitor Controller Officers 2. Officers appointed as Peace Officers	1. Boundary fence cleared of vegetation 2. Erect signage iro handling of unwanted pets	1. Steel gate at offices to be kept locked, and fitted with buzzer and solenoid access control 2. Video monitor for door 3. Service counter inside front door 4. Alarm system to include response 5. Long-range mobile panic buttons

			6. Lighting at offices and main gate 7. Peak Inversion camera for main gate 8. Guard Monitoring system 9. Basic staff equipment
Tygerberg	1. Employ current 3 Contract Bushrangers 2. 2x Bushrangers 3. 1x Site Manager 4. 1x Foreman 5. 5x Labourers 6. 1x Additional EE Officer/Community Liaison 7. 2x Visitor Controller Officers 8. Officers appointed as Peace Officers 9. Station District Law Enforcement Component	1. Attend Community Police Forum and Crime Watch meetings. 2. Bushrangers obtain drivers licenses 3. Staff presence over week-ends and after hours 4. All gate remotes currently issued be recovered immediately and re-issued under a new access signal code 5. Keys handed out should be retrieved and locks changed. 6. Kanonberg be afforded controlled access in the event of a fire.	1. Replace existing camera at main entrance gate with a Peak Inversion camera with recording facility 2. Present cameras be replaced with Day-Night cameras. 3. Plattekloof and Quarry area be re-fenced with electric fence 4. Perimeter road should be constructed where feasible 5. Flatrap razer coils installed on top of all fences and along bottom of select fences 6. Accommodation for Bushranger teams 7. Installation of trigger operated floodlight in darker area of parking 8. Additional mountain bike 9. Basic staff equipment
SOUTH			
Zandvlei	1. 3x Visitor Controller Officers 2. 3x Bushrangers 3. 4x Labourers 4. Officers appointed as Peace Officers	1. Cease involvement in public amenity facilities on eastern side 2. Formal gate control required during open hours 3. Formalise relationship with Mountain Men Security Services 4. Evening security at offices by private security service provider 5. Introduce ad hoc evening patrols 6. Formalise co-operation with Marine and Coastal Management regarding	1. Northern access well designated and controlled access point 2. Signage at the entrance, parking areas & along the water 3. Re-fence office area with Diamond Razor Mesh 4. Provide appropriate security lighting 5. Replaced northern and western fence with Diamond Razor Mesh fence 6. New offices need to be completed & fitted with monitored alarm system

		control at the estuary.	and BX Outdoor Beams 7. Guard Monitoring system 8. Motorized boat 9. Basic staff equipment
False Bay	1. 9x Bushrangers 2. 4x Static Guards 3. Officers appointed as Peace Officers 4. Station District Law Enforcement Component	1. Regular patrols supported 2. Bushrangers and Visitor Control officers should be circulated & deployed to cover peak periods of public use within the Park. 3. Change permanent night shift to a planned basis during periods of specific risk or in response to specific incidents 4. Co-ordinate night activities with other law enforcement bodies 5. Visitor Controller Officers patrol Zeekoevlei picnic area during peak periods.	1. Establish two or three Bushranger bases 2. Re-fence southern and eastern boundary electric fence 3. Motorised patrol 4. 2x Quad 5. Install Guard Patrol Monitoring system 6. Fence Rondevlei offices and EE Centre with Diamond Razor Mesh Install additional trigger 7. Install flood lights at all facilities 8. Day-Night camera to Rondevlei Viewing Tower for office and entrance area 9. Upgrade all existing cameras to Day-Night cameras with recording 10. Additional cameras for Zeekoevlei entrance gate and new office complex 11. Buildings should be alarmed with a siren and linked to a security service provider 12. Buildings which do not have security staff at night should be fitted with BX80 13. Erect signage 14. Basic staff equipment
Edith Stephens	1. Replace “small plant operator” with a fence maintenance post.	1. The reserve fence needs to be patrolled daily or at least twice a week 2. Walk-in access should be controlled and documented at the gate 3. Office gate should remain locked	1. Northern and southern fences must be replaced with Razor Diamond Mesh be considered or electric fence using spring steel wire 2. Management track should be created along the fence 3. Basic staff equipment

EAST			
Wolfgat & Macassar	1. 8 x Bushrangers. 2. 3x District Law Enforcement Officers 3. 2 x Community Liaison Officers 5. Officers appointed as Peace Officers 6. Station District Law Enforcement Component	1. Weltevreden office security system should include a response system 2. City employed private security with mobile support to patrol coastal road esp. parking areas 3. Investigate sand mining permits	1. Demarcate reserve using cement poles 2. Erect signage 3. Move Macassar Gate 4. Basic staff equipment
Kogelberg	1. 1x Visitor Controller Officer 2. 3x Bushrangers 3. Officers appointed as Peace Officers	1. Improve communication services	1. Construct Bushranger camp 2. Erect signage 3. Fence Erf 19 and north-west boundary using electric fence 4. Install alarm at all buildings 5. Install trigger lighting 6. Install depot fence at rear 7. Install Reed Switches for solar panels 8. Peak Inversion Camera for entrance gate to depot 9. Basic staff equipment
Helderberg	1. 6 existing Labourers trained to level of Bushrangers 2. Officers appointed as Peace Officers	1. Develop system for evening monies 2. Regular perimeter patrols	1. Erect signage 2. Electric fence be retained 3. Peak Inversion camera at main gate 4. Day –Night camera to cover parking area 5. Basic staff equipment

- **COSTING**

The equipment costing listed below are based on actual quotes provided.

Fencing:

Diamond Razor mesh fencing installed per 100m	R 440,00/meter
1,8m, 12 strand electric fencing installed at 100m (Au Alloy wire)	R 55,00/meter
12 Joule Nemtek energizer with built in fence monitor	R 3400,00 excl

Alarm Equipment:

To supply and install an 8-zone alarm Paradox alarm system complete with battery back-up, keypad, 15 watt siren, four internal infra-red passives, two fixed panic buttons and two reed switches. Alarm system can be zone doubled to a 16 zone system.

R 3600,00 excl.

To supply and install one outdoor BX80 beam

R 1500,00 excl.

GSM 4 channel radio, programmed to four cellular phone numbers and linked to fence energizers, Alarm systems, Solar panels and standalone panic systems R 1800,00 excl

Long Range remote panic – one long range remote

R 250,00 excl.

Long Range receiver – installed

R 1100,00 excl.

Cameras:

To supply and install one gate camera – Peak inversion camera, auto-iris lens, 40m co-axial cable, power supply, 4-channel embedded digital recorder (250 G) hard drive and one 17 inch monitor. Price includes camera housing and installation

R 11 900,00 excl.

To supply and install one day/night camera – Day/Night camera, auto-iris lens, 40m co-axial cable, power supply, 4-channel embedded digital recorder (250 G) hard drive and one 17 inch colour monitor. Price includes housing and installation

R 12 900,00 excl.

Appendix 11: Zandvlei Estuary Nature Reserve fire management plan



Greater Zandvlei Estuary Nature Reserve Fire Management Plan



1st Edition
May 2008
2nd
Edition
November
2011

Cassandra Quinton Sheasby
Deep South Area Manager
Greater Zandvlei Estuary



Integrate

THIS CITY WORKS FOR YOU

Nature Reserve

Important Fire Related Contact Numbers

All Emergencies:	107 (landline)
Lakeside Fire Station:	(021) 788 1843
Fire Control:	(021) 590 1900
	Fax: (021) 591 4115
Norman Alexander (Inspector Zandvlei):	(021) 797 6842
	Fax: (021) 797 6855
Nevil Ambler (permit inspector):	076 722 1894
Bethwell Mbete (Air Pollution):	(021) 5901419
South African Police Muizenberg:	(021) 787 9000
Van direct no:	082 522 1809

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➤	Introduction
➤	Zandvlei management block names and descriptions
➤	History and usage of the area
➤	The role of fire in the Western Cape
➤	Objectives of burning at Zandvlei
➤	Alien clearing and brush pile burning
➤	Prescribed burning
➤	Fire history mapping
➤	Fire break map, current and required
➤	Burning needs of management blocks colour coded map
➤	Management blocks 1 - 33: characteristics, special precautions

and recommendations

References

Acknowledgements

Preface

This fire management plan has been drawn up as a living document which needs relevant information added to it as fire events happen at Zandvlei.

Without the constant updating of this information, the knowledge and memory of what happened in the area becomes lost and makes it increasingly difficult to manage the vegetation accordingly. For this reason, a hard copy of the document will be kept in a lever arch file in the Zandvlei reserve office where it can be used as reference material for decision making and historical records can be easily accessed. A digital version will be kept in the office computer, backed up on the biodiversity database as well as sent to the Environmental Resource Management department head office in Wale Street.

It will be the duty of the management and staff of Zandvlei to update the information in this document. The easiest way for this to be achieved is to include information on burning activities into the hard copy which is then annually fed into the digitised version.

Documents that should be included and updated in this file include:

- ➡ Laminated copies of the annual burning permits
- ➡ Copies of completed burning permit applications
- ➡ Blank copies of the burning permit applications
- ➡ Contact numbers of the fire departments and control offices
- ➡ Fire Danger Index ratings and explanations
- ➡ Completed Veld Fire log sheets
- ➡ Blank Veld Fire log sheets
- ➡ Blank acetate management block maps
(for updating fire history map)
- ➡ Fixed point photography photos by management block
(still in process of being set up at the reserve)
- ➡ Photographs of emergent plant species after fire
- ➡ Zandvlei plant species list
- ➡ Articles (Zandvlei Trust, Marina Newsletter, Argus etc) on fires in
natural areas
- ➡ Fire Checklist (Blank & completed)

Without the documentation of the past, there is nothing to compare the present to!

Introduction

The Zandvlei Nature Reserve was originally only 22ha in size and consisted of a terrestrial portion of land with internal wetlands but excluded the large water body. It was known as the Zandvlei Bird Sanctuary and was proclaimed in 1978.

In October 2006 the application to extend the boundaries was approved by Tasneem Essop, the Minister of Environmental Affairs, Planning and Economic Development in terms of section 7 (7) of the Nature Conservation Ordinance, 1974. The name was changed to the Greater Zandvlei Estuary Nature Reserve and was expanded to 204ha. The entire water body, Park Island, Wildwood Island, Little Australia Island, Bath Road, The Keyzers River rehabilitation area and Westlake Wetlands are now included in the nature reserve. In 2010 a new proclamation process was started to have the City of Cape Town Nature Reserves proclaimed in terms of the Protected Areas Act. Two additional tracts of conservation worthy land were included into Zandvlei in this process. The Old Boyes Drive corridor (Peninsula Granite Fynbos) and the Coastal Strip corridor (Cape Flats Dune Strandveld).

Greater Zandvlei Estuary Nature Reserve is recognised as the only viable estuary along the False Bay Coastline and was ranked 46th out of 250 estuaries in a study by Dr Jane K Turpie. The terrestrial and aquatic environments are the remnants of those which originally covered the majority of the Cape Flats. Zandvlei has ten red data plant species of different conservation status. Unfortunately alien plants in both the terrestrial and aquatic environments threaten the long-term survival and conservation of these remnants.

Aerial map 1: Greater Zandvlei Estuary Nature Reserve Boundary

Yellow: Proclaimed 1978

Red: Proclaimed 2006



Aerial map 2: Greater Zandvlei Management Blocks

The Zandvlei management blocks were drawn up in January 2008 and were compiled using defined boundaries that are easy to locate on the ground.



Zandvlei management block names and descriptions

- 1: Road reserve
- 2: Langevlei canal field
- 3: Sand River Wetland rehab area
- 4: Sand River field
- 5: Road reserve road to salt marsh canal
- 6: Old nursery including new wetland area
- 7: Salt marsh canal to centre pan
- 8: Centre Pan
- 9: Scirpus hide block
- 10: Path north to centre pan
- 11: Lookout path south west to shore
- 12: Path south to lookout path
- 13: Wildwood island
- 14: Little Australia Island
- 15: Park Island
- 16: Boardsail Inn Site
- 17: Cookie cutter east shore
- 18: Bath Road
- 19: Cookie cutter west shore
- 20: Western shoreline
- 21: Promenade road section
- 22: Brushpile island
- 23: Westlake Wetlands proper
- 24: Bermuda triangle
- 25: Westlake wetlands pans
- 26: West of railway to Keysers river
- 27: Henley road wetland east of railway
- 28: Night heron Island
- 29: Keysers River rehab site
- 30: Main water body: Zandvlei
- 31: Northern Marina da Gama canals
- 32: Southern Marina da Gama canals
- 33: Estuary Mouth
- 34: Rutter Road Pond
- 35: Westlake and Keysers Rivers
- 36: Old Boyes Drive corridor
- 37: Grysbok Park and coastal strip

History and usage of the area

Zandvlei has a long history of public usage. The water body and surrounding areas have undergone severe transformation due to human intervention. The water body which is now a permanent feature of the area originally would have functioned as a seasonal wetland which was open to the sea for part of the year when the water was at its highest. This area was used by farmers in the early 1600s to graze their cattle. When the Steenberg Railway line was built it led to many changes including the reclamation of huge tracts of wetland.

In the late 1960s Marina da Gama was built. This led to massive changes in the water and soil regime. A large sewerage pipeline now runs a few feet under the mouth of the estuary. To protect this pipeline from damage, a rubble weir was placed over the pipeline which would regulate the water level to prevent scouring of the sand leading to any rupture of the pipe.

The estuary mouth is now managed artificially by the Catchment Management Department of the City of Cape Town. A sand bar is used to keep the estuary mouth closed and it is opened each spring high tide using a mud dozer. This is an essential to maintain the integrity of the Marina da Gama building development. If the water is not kept between 0.6 and 0.9m above sea level, the revetments are not kept in place by the water pressure which leads to erosion and could cause the collapse of buildings.

Since human habitation the area has been used for recreational purposes and is still used today for the following: bird watching, fishing, yachting, wind surfing, canoeing, rafting, bowling, picnicking, braaiing, caravan and camping etc.

These activities as well as other considerations such as the transport system (train lines close-by can short circuit due to thick smoke, visibility on roads in the area, people suffering from illnesses which can be exacerbated by smoke inhalation etc) have to be taken into account when burning. This makes the management of small nature reserves in urban areas even more challenging!

The role of fire in the Western Cape

The amount of literature on fire is scarce in comparison with other ecological subjects. Bond & van Wilgen (1996) believed that some writers could not decide where the subject of fire was best placed and could be tentatively placed between physical and biological processes that have impacts on plants. The ecology of fire is the study of disturbance ecology and has similar effects as heavy herbivory would on vegetation. Disturbance has been defined as “any relatively discrete event in time that removes organisms and opens up space which can be colonized by individuals of the same or different species” by Begon *et al.*, 1990. It is a discrete event that opens up space from less than 1 ha to over 1 million ha at intervals from 1 to 1000 years depending on all the factors involved such as burning fuels and the conditions conducive to a fire event (Bond & van Wilgen, 1996). Burning can only take place where there is sufficient fuel to burn, where the environmental conditions such as weather have dried that fuel sufficiently and where there is an ignition source (Cowling *et al.*, 1997 & van Wilgen, 1996).

Fire is most frequent in the less palatable vegetation types where herbivory is minimal. Fires in the fynbos or Cape Heathland region are supported by woody species fueling them, however thicket vegetation seldom burns due to the density of the vegetation and the morphology of the plants which are adapted to exclude fire. Dune thicket found along coastlines in deep well drained sandy soil is an example of this (Cowling *et al.*, 1997).

In the Western Cape, the fire season is well known for the howling South Easterly winds that fuel the fire with oxygen, can move the fire and spread it very quickly and can push up the intensity of the fire exponentially (Bond & van Wilgen, 1996).

Biological effects of fire are determined by the fire regime, namely the frequency, type, intensity and season of burn. In fynbos, frequency depends largely on the amount of time since the last burn and the fuel accumulated during that period. Crown fires that burn all layers of vegetation occur in fynbos vegetation (Cowling *et al.*, 1997).

The combination of an open ground layer, high availability of resources and temporary predation reduction is what the plants need for good seedling establishment after fire. Some species flower profusely after fire, others build up a seed bank in the soil which is stimulated by the chemical reactions that take place with the heat and smoke during the fire.

Fire stimulated flowering occurs in species such as Orchidaceae, Iridaceae, Liliaceae, Amaryllidaceae, Poaceae and Cyperaceae. *Leucospermum* and *Leucodendron* species with hard seeds rely on the heat from fire to dessicate the seed coat which then cracks on moistening. The fires can also change the microclimate of the soil, widening the temperature fluctuations have been documented which aid germination (Cowling *et al.*, 1997).

Changes in species composition after fire events are caused by the interaction between the fire and the regenerative properties of the plants. Many non sprouting species are sensitive to the season of burn with high recruitment after autumn burns and poor recruitment after spring burns (Cowling *et al.*, 1997).

Burning can alone or in combination with other forces, kill mature plants and it is therefore one of the main driving forces behind structural change in plant communities (Bond & van Wilgen, 1996).

The Fire Danger Rating Index

Fire Alert Stage	BLUE	GREEN	YELLOW	ORANGE	RED
FDI	0 - 20	21 - 45	46 - 60	61 - 75	75 – 100
Fire Behaviour	SAFE	MODERATE	DANGEROUS	VERY DANGEROUS	EXTREMELY DANGEROUS
Flame Length	0 - 1	1 – 1.2	1.2 – 1.8	1.8 – 2.4	2.4 PLUS
Fire Controllability Guide	If started they spread very slowly and may go out without suppression forces. There is little flaming combustion and intensity is low. Control is readily achieved and little or no mop up is required.	Ignition may take place near prolonged heat sources. Speed is slow in forests, moderate in open areas. Light surface fires with low flames. Control is readily achieved with direct manual attack with minimum forces. Steep, exposed slopes may require light mop up.	Open flame will start fires. Mature grasslands and forest litter will burn readily. Spread is moderate in forests and fast in exposed areas. Fires burn on surface with moderate flame heights. Fight fires with direct attack and all available resources including aircraft. Light to moderate mop up.	Ignition can occur readily with fast spread in forests. Grass fire behaviour will be extreme. Fires will be very hot with crowning and short to medium spotting. Direct attack on the head may not be possible requiring indirect methods on flanks. All available resources must be used with extended mop up. Beware of wind change!!!	Ignition can occur from sparks. Fires will be extremely hot with fast rate of spread. Control may not be possible during day due to long range spotting and crowning. Suppression forces should limit efforts to limiting lateral spread. Damage potential total. All available resources must be used with extended mop up and careful attention to areas that can flare up. Beware of wind change!!!
Controlled Burning operations	Control burns can be executed if burning prohibitions and BOPs allow	Control burns can be executed if burning prohibitions and BOPs allow	No controlled burns if FDI forecast for the day exceeds 50.	No control burns of any nature	No control burns of any nature
Fire Duty Foresters	Normal – good time to take time off if raining and standby forester available.	Normal – remain on duty in radio and cell contact. Report all movements to ops.	Alert - remain on duty in radio and cell contact. Know where all teams are, have strike crews on vehicle. Report all movements to ops.	Danger - remain on duty in radio and cell contact. Report all movements to ops. Know where all teams are, have strike crews on vehicle and move to danger areas	Extreme Danger - remain on duty in radio and cell contact. Report all movements to ops. Know where all teams are, have strike crews on vehicle and move to danger areas. Keep up to date

					on weather.
Proto Teams	<u>Working hours</u> Fire fighting units available with driver. Report all movements to ops. <u>After hours</u> Standby in village	<u>Working hours</u> Fire fighting units available with driver. Report all movements to ops. <u>After hours</u> Standby in village	<u>Working hours</u> Fire fighting units available with driver. Report all movements to ops. <u>After hours</u> Standby in village. Full crews	<u>Working hours</u> Fire fighting units available with driver. Full crews and at danger standby points. Report all movements to ops. <u>After hours</u> Standby in village. Full crews	<u>Working hours</u> Fire fighting units available with driver. Full crews and at danger standby points. Report all movements to ops. <u>After hours</u> Standby in village. Full crews
Ops day staff	Normal. 07:00 to 16:30 – good time to take time off if raining and standby operator available.	Normal. 07:00 to 16:30 unless fire is currently burning. FDIs every 2 hours.	Alert. 06:30 to 17:30 unless fire is currently burning. FDIs every hour. Remain in contact at night.	Danger. Sunrise to sunset, unless fire is currently burning or aircraft are still flying. FDIs every hour. Remain in contact at night. Be super aware of weather.	Extreme Danger. Sunrise to sunset. If fire is currently burning or aircraft are still flying hand over to suitably qualified person – management only. FDIs every hour. Be super aware of weather.
Lookouts	Normal 24 hours	Normal 24 hours	Normal 24 hours. Check alidades and confirm technician on standby. Manual scan every 30 minutes	Normal 24 hours. Check alidades and confirm technician on standby. Manual scan every 15 minutes	Normal 24 hours. Check alidades and confirm technician on standby. Manual scan permanent if low vis.
Spotter	Airborne 25 min	Airborne 15 min	Airborne 5 min. On standby at airfield	Immediate take off. Patrolling FDI above 60	Continuous patrolling. Only stop for fuel.
Bomber	Airborne 25 min	Airborne 15 min	Airborne 5 min. On standby at airfield	Immediate take off.	Immediate take off
Silviculture Contractors	Normal	Normal	Normal – in radio contact	In radio contact. Aware of conditions. Crews and water tankers available for mop up.	Stop all work and withdraw. Available for mop up. Crews and water tankers available for mop up.
Harvesting Contractors	Normal	Normal	Normal – in radio contact	In radio contact. Aware of conditions.	Stop all work and withdraw
Mechanic	Normal	Normal	Notify agents	Notify agents	Notify agents

Objectives of burning at Zandvlei

Nutrient loading

The vegetation growing in the Cape Floristic region is found growing in nutrient poor soils. It is adapted to these conditions and these should be maintained as much as possible. Due to the high levels of nutrients entering natural systems due to urbanisation, increased runoff due to many more hard surfaces, the high number of sewerage spills occurring due to power outages and the many chemical pollutants entering catchments the soil characteristics have started changing. Alien plants such as *Acacia* species also add to the nutrient loading due to their mycorrhizal bacteria that are able to make use of nitrogen that would under normal circumstances be unavailable to these plants.

One of the main objectives of burning areas like these is to volatilize nutrients by burning (Gibbs, pers. comm., 2006). This will decrease the nutrient loading on the site which will encourage the indigenous vegetation. Areas of priority to burn for this objective include large reed-beds, stands where kikuyu grass is dominant and has been herbicided and areas where buffalo grass has become dominant. Areas with high fuel loads in standing biomass due to senescence should also be included to prevent fuel loads creating unnatural fire intensity.

Burning for biodiversity

Competition along with disturbance determines species diversity. If vegetation stands are left for long intervals after disturbance allowing enough time for stronger competitor plants to take over, plant species diversity will decrease (Bond & van Wilgen, 1996) which also leads to lower species diversity in fauna utilizing the habitat (Sheasby, unpublished 2005).

In many areas where the vegetation has become homogenous with only a few species of plant dominant, it is important to burn to open up the area and allow species who favour different conditions to emerge. Many plant species such as *Ixia paludosa*, *Satyrium carneum*, *Moreae fugax*, *Lachenalia rubida* and so on prefer open habitats where they do not have to compete for sun light to flower. The natural succession of Strandveld vegetation would be to create thickets of fire resistant stands, which often leads to the lower growing species becoming dormant.

A good example of this was observed at Zandvlei. The salt marsh area was heavily overgrown by *Morella cordata* in 2006/2007. The *Lachenalia rubida* plants that came up in 2007 were thin, long stemmed plants that had to reach heights of up to 30cm before they flowered. This decreased the amount of resources that they had available for flowering because more effort had to be put into growing long stems. They did flower and most of the flowers were pollinated producing a relatively good seed yield.

Once they had flowered, the *Morella* was cut back completely, opening up the habitat and producing large sandy patches. In 2008, the *Lachenalia rubida* plants were able to produce stems of the normal length, approximately 5 to 10cm (see Figure 1) and they flowered profusely.

In this instance, the vegetation was cut back to mimic or imitate the effect that burning would have.



Lachenalia rubida size compared to pen top, 2008

Alien clearing and brush pile burning

Each year the manager motivates for alien clearing funds which are used to employ contract staff. Supervised by reserve staff these contractors cut down large amounts of alien and indigenous invasive vegetation which is then stacked into manageable brush piles (See Figure 2). Applications for burning permits (addendum 1) are sent to the Air Pollution department, forwarded to the Fire Departments and finally are reviewed by the relevant sub council acting in the area before these are approved.

Burning of brush piles begins once the burning permit has been received (normally May) and lasts until the last day of September.



Example of a brushpile at Zandvlei, 2007

Prescribed Burning

Prescribed burning has become a controversial issue in the last decade. According to Bond & van Wilgen (1996), the ecologists have not wanted to recognise the importance fire has to play in the ecology of vegetation due to many people viewing it as an unnatural disturbance.

Due to large wild fires that have spread through many areas endangering residential properties and/or having too high a frequency, the use of fire for the purposes of vegetation regeneration has become frowned upon by many fire departments. This attitude towards fire almost caused plant extinctions in the Cape Fynbos region (Bond & van Wilgen, 1996).

Fire in fynbos is an essential part of the natural regeneration process of which many plant species are wholly reliant on for seed dispersal and to break seed dormancy. Within Zandvlei Nature Reserve there are many species that require fires for regeneration purposes. These include *Imperata cylindrica* (Sword or Cottonwool Grass), *Satyrium carneum* and *Ixia paniculata*.

In most areas of Zandvlei Nature Reserve the vegetation has not burnt for the last ten to thirty years and has become senescent (Dorse, *Pers. comm.*, 2007). In these instances burning is of priority, however due to the age of the veld, all safety aspects must be in place before burning can be undertaken. These include cutting and maintaining fire breaks, warning residents, ensuring burning permits are valid and are available on request by the fire department, notifying the closest fire departments, the fire control office, the other south area reserve managers and south district manager. As many people as are available who have been trained in fire fighting must be on site with all necessary equipment.

Burning permit applications

Any burning permits (brush pile or prescribed) need to be correctly completed in full, signed by the manager and sent to Air Pollution dept by end of April at the latest for that current years burns. This will ensure that permits are correctly scrutinized, there is sufficient time for the site meeting and inspection with the Fire Department and the terms of the permit can be discussed if necessary. The permit only goes to the Fire Department once it has been approved by Air Pollution. Once the Fire Department has done the inspection and is satisfied with the permit conditions, the application is sent to the Subcouncil for noting and approval. Ensure that copies of the original that was sent are available in case it is necessary to resend it to either of the departments.

Fire History Mapping

It is recommended that after any burning (brush pile burning, prescribed burning or wild fire) has taken place, a “veld fire log sheet” (addendum 2) be completed with all relevant information with regards to the burn. Perimeter GPS co-ordinates of the burnt area should be taken and entered into the log sheet.

The log sheets are filed in the fire management plan file as well as sent to the GIS official (currently Amalia Stipinolv) at Head Office for inclusion onto the GIS system. This will help to update the fire history map (see aerial map 3) onto the GIS system for future reference and database records.

The following legislation is applicable to Greater Zandvlei Estuary Nature Reserve and regulates the use and management of fire in South Africa:

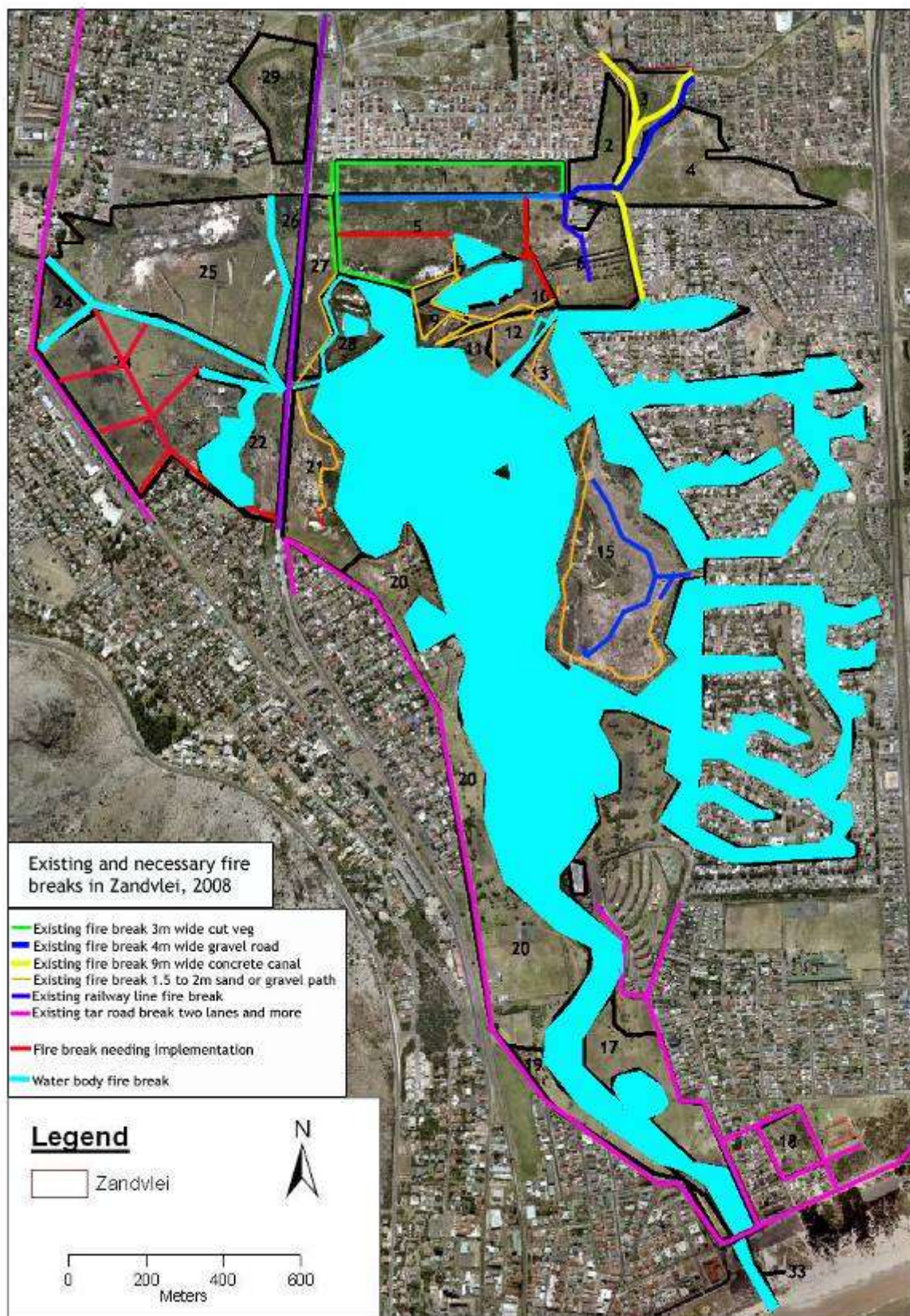
- ⊕ National Veld and Forest Fire Act 1998 (Act 101 of 1998)
- ⊕ By Law relating to community safety (Provincial Gazette 5832 of 2002)
- ⊕ Community Fire Safety Amendment By Law (Provincial Gazette 6447 of 2007)
- ⊕ Nature Conservation Ordinance 1974 (Ordinance 19 of 1974)
- ⊕ Forest Act 1984 (Act 122 of 1984)
- ⊕ Mountain Catchment Areas Act 1970 (Act 63 of 1970)
- ⊕ Occupational Health and Safety Act 1993 (Act 85 of 1993)
- ⊕ Fire Brigade Services Act 1987 (Act 99 of 1987)
- ⊕ Conservation of Agricultural Resources Act (Act 43 of 1983)
- ⊕ Disaster Management Act 2002 (Act 57 2002)
- ⊕ National Environmental Management Act 1998 (Act 107 of 1998)
- ⊕ National Environmental Management Biodiversity Act 2003 (Act 10 of 2003)

It is the managers responsibility to know the legislation and up to date copies should be kept in the fire management file. (For BTech purposes I have included the Veld and Forest Fire Act, the Community Safety By Law and the Community Safety Amendment By Law. The Fire Management Plans of the Table Mountain National Park as well as Cape Nature will also be kept in the Fire Management File for reference purposes).

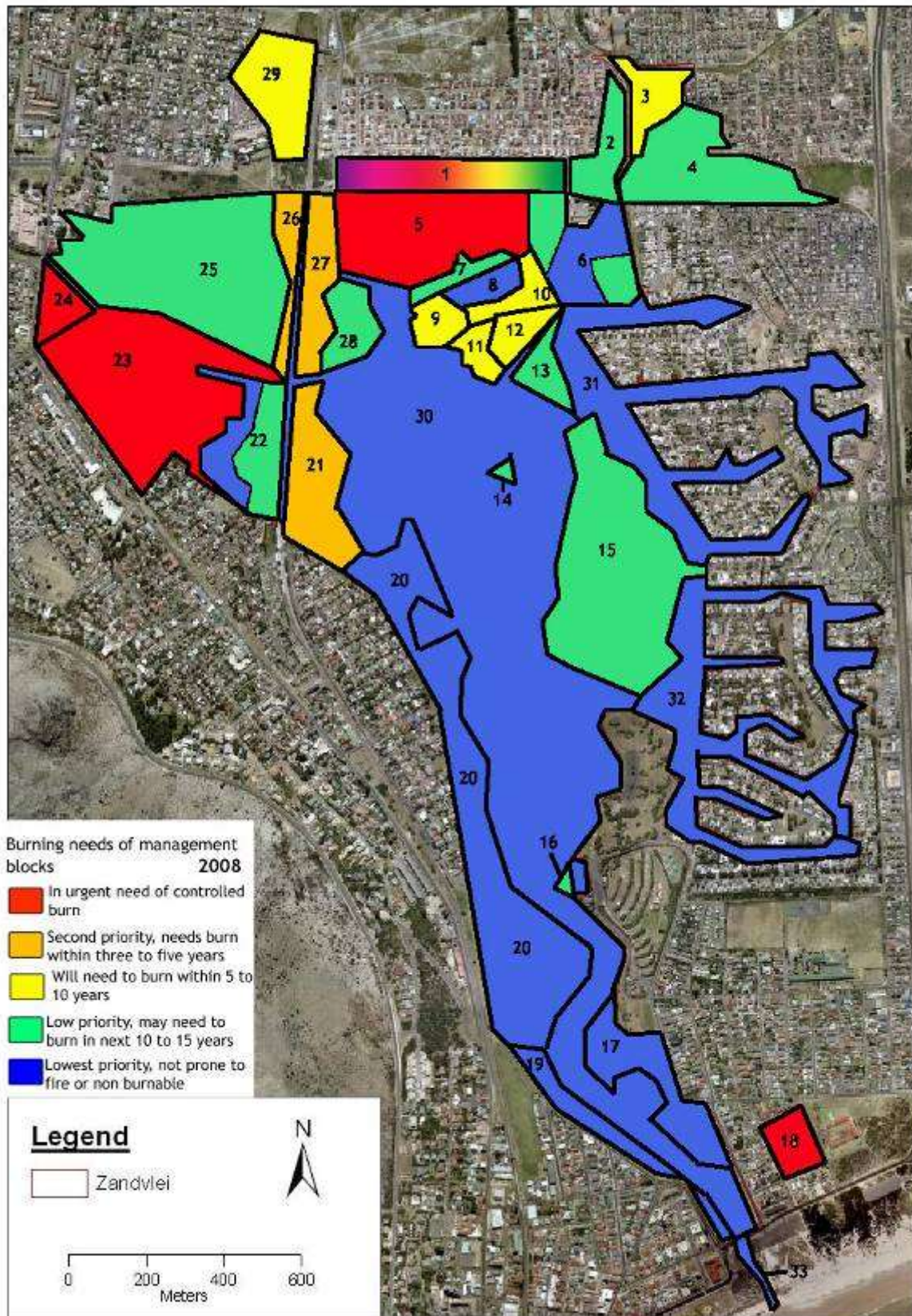
In each of these Acts, Ordinances and By Laws the emphasis is placed on precautionary measures (fire breaks etc), landowner responsibility and liability, restrictions on open air burning and restrictions as well as penalties for arson (Erasmus 2005 ; Forsyth & Bridgett 2004).



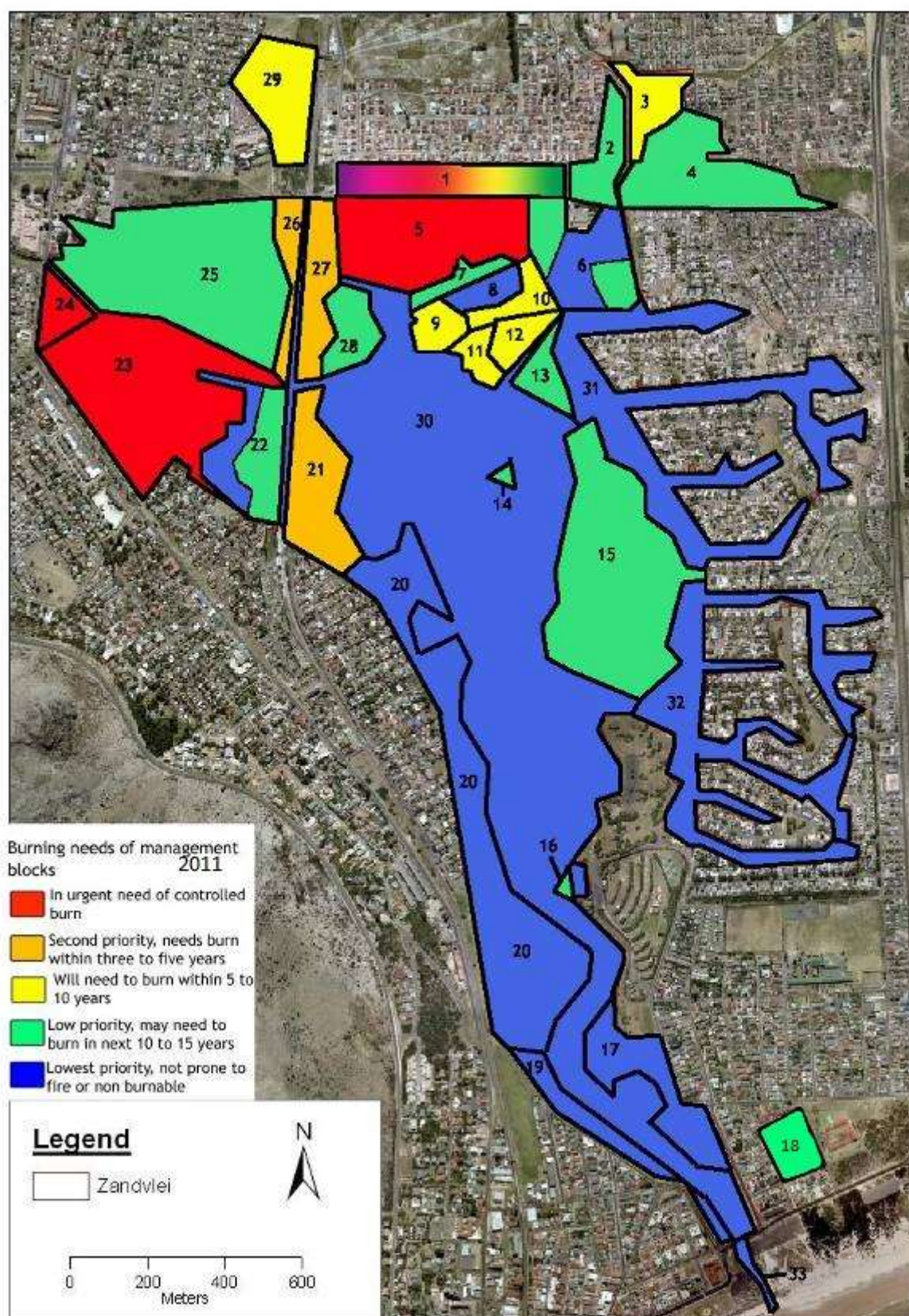
Fire History map Zandvlei, 2011



Fire break map: Existing and required at Zandvlei



Fire needs per management block colour coded, 2008



Fire needs per management block colour coded, 2011

This block technically does not fall within the reserve boundaries as it has been set aside by the Provincial Roads Department for the Muizenberg link road, but it was fenced in by the Clifford Dorse in 1999/2000 and has been managed by Zandvlei staff since then. It has high potential for rehabilitation and was ground truthed by City of Cape Town and Cape Nature for the Biodiversity Network as a site of biodiversity importance.

The vegetation in this block consists of mostly dry dune strandveld or thicket species, of which the following species are dominant:

Imperata cylindrica, *Stenotaphrum secundatum*, *Chrysanthemoides monilifera* and *Searsia glauca*.

The majority of these species are resprouters and would regenerate well after a controlled burn.

Management block 1 considerations / special precautions

1. Sword grass population and ecology thereof

The road reserve has five populations of Sword grass in it. Sword grass is a food plant for a (City wide) critically endangered butterfly *Kedestes barba bunta* (Barbers Ranger). This butterfly was last found in 2003 in the Strandfontein area. Its current population size is not known but is under severe threat from increasing development and urbanisation. At least one other species of butterfly within this genus and another two within the same family have been found in the sword grass in Zandvlei.

The caterpillars make many “housing tubes” by stitching the blades of this grass together with silk. They then live in these housing tubes and come out at night to feed. The caterpillars only pupate and take flight in September/October. In 2008 a census is to be undertaken to ascertain which species of butterfly are using the five populations of sword grass. In January 2008, feeding damage was found on the sword grass in each of the five populations.

These butterfly species are not adapted to fire and cannot fly far. The Sword grass is dependant on fire to flower and produce new genetics in the population. Taking these factors into consideration, the five sword grass populations were mapped (aerial map 3 and 4) and the entire road reserve area would need to be burnt in five separate sections across the space of at least five years. This would however depend on the regeneration speed of the sword grass and would need to be assessed after the first burn’s vegetation had recovered.

2. Invasive alien species encroachment

Due to continued alien species eradication programmes, the road reserve has a very low frequency of alien invasive species. There are however a few important species which need constant monitoring and follow up clearing. The most important invaders here are *Vicia benghalensis*, *Vicia sativa* (wild lentil or vetch) and *Pennisetum clandestinum* (Kikuyu grass). Burning of indigenous areas can often lead to an opportunity for these to invade. Constant monitoring and clearing of these species will be necessary. *Vicia* is an annual weed which produces huge volumes of seed which are viable for at least seven years. The best eradication method is hand pulling of these plants before they flower. Kikuyu can be sprayed year round with a 3% Glyphosate to water solution.

Recommendations

The road reserve area to be burnt in consecutive sections over at least five years. GPS readings collected after the regeneration of vegetation to map differences in sword grass distribution each year.

Annual insect surveys to show population changes in butterflies present.

The extent of *Pennisetum clandestinum* (kikuyu grass) and *Vicia* (wild lentil) infestation should be mapped and monitored on an annual basis.



The five populations of *Imperata cylindrica* (Sword or Cottonwool Grass) in management block 1: The Road Reserve

Block 2: Langevlei Canal Field 3.01ha

This field does not fall under the boundaries of the Zandvlei Nature Reserve but has been included into the management block map as the reserve staff members occasionally undertake work in it.

The field is classified as Public Open Space. Dominant plant species include *Cynodon dactylon*, *Stenotaphrum secundatum*, *Vicia* spp., etc.

The area is mowed on a regular basis by the Muizenberg Parks Department. It has quite low rehabilitation potential. Occasional illegal fires are started here which are put out by the nature conservation staff.

No burning is needed on this site. In the event that it does burn, monitoring of the site is needed as invasion by Port Jackson (*Acacia saligna*) is of concern. These plants are currently kept under control by alien clearing teams which are contracted on an annual basis.

Block 3 Sand River Wetland Rehab area 3.11ha

Dominant plants species include *Phragmites australis*, *Elegia tectorum*, *Orphium frutescens*, *Chrysanthemoides monilifera*.

This area was rehabilitated by the Working for Wetlands project. It was included into the Greater Zandvlei Estuary Nature Reserve in 2006. Further rehabilitation should take place. The site should have more reseeding species such as *Orphium frutescens*, *Passerina paludosa*, *Elegia* and *Ficinia* species put into it. The area should only be burnt in five to ten years when a seed bank has been established.

Block 4 Sand River Field 6.80ha

As with Block 2, this field is of low concern and of low burning priority. The same considerations need to be taken into account if this site does burn.

Block 5 Road Reserve road to Salt Marsh canal 9.18ha

Eastern part of this block is disturbed land from the old nursery site. It still had a number of palm trees on it until May 2008. It is dominated by *Erharta villosa*, *Stenotaphrum secundatum* and a few *Morella cordata* stands. The *Stenotaphrum secundatum* dominant areas have become senescent and should be burnt in Feb/March 2009. For this reason the block has been placed under high priority for burning.

The most northerly portion of this block consists of thicket up to three metres tall and of a practically impenetrable density. Dominant plants are *Euclea racemosa*, *Chrysanthemoides monilifera*, *Senecio halimifolius*, *Searsia laevigata*, *Salvia africana-lutea* and *Aspalathus hispida*.

The most western part of this block includes the Red Data site and Salt Marsh area. The Red Data site consists of Cape Sand Fynbos species such as *Elegia tectorum*, *Passerina paludosa*, *Psoralea glaucina*, *Muraltia metior*, *Gladiolus angustus* and *Wachendorfia paniculata*. The area is also prime Cape Dwarf Chameleon habitat (many of which can be found easily at night). The vegetation here is still relatively young (between 5 and 10 years old) and should therefore only burn in the next 5 to 10 years when the vegetation age is between 10 and 20 years or older. This will ensure a sufficient seedbank of the reseeders.



Management block 5 Road Reserve Road to Salt Marsh canal, looking South East, 2008

The Salt Marsh area has undergone vegetation management by way of *Morella cordifolia* clearing in 2007/2008. It now consists of an open sandy habitat with species such as *Passerina paleaceae*, *Passerina vulgaris*, *Nylandtia spinosa*, *Metalasia muricata*, *Brunsvigia orientalis*, *Lachenalia rubida*, *Moreae fugax*, *Chironia baccifera* and *Romulea hirsuta*. Young *Euclea racemosa*, *Putterlickia pyrocantha* and *Olea capensis* trees have started growing in this area since the *Morella* was removed.

The area between the Salt Marsh and the Red Data Site (at the Jetty) was burnt in April 2008. In this area red data plants *Satyrium carneum* and *Lachenalia reflexa* are found. Before the burn the area was densely vegetated with *Passerina vulgaris* (senescent), *Leucadendron coniferum* and *Chrysanthemoides monilifera*. Only one week after the burn, approximately 20 shoots of *Ferraria crispa* were visible. These plants had not flowered on the site since at least 2006. The area contains many *Leucadendron coniferum* which were planted in 2001-2003 and have been highlighted as a priority to remove. In order to undertake this, the cones need to

be removed, the trees cut down before the fire and the seedlings need to be removed by hand pulling after the fire.

Block 6 Old nursery including new wetland area 6.84ha

Some of this area was used by the Parks department as a nursery. It has been largely transformed and only remnants of indigenous vegetation remain. The dominant plant species include: *Geranium incanum*, *Stenotaphrum secundatum*, *Morella cordifolia*, *Senecio halimifolius*. Other plant species include *Tetragonia decumbens*, *Pelargonium cuculatum*, *Euclea racemosa*, *Chrysanthemoides monilifera*, *Otholobium decumbens*, *Cynodon dactylon*, *Leucodendron coniferum*, *Leucodendron levisanus*, *Erharta villosa*.

This area is slowly being rehabilitated. The new wetland section was dominated by *Pennisetum clandestinum*. The area was sprayed with herbicide and later burned (2007) to volatilise nutrients. It is now in the process of being excavated which will be revegetated with indigenous wetland species. The area is suitable for the red data plant *Psoralea glaucina*.



Management block 6: *Senecio halimifolius* dominant area, looking North, 2008

Certain parts of this land are of single species dominance. These areas should be burnt to encourage new plant species. Seeds should be scattered in these areas to increase diversity of plants. Species which become dominant and invasive such as *Morella cordifolia* and *Senecio halimifolius* should be burnt or cut down and brush

piled. The areas should then be rehabilitated. If using a fire regime, it should be a hot fire to kill most of the invasive alien grass seeds and prevent further invasion from this.

Block 6 considerations / special precautions

There are a few *Leucadendron levisanis* (red data plant species) found in this block. Cuttings and seeds have been taken from these plants. They are approximately ten years old but have not grown over 1m tall indicating that they are not growing in optimum conditions. If the area is to be burnt, plant stock to replace these three plants should be guaranteed prior to burning. Preferable methods of restoration include seed scattering instead of planting bagged plants.

GPS readings of these plants have been recorded. The plant sites should be monitored on an annual basis to record if the plants create offspring after the fire.

Recommendations

A fire break should be cut along the old Parks nursery fenceline to prevent the fire from spreading into adjacent reedbeds. If the reedbeds are to be burnt, fire breaks need to be cut along the block boundary of block 10 to ensure that the fire does not spread (see Fire break Map).

Prior to burning the area should be walked through, *Amietophrynus pantherinus* (endangered Western Leopard Toad), *Chersina angulata* (Angulate Tortoise) and *Bradypodion pumilum* (Cape Dwarf Chameleon) should be looked for and relocated to a nearby block with similar vegetation and the relocations put into the biodiversity database (www.biodiversity.co.za) by staff with a login.



Management block 6: Old nursery including new wetland, looking North West, 2008

Block 7	Salt Marsh canal to centre pan	1.37ha
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Dominant plants include *Phragmites australis*, *Juncus krausii*, *Ficinia nodosa*, *Chrysanthemoides monilifera*, *Metalasia muricata*. This vegetation is still relatively young and therefore does not need to be burnt for at least the next ten years.

Block 8	Centre Pan	1.40ha
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Not applicable: water way

Block 9	Scirpus hide block	1.19ha
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Dominant plant species include *Ficinia nodosa*, *Juncus krausii*, *Phragmites australis*, *Typha capensis*, *Senecio halimifolium*, *Chasmanthe aethiopica*, *Chrysanthemoides monilifera* and *Stenotaphrum secundatum*. This area is wet for most of the year except at the height of summer. Burning here would not be a priority as most of the species are wetland plants.

The few *Tarchonanthus camphoratus* trees that are along the path will need protection should controlled burning take place here. A species that could benefit from a burn here is *Haemanthus coccineus*. Any burning in this area will have to take the Bird Hide into consideration.

The alien *Myoporum tenuifolium* trees sheltering the bird hide need to be phased out. Vehicle access to this site is not possible (except quad bike) and the cut down manatokas should be stacked neatly along the Zandvlei estuary bank and burnt. This should take place between 2009 and 2012. A brush pile burning permit must be submitted.

Block 10	Path north to centre pan	1.5ha
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Dominant plant species include: *Juncus krausii*, *Phragmites australis*, Western end predominantly *Phragmites* up to 3 metres tall. Other plants species of less dominance include *Stenotaphrum secundatum*, *Senecio halimifolius*, *Sarcocornia*, *Sideroxylon inerme*, *Searsia glauca*, *Salvia Africana-lutea*, *Solanum guineense* and *Carpobrotus edulis*. Geophytes include *Chasmanthe aethiopica* and *Amaryllis belladonna*.



Management Block 10 Path north to Centre Pan, looking North west west, 2008

Most of the area consists of waterlogged, salt marsh conditions. The frequency of fires in this area would be low.

A fire break needs to be cut on the northern side from the water to the Parking area dissecting block 5 and 7.

The *Sideroxylon inerme* trees (milkwoods) will need to be protected from the burning. Fire breaks should be cut around the trees and water should be on hand when burning takes place to prevent accidental scorching.

Block 11 Lookout path south west to shore 1.35ha

Dominant plant species include *Phragmites australis*, *Juncus kraussii*, *Searsia glauca*, *Ficinia nodosa*, *Stenotaphrum secundatum* and *Scenecio halimifolius*. Other less dominant plant species are *Chrysanthemoides monilifera*, *Cynodon dactylon*, *Searsia leavigata* etc.

The red data plant *Ixia paniculata* was historically known from this block. The leaves of this plant were found in 2007 but it did not flower. In 2008 it did not leaf or flower suggesting that the surrounding vegetation (*Searsia*, *Stenotaphrum*) is out-competing it. Although this is a priority site for burning, due to staffing and time constraints it has been put under the medium priority status. A localised burn could be undertaken on the area immediately around the *Ixia paniculata* patch in March/April 2009.

Vicia has invaded this area and during the growth season, it becomes seasonally dominant in areas with low growing vegetation. Should burning take place in this area, follow up alien clearing will need to be done after the fire especially with regards to weedy species. The majority of *Vicia* plants begin emerging in June/July, however plants have been seen as early as April.



Management Block 11 Lookout path south west to shore, *Searsia glauca* thicket, 2008

Prior to burning, the area should be walked through, *Amietophrynus pantherinus* (endangered Western Leopard Toad), *Chersina angulata* (Angulate Tortoise) and *Bradypodion pumilum* (Cape Dwarf Chameleon) should be looked for and relocated.

Should fire be excluded from this site indefinitely, there is a good chance that thicket vegetation as found in the northern part of block 5 will develop here. There are already large areas covered by dense stands of *Searsia glauca*, *Searsia laevigata* and *Euclea racemosa* up to 3m tall. Should the thicket edge along the waters edge be encouraged, the diversity of species should be increased by planting *Sideroxylon inerme* (White Milkwood), *Putterlickia pyrocantha*, *Olea capensis*, *Tarchonanthus camphoratus* (Camphor bush), *Leonotis leonora* (Wilde dagga), *Salvia Africana-lutea* (Wild Rosemary) and *Metalasia muricata*.

If this takes place, the fire management plan should be updated with the details of the plantings, the area that has been encouraged as thicket should be marked on the map and the area where the *Ixia paniculata* were historically should not be disturbed and should be monitored for plants each August to September.



Management Block 11 Lookout path south west to shore, vlei rat droppings, 2008

Block 12**Path south to lookout path****1.58ha**

This block was burnt in 1998 by Clifford Dorse. In some areas the charcoal from the burn is still visible on the ground. Dominant plants in this area include *Juncus krausii*, *Phragmites australis* (eastern boundary dominant), *Ficinia nodosa* (was *Scirpus nodosus*), *Carpobrotus edulis*, *Chrysanthemoides monilifera*. Other plant species include six *Gladiolus angustus* plants which flowered and set seed in 2007. *Stenotaphrum secundatum*, *Cynodon dactylon*, *Chasmanthe aethiopica*, *Searsia glauca*, *Otholobium frutescens*.



Management block 12 Charcoal residue of 1998 prescribed burn, 2008

Invasive plant species that are controlled here include *Myoporum tenuifolium* (manatoka) and *Acacia saligna* (Port Jackson). Eradication efforts in this area keep numbers of these plants very low. *Vicia* is however a large problem. From 2006 to 2008 these plants have been hand pulled in this area where they grow in the *Juncus krausii* beds. The eradication efforts have shown a decline in their numbers. Should a prescribed burn be planned for this site, *Vicia* Invasion will become a much larger problem. Alien clearing teams must be arranged to tackle the weed after a burn in this area.

The area has not become senescent and will only need to burn again in the next five to ten years. The reedbeds along the shoreline of this site act as shelter for one of the breeding populations of *Amietophrynus pantherinus* (Western Leopard Toad) at Zandvlei. In the last three years the breeding here has been successful and toadlets have been found in this management block. The *Juncus krausii* beds

provide good cover from birds who prey on these animals. In order to ensure that this population is protected, the area should be burnt between February and April, out of the breeding season of these toads.

Prior to burning, the area should be walked through, *Amietophrynus pantherinus* (Western Leopard Toads) and *Chersina angulata* (Angulate Tortoises) should be looked for as well as *Bradypodium pumilum* (Cape Dwarf Chameleons). The area is also home to *Otomys irroratus* (vlei rat) which should be flushed prior to burning.



Management block 12 Looking west, 2008

Block 13

Wildwood Island

1.84ha

Wildwood Island was created during the Marina da Gama residential development. It was partially rehabilitated by Nature Coservation staff. On a regular basis the Zandvlei staff team visit the island and undertake invasive alien plant clearing.

This area is currently of a low priority to burn. The reedbeds on the south west and south east sides have started encroaching on the open water in the canal. These reedbeds will need to be cut using the reed cutter and stacked onto wildwood island for brushpile burning. This should be done as soon as the reed cutting machine becomes available and follow ups should be undertaken on an annual basis.

Block 14**Little Australia Island****<1ha**

This small island is covered by alien trees predominantly *Myoporum tenuifolium* (Manatoka), *Acacia saligna* (Port Jackson) and *Acacia cyclops* (Rooikrans). For the last two years, members of the Zandvlei Trust, Zerilda primary school and City of Cape Town Nature Conservation have planted *Sideroxylon inerme* (White Milkwood) on the island so that the vegetation can be changed to indigenous vegetation over a long period of time.

This island does not need to be burnt as it will only encourage further alien infestation. It needs to be managed by manually removing and slowly replacing the alien vegetation.

Block 15**Park Island****16.51ha**

Park Island is a large tract of the nature reserve which was rehabilitated largely by the Zandvlei Trust and City of Cape Town Nature Conservation staff from 1998 to 2003. It has large salt marsh areas of conservation importance.

There is a *Sideroxylon inerme* (White Milkwood) and *Tarconanthus camphoratus* (Camphor tree) thicket area in the middle of the island which would need protection from fire. This area is one of the only large stands like it in Zandvlei.

Dominant plants on Park Island include *Senecio halimifolius*, *Chrysanthemoides monilifera*, *Stenotaphrum secundatum*, and *Geranium incanum*. In most areas, the *Vicia* infestation is high. *Juncus kraussii* and *Phragmites australis* are dominant along the edges of the water.



Management block 15 Park Island from entrance gate, looking South west, 2008

It is largely used by the Marina da Gama residents to walk their dogs.

Any burning on this site will have to be done with a public participation process where the residents are informed of the burn in writing before hand well in advance. Signage should be erected on the gates in advance. The areas to be burnt should be walked through and searched for any wildlife which should be documented and relocated.



Management block 15 Park Island from along the path, looking North, 2008

Block 16	Boardsail Inn site	0.22ha
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This tiny island is overgrown with alien plants currently. It is a good area for bird-watching, however does not currently support any indigenous vegetation and will need to be cleared before any rehabilitation can be done. Burning is not a priority for this site for the next five years. This should be assessed again when rehabilitation has been set out for this site.

Block 17	Cookie cutter east shore	5.4ha
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Dominant plants include *Stenotaphrum secundatum*, *Psoralea repens*, *Geranium incanum*, *Ficinia nodosa* (was *Scirpus nodosus*), *Erharta villosa*. The edges of the estuary on this side have been rehabilitated by the Zandvlei Trust and Working for Wetland teams. Here the vegetation consists of low growing Strandveld including

Senecio halimifolius, *Pelargonium capitatum*, *Psoralea glaucina*, *Otholobium fruticosum*, *Metalasia muricata*, *Albuca* spp., *Lampranthus reptans*, *Carpobrotus edulis*, *Elegia tectorum*, *Salvia Africana-lutea*, *Eriocephalus racemosa*, *Orphium frutescens*, *Chasmanthe aethiopica*, *Leonotis leonora*.



Management block 17: Cookie Cutter East Shore, 2008

These areas were replanted to increase the corridor between Zandvlei Estuary and Bath Road sites to increase biodiversity and movement of plants and animals.

The majority of the area is mowed lawn and will not require burning at any frequency.

This area consists of a low lying densely vegetated area and a dune with some open areas as well as some thicket areas.

The low lying area is dominated by the following species: *Passerina paludosa*, *Elegia tectorum*, *Chrysanthemoides*, *Stenotaphrum secundatum*, *Metalasia muricata*, *Otholobium fruticosum*, *Geranium incanum*, *Ficinia nodosa* (was *Scirpus nodosus*), *Chasmanthe aethiopica*. This area is of high priority to burn. The reseeding component is found in this low lying area and the species such as *Passerina* have become senescent. Some of them are over 2m tall and area starting to die. Cocktail ant nests are present in this site and should be taken into consideration when burning takes place. It should be burnt in February/March 2009.

The dune area is dominated by *Searsia glauca*, *Euclea racemosa*, *Erharta villosa* and *Ruschi macowanii*. This sparsely vegetated section will not burn successfully.

Half of this management block was successfully burnt in April 2010. The following season a high rate of recruitment of *Passerina* species was observed as well as many of the bulbs in the area which had become dormant due to dense vegetation cover.



Management block 18: Bath Road senescent *Passerina*, 2008



Management block 18: Bath road burn taking place 14 April 2010



The Bath road burn taken facing east 14 April 2010

The burn was undertaken on 14th April 2010 from 09h00. The vegetation was still damp from dew and would only ignite after 10am. The fire carried itself well even in the less dense vegetation and by 14h00 had been fully extinguished. The vegetation rejuvenated well with over 1000 *Passerina* plants being counted in 2011.



Young *Passerina* plants coming up after the burn, 2010



Lachenalia bulbifera came up after the fire, 2010

Block 19**Cookie cutter west shore****2.72ha**

This block has been transformed into a childrens play area with low mown lawn covering the majority of it. No plants of huge importance are found in this area. *Myoporum tenuifolium* (Manatoka) trees have been left as shade trees and the shoreline has a thin line of *Phragmites australis* growing along it which should be cut back instead of burnt for management purposes.



Management block 19: Cookie Cutter west shore, 2008

Block 20**Western shoreline****16.77h**

This block has many buildings on it including the Imperial Yacht Club, the Zandvlei Sports club and the SA Sea Cadets base. The area has been kept low growing except for a small portion of *Phragmites* that has been left along the water edge. No burning is required on this management block.

Block 21**Promenade road section****5.72ha**

The area is of high conservation priority. It is dominated by reedbeds of *Phragmites australis* for the northern half of the block as well as along the waters edge and the train line. *Morella cordifolia* is dominant in the southern half of the area and needs to be cleared/burnt/brushpiled.

Other species on this site include but are not limited to: *Psoralea glaucina*, *Psoralea repens*, *Otholobium decumbens*, *Geranium incanum*, *Passerina paludosa*, *Nylandtia spinosa*, *Salvia africana-lutea*, *Pelargonium capitatum*, *Ficinia nodosa* (was *Scirpus nodosus*), *Leucodendron coniferum*, *Cyperus sphaerospermus*, *Ficinia vulbosa*, *Scirpus membramicus* and *Satyrium odorum*.. The site is a stunning example of the vegetation that was once found all around the Zandvlei estuary. Salt marshes are also found here where frogs breed each winter.

The drier area will require burning within the next five to 10 years. The reseeding plants are still relatively young. From a biodiversity point of view, it would be good to burn this site approximately every 15 years. The proximity to the railway line will make this difficult as the smoke can short out the overhead lines.



Management block 21: Promenade Road looking North east, 2008

Block 22**Brushpile island****2.85ha**

This small area of land consists of a low lying area which consists of salt marsh vegetation such as *Shoenoplectes* and *Sarcocornia capensis* which becomes inundated with water during winter, and a higher lying dune area. The dune ridge has some large *Sideroxylon inerme* (Milkwood), *Tarconanthus camphoratus* and *Searsia* trees on it creating densely packed thicket. The areas close to the water have a thin edge of *Phragmites* and a few *Typha capensis* plants. *Chasmanthe aethiopica* sprouts here in large numbers each winter.

Invaders here are few and in low numbers, they are *Shinus terebinthefolius* (Brazilian pepper trees), *Acacia saligna* and *A. cyclops*.

Due to the proximity to the railway line and the nature of the vegetation, burning here will be unnecessary. Brushpile burning of alien vegetation is a possibility but will need to be discussed in depth with the fire department before hand. In previous years large brushpiles had to be carried by canoes to Rutter road before being put onto a vehicle and taken to a burning area. This is a very costly way of dealing with the material in time and resources. Chipping of the brush and taking the chippings away by canoe is possibly a better way of dealing with the brushpiles in the future.

Block 23**Westlake wetlands proper****15.56ha**

The Westlake wetlands consist of very few plant species, of which *Phragmites* is the dominant one. These reedbeds are becoming a public liability as they are now being used by vagrants at night. The area is large and is a large fire risk at the moment especially in summer when the reedbeds are dry.



Management block 23: Westlake Wetlands Proper, 2008

This area needs at least three fire breaks cut into it and the area inside of these fire breaks should be burnt in sections.

The *Phragmites* will grow back relatively quickly considering the amount of nutrients available to the plants. These reedbeds should be burnt on an annual basis. The areas being burnt should be mapped and photographed with fixed point photography on an annual basis to show the movement of the reedbed.

The desired goal is to have these *Phragmites* reedbeds burnt thereby volatising nutrients entering the Westlake Wetlands system which should in turn over a number of years start to decrease the size of these reedbeds. They will need to be extensively managed to have open water in this area.

Block 24 Bermuda triangle 1.56ha

This small triangle consists of *Phragmites australis* reedbeds and low growing grass patches. The area should be burnt at a separate time to management block 23, but should be burnt as soon as is possible, possibly 2009 / 2010.

The reeds should be burnt in rotation with management block 23 to provide sufficient habitat for the birds and animals to move around. They should not be burnt at the height of the bird breeding season (August / September) as many nests will be destroyed. The Leopard Toad breeding season (July and August) must also be taken into account as the Westlake River is one of the main breeding grounds for these Toads.

Block 25 Westlake wetlands pans 17.08ha

The pans cover a large portion of land and consist of shallow seasonal wetland pans, salt marshes and sandy flats. Dunes of dumped material have changed the landscape in the most north westerly section and have become overgrown largely by *Pennisetum clandestinum* (Kikuyu).



Management block 25: Westlake Wetlands pans, 2008

For rehabilitation purposes the kikuyu areas should be sprayed with herbicide and burnt to volatilise nutrients and provide opportunity for indigenous plant species to establish.

Dominant plants include *Sarcocornia*, *Phragmites*, *Schoenoplectus* spp., *Carex* spp., *Ficinia* spp..

The area should burn in blocks to keep nutrient levels down and to provide opportunities for the vegetation to regenerate. It has been put at low priority currently and may need to be burnt in the next 10 to 15 years.

Leopard Toad breeding season must be taken into account as well as peak bird breeding as this is a prime site for both.



Management block 25: Westlake Wetlands pans, 2008

Block 26

West of railway to Keyzers river

2.22ha

Phragmites australis is dominant in this area. The risk of the reedbeds burning here and causing problems with the railway line is high. The reedbeds should be cut down every 5 to ten years to initiate regeneration of the vegetation and to take nutrients off the site. This should be done at the end of the growing season when the nutrients are not being stored in the root stock of the plants.

Block 27	Henley road wetland east of railway	3.44ha
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This area is typical of a wetland area that is seasonally inundated with water. Due to the salt content of the soil in this area, the invasion by *Phragmites* is manageable. *Sarcocornia* is found in many of the salt pan areas here. Other dominant plants include *Stenotaphrum secundatum*, *Chrysanthemoides monilifera*, *Geranium incanum* etc.

This area will be difficult to burn due to the proximity to the railway and overhead lines. This area should be burnt within the next three to five years to facilitate rehabilitation and in order to increase the plant species diversity. Invasion by *Acacia saligna* (Port Jackson), *Acacia cyclops* (Rooikrans) and *Vikia* spp. will need to be taken into consideration if this area is to be burnt.

Block 28	Night heron Island	2.09ha
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This small island is infested with alien vegetation. The main species are *Acacia cyclops* and *Acacia saligna*. Disturbance to it has been kept as far as possible to a minimum due to it being a roosting site for *Nycticorax nycticorax* (Black-crowned Night Heron). Each year high numbers of juvenile night heron are counted here (often in excess of 30) and there is a high possibility that they breed in the reed beds surrounding this island.

This island is of low conservation status and has very low floristic species diversity. Burning this site is not a high priority. Alien plants should be thinned out and slowly replaced with indigenous trees. Dead tree branches can remain on the island as roosting platforms.

Block 29	Keysers River rehab site	5.05ha
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This rehabilitation site consists mostly of large open tracts of *Pennisetum clandestinum* with *Myoporum tenuifolium* trees which have been kept as shade trees for the public. The river edge is dominated by *Phragmites australis* which should be cut every five years or so. The area is adjacent to the railway line and is bordered on another side by residential houses.

The risks of burning this site are substantial and the biological reward for this would be very low due to high disturbance. In areas where the Working for Wetlands team has planted stands of indigenous shrubs (such as in 2004), the vegetation should be monitored for senescence. The species that were put into this area consist of mostly strandveld species and should therefore not have to burn for at least the next 20 years.

Block 30	Main water body : Zandvlei	68.1ha
Not applicable: water way		
Block 31	Northern Marina da Gama canals	14.62ha
Not applicable: water way		
Block 32	Southern Marina da Gama canals	15.37ha
Not applicable: water way		
Block 33	Estuary mouth	0.37ha
Not applicable: water way		
Block 34	Rutter Road Pond	2.33ha
Only applicable to Reed beds, however proximity to the railway line and residential areas will limit burning and may have to be done mechanically with the reed cutter.		
Block 35	Westlake and Keysers Rivers	1.99ha
Burning should not take place unless the banks of these rivers are planned to be rehabilitated in which case the kikuyu should be sprayed and burnt to start the process. Leopard Toad breeding and bird breeding seasons need to be taken into account for this. It should also tie in with the management plan for dealing with invasive aquatic plants.		
Block 36	Old Boyes Drive Corridor	
This block consists of Peninsula Granite Fynbos which is more than 20 years old currently. The last known burn on this site is unknown. This section was included into Zandvlei in 2010 and is invaded by Australian Myrtle, Eucalyptus spp, Pennisetum clandestinum and Spartium junceum. The Zandvlei Trust has been hacking here every 2 nd Saturday of the month 14h00 to 16h00 since 2009 to reduce the invasive alien vegetation. Large standing and fallen biomass remains on the site and should be removed from site by truck. This area should be prioritized for burning in the next 3 years.		
Considerations: The Old Boyes Drive road which drives through these remnants is a busy road currently due to the work being done on the water and sewerage system in Fish Hoek. If burning was to take place, the road would have to be closed (Traffic would need to assist), the residents living around this area would need to be warned and sufficient fire breaks would need to be cut and secured beforehand. The current state of the seedbank in this block is unknown and seed should be secured before hand to initiate restoration. The area is steep and the possibilities of rockfalls due to erosion would be high. This would have to be assessed and mitigation measures put in place to remove dangerous rocks prior to the rainy season.		

The fire hydrants currently need to be checked and if repairs are needed, this needs to be forwarded to the Fire Department inspector for the south district.

Block 37: Grysbok Park and the coastal strip

This area consists of two zones. Grysbok park is more or less stand alone and is surrounded by roads and houses on two sides. The vegetation consists of Strandveld but is in a degraded state with very low species diversity. The area could possibly be burnt to rejuvenate this vegetation, although many factors could prove to be challenging. Currently there are vagrants who move through this area and occasionally sleep in the bush on this site, this area is also used for prostitution and concern that informal dwellings will be built on this site need to be taken into consideration.

REFERENCES

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Many thanks to my mentor, Mr Dalton Gibbs (Area Manager Nature Conservation South) for sharing his knowledge on the ecology of the flora and fauna of the Cape Flats.

Thanks to staff who each year put lots of hard work and many after work hours into fighting the too frequent wildfires of Cape Town as well as those who assist us on an annual basis with brush pile and prescribed burning.

Many thanks to Amalia Stipinovich for the help in mapping the sword grass populations in the Road Reserve for burning in 2009 onwards and for the planning to incorporate our Veld Fire Logsheets onto the GIS layer starting this year.

Thanks to Jacques Kuyler, Manager of Tygerberg Nature Reserve for sending the managers the Fire Danger Index and weather via email each morning as well as broadcasting RED FDI warnings over the radio, for keeping our fire store inventory up to date for the whole branch, for the FDI paper explanation and fire fighting safety orders provided in this document.



For official use only Application No: _____ File No: _____		CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD	
APPLICATION <i>Application to burn combustible material in terms of Sub-section 35(4) of the Community Fire Safety By-law and to cause emissions by open burning in terms of Sub-section 14 (1) of the Air Pollution By-law of the City of Cape Town</i> Directorate: City Health Air Quality Management PO Box 2815 CAPE TOWN 8000 Tel: (021) 590-1419 Fax: (021) 590-1621			
Name of applicant: Greater Zandvlei Estuary Nature Reserve			
Address: Coniston Avenue, Retreat			
Contact Numbers	Tel: 021 701 7542	Fax: 021 713 0510	Cell: 083 713 7925
SECTION 2 - DETAILS OF PREMISES WHERE THE PROPOSED BURNING IS TO TAKE PLACE			
Erf No: (See attached photograph)			
Street Address:			
Suburb: Muizenberg			
Owner of premises: City of Cape Town			
Does the premises fall within the Cape Peninsula / or Helderberg Basin Fire Protection Association area? (If yes provide the details.) Yes – South Peninsula FPA			
SECTION 3 - AIR POLLUTION			
Complete the following giving concise answers and/or motivation. Use separate sheet if necessary.			
Supply full description of the type and estimated quantity of material to be burned, time period of burning, location as well as the estimated cost of the burning operation.			
Does the material originate on the land described in Section 2 above?			

Detail the alternatives, including cost, for reducing, reusing or recycling the material that have been investigated.	
Detail the alternative means, including cost, of disposal that have been investigated as well as cost implication.	
Is the proposed burn site 100m away from buildings or structures?	
Will the open burning pose a hazard to human health, safety, private property or the environment? Motivate answer.	
Has the owners and occupiers of adjacent properties been notified in writing of the details of the proposed burn and their right to object in writing to the Council within 7 days of being notified? Supply copy of notification and full details of properties notified.	
APC Officer (signature)	Print name:
A certificate fee of R_____ is payable to _____ in respect of this application and subsequent inspection	
Air Pollution Officer	Date
Name of receiving official	Designation
SECTION 4 – FIRE SERVICE	
Is the land on which the proposed burning of combustible material will take place State land, a farm, small holding or land within a proclaimed township not used for residential purposes? The land is state land owned by City of Cape Town, managed by the Biodiversity Management Branch.	
Describe the fire fighting measures that will be put in place during the proposed open burn: Bakkie sakkies, beaters, rakos etc will be on site. Staff are equipped and correctly trained. Fire control and Lakeside are informed of the brush pile burning on the morning and given the permit number for reference. All regulations and permit conditions will be adhered to.	
Is the area around the proposed combustible material free of material which is likely to spread the fire? Fire breaks are put in place, vegetation surrounding the brushpiles is cleared of combustible material prior to the burn taking place.	

Are the heaps of such a size that should a sudden wind arise the fire can be easily doused using equipment on site?

All brush piles are of a size no larger than 5m X4m X 2m and area packed in such a way as to ensure quick combustibility and easy dousing there after.

All nature conservation staff have had fire fighting training and wild fire suppression experience. There will be a bakkie sakkie on the site as well as beaters, rake hoes and knapsack sprayers.



Signature of applicant:

Address: Coniston Avenue, Retreat

Telephone No: 021 701 7542

For Chief Fire Officer: (signature)

Print name:

A certificate fee of R_____ is payable to _____ in respect of this application and subsequent inspection.

Chief fire officer

Date

Name of receiving Official

Designation



For official use only Application No: _____ File No: _____		CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD	
APPLICATION <i>Application to burn combustible material in terms of Sub-section 35(4) of the Community Fire Safety By-law and to cause emissions by open burning in terms of Sub-section 14 (1) of the Air Pollution By-law of the City of Cape Town</i>			
Directorate: City Health Air Quality Management PO Box 2815 CAPE TOWN 8000		Tel: (021) 590-1419 Fax: (021) 590-1621	
Name of applicant: Greater Zandvlei Estuary Nature Reserve			
Address: Bath Road, Muizenberg			
Contact Numbers	<u>Tel:</u> 021 701 7542	Fax: 021 701 7542	Cell: 083 713 7925
SECTION 2 - DETAILS OF PREMISES WHERE THE PROPOSED BURNING IS TO TAKE PLACE			
Erf No: 00-87402-1			
Street Address: Bath Road Block 18, Muizenberg			
Suburb: Muizenberg			
Owner of premises: City of Cape Town, Biodiversity Management			
Does the premises fall within the Cape Peninsula / or Helderberg Basin Fire Protection Association area? (If yes provide the details.) Yes, South Peninsula Fire Protection Association.			
SECTION 3 - AIR POLLUTION			
Complete the following giving concise answers and/or motivation. Use separate sheet if necessary.			

Supply full description of the type and estimated quantity of material to be burned, time period of burning, location as well as the estimated cost of the burning operation. Type of material: Cape Flats Strandveld, Dune Slack Vegetation: live, still standing biomass, approximately one hectare of vegetation (150m X 68m). Burning is for conservation reasons to regenerate the vegetation component (Passerinas, restios and other reseeding plants). Bath Road falls within the 2006 proclaimed boundary of the Greater Zandvlei Estuary Nature Reserve. The burn will need to take place during February 2010. Cost of burning will be minimal. Cost of not burning will result in vegetation becoming senescent, resulting in a real fire hazard. Currently there is already a high biomass of dead material collecting on the site from senescent trees.
Does the material originate on the land described in Section 2 above? Yes
Detail the alternatives, including cost, for reducing, reusing or recycling the material that have been investigated. There is no way that the chemical and physical properties of burning this vegetation can be reproduced by other means.
Detail the alternative means, including cost, of disposal that have been investigated as well as cost implication. There is no way that the chemical and physical properties of burning this vegetation can be reproduced by other means.
Is the proposed burn site 100m away from buildings or structures? Burn site is surrounded on two sides by houses, however these are separated from the vegetation by a road on one side and a sandy fire break on the other side. The burn will have to take place with the wind in a south easterly or southerly direction as any other wind will blow any smoke into Royal Road and Prince George Drive. Traffic services may be needed to ensure that the road users do not cause obstructions by rubber necking. The northern and southern ends of the block will need to be wetted down using a bakkie sakkie prior to burning as a safety measure for the houses.

Will the open burning pose a hazard to human health, safety, private property or the environment? Motivate answer. The burning should not last for more than 2 hours and the amount of smoke caused will be minimal if it takes place in February when the vegetation is dry and before the first winter rains hit. The burning should not cause a hazard to public health. Pamphlets will be distributed to all residents to raise awareness for the proposed burn and give them an opportunity to raise any concerns that they may have.	
Has the owners and occupiers of adjacent properties been notified in writing of the details of the proposed burn and their right to object in writing to the Council within 7 days of being notified? Supply copy of notification and full details of properties notified. Owners of properties will be notified well in advance by pamphlet drop and will have the opportunity to raise any concerns that they have with our branch. This will only take place closer to the burn time (beginning of January 2010). 80 Pamphlets were dropped at residents surrounding the burn area. All queries were dealt with either telephonically or by email. A register of premises where the pamphlets were dropped was taken and is available (by fax).	
APC Officer (signature)	Print name:
A certificate fee of R_____ is payable to _____ in respect of this application and subsequent inspection	
Air Pollution Officer	Date
Name of receiving official	Designation
SECTION 4 – FIRE SERVICE	
Is the land on which the proposed burning of combustible material will take place State land, a farm, small holding or land within a proclaimed township not used for residential purposes? State land. Part of the proclaimed Greater Zandvlei Estuary Nature Reserve.	
Describe the fire fighting measures that will be put in place during the proposed open burn:	

Is the area around the proposed combustible material free of material which is likely to spread the fire? The area has a road on the southern side. The western side of the block is a sand dune with sparse vegetation on the slope and thicket vegetation at the top which is not prone to burning. The northern end is sandy with sparse grass cover and little vegetation. The eastern side has a road dividing it from other properties.	
Are the heaps of such a size that should a sudden wind arise the fire can be easily doused using equipment on site? The vegetation is low growing (less than 1.5m tall) and will provide easy access from the road on the eastern side as well as road access from the southern side for bakkie sakkies. The staff available for this operation will include: Working on Fire South team, Rondevlei and Zeekoevlei fire fighting staff, Zandvlei Nature Reserve staff. Bakkie Sakkies, rakes, beaters, knapsacks, fire trailers etc. All staff are trained in fire fighting operations including controlled burn, wild fire and brush pile burning operations. The Zandvlei Trust (Friends Group) will also help to raise awareness of this operation in the community. The Muizenberg Rate Payers association will be consulted with this as well as the Ward 64 Councillor Mr Demetri Qually. 22 February 2010: Cllr Qually is aware of the proposed burn. Members of the Zandvlei Advisory Committee were briefed on the burn on 10 February 2010 which include representatives of the ratepayers, home owners associations and interested parties.	
 Signature of applicant:	
Address: Nature Conservation Zandvlei, Off Coniston Road, Retreat	
Telephone No: 021 701 7542	
For Chief Fire Officer: (signature)	Print name:
A certificate fee of R_____ is payable to _____ in respect of this application and subsequent inspection.	
Chief fire officer	Date
Name of receiving Official	Designation



Dalton Gibbs
Area Manager South
c/o Rondevlei Nature Reserve
Fisherman's Walk
Zeekoevlei



*" Caring for the City's nature today,
for our children's tomorrow"*

MEMO

Bath road Dune slack vegetation burning as proposed in the Fire Management Plan of Greater Zandvlei Estuary Nature Reserve, 2008.

Question1:

Type of material: Cape Flats Strandveld, Dune Slack Vegetation: live, still standing biomass, approximately one hectare of vegetation (150m X 68m). Burning is for conservation reasons to regenerate the vegetation component (Passerinas, restios and other reseeding plants). Bath Road falls within the 2006 proclaimed boundary of the Greater Zandvlei Estuary Nature Reserve. The burn will need to take place during February 2010. Cost of burning will be minimal. Cost of not burning will result in vegetation becoming senescent, resulting in a real fire hazard. Currently there is already a high biomass of dead material collecting on the site from senescent trees.

Question 2:

Yes.

Question 3 and 4:

There is no way that the chemical and physical properties of burning this vegetation can be reproduced by other means.

Question 5:

Burn site is surrounded on two sides by houses, however these are separated from the vegetation by a road on one side and a sandy fire break on the other side. The burn will have to take place with the wind in a south easterly or southerly direction as any other wind will blow any smoke into Royal Road and Prince George Drive. Traffic services may be needed to ensure that the road users do not cause obstructions by rubber necking.

The northern and southern ends of the block will need to be wetted down using a bakkie sakkie prior to burning as a safety measure for the houses.

Question 6:

The burning should not last for more than 1 hour and the amount of smoke caused will be minimal if it takes place in February when the vegetation is dry and before the first winter rains hit. The burning should not cause a hazard to public health.

Pamphlets will be distributed to all residents to raise awareness for the proposed burn and give them an opportunity to raise any concerns that they may have.

Question 7:

Owners of properties will be notified well in advance by pamphlet drop and will have the opportunity to raise any concerns that they have with our branch. This will only take place closer to the burn time (beginning of January 2010).

Question 8:

State land. Part of the proclaimed Greater Zandvlei Estuary Nature Reserve.

Question 9:

The area has a road on the southern side. The western side of the block is a sand dune with sparse vegetation on the slope and thicket vegetation at the top which is not prone to burning. The northern end is sandy with sparse grass cover and little vegetation. The eastern side has a road dividing it from other properties.

Question 10:

The vegetation is low growing (less than 1.5m tall) and will provide easy access from the road on the eastern side as well as road access from the southern side for bakkie sakkies.

The staff available for this operation will include: Working on Fire South team, Rondevlei and Zeekoevlei fire fighting staff, Zandvlei Nature Reserve staff. Bakkie Sakkies, rakos, beaters, knapsacks, fire trailers etc. All staff are trained in fire fighting operations including controlled burn, wild fire and brush pile burning operations. The Zandvlei Trust (Friends Group) will also help to raise awareness of this operation in the community. The Muizenberg Rate Payers association will be consulted with this as well as the Ward 64 Councillor Mr Demetri Qually.

— Biodiversity Management —

DATE	12 January 2009
To	Director : Environmental Resource Management Department Mr Osman Asmal

Motivation to undertake open burning of endangered Cape Flats Dune Strandveld at Erf 0087402-1, Bath Road as part of the proclaimed Local Authority Greater Zandvlei Estuary Nature Reserve, Muizenberg

Dear Mr Asmal

The Greater Zandvlei Estuary Nature Reserve is situated between residential areas of Muizenberg, Marina da Gama, Lakeside and Retreat. It originally consisted of a small area (only 22 ha) of terrestrial habitat which was then expanded to 200 ha in 2006 and now covers the entire water body and estuary mouth. The Zandvlei estuary is the last functional estuary on the False Bay coastline and as such supports many endangered habitats and ecosystems. One of the protected sites which now falls within the 2006 proclamation boundary is Erf 0087402-1 (Bath Road) which consists of the endangered Cape Flats Dune Strandveld on the eastern side and open sandy habitat on the western side of the block.

Cape Flats Dune Strandveld is fire driven and maintaining burning cycles between 15 and 20 years are of the utmost importance to sustain the viability of the vegetation and ensure that we do not lose our reseeding component. In this particular site which is land locked on three sides and has a small portion of land connecting it to the False Bay coastal strip, the area has not burnt in at least the last 20 years which has started impacting on the species regeneration of this vegetation. This area needs to be burnt out of the winter season (April being the optimal month) in order to ensure that the geophytes are stimulated in the correct season.

In 2008 a Fire study was undertaken and Fire Management Plan compiled by the Reserve Manager for Greater Zandvlei Estuary Nature Reserve, highlighting which areas are of ecological importance for burning, which areas are currently highlighted as fire hazards due to a high fuel load and includes a fire history map of the area which will be updated on an annual basis. Currently this vegetation is causing a fire hazard due to the senescent vegetation creating a high fuel load and biomass. If a wild fire should start on this area due to an ignition source such as a cigarette, it could present danger to adjacent residential properties or could spread to adjacent vegetated sites such as Grysbok Park. In order to nullify this possibility and mimic the natural ecological functioning, the Biodiversity Management department wishes to obtain a permit to burn in March/April 2009.

A pamphlet has been drawn up to notify residents of our intention to burn and these will be issued by letter drop now to provide 7 days for written objections to City of Cape Town and again in April before the burn takes place. Notice will also be issued to the media through our media liaison officials to advertise the intent to burn.

If a prescribed burn is not undertaken on this site, it will result in a loss of biodiversity and a threat to adjacent property.

All the specifications on the burning permit application will be complied with. Sufficient Nature Conservation fire fighting staff (approximately 30 trained staff) and equipment (including a bakkie sakkie, unimog, snapsack sprayers, beaters, rake hoes, spades etc) will be available in the South district Nature Conservation Branch to undertake this prescribed burn at Bath Road. Staff have been trained at various levels (from crew leader to fire boss) and have many hours of fire fighting experience in the field.

Kind Regards



Cassandra Quinton Sheasby
Reserve Manager
Greater Zandvlei Estuary Nature Reserve
Ph/fax: 083 713 7925

Supported / Not Supported:

Name :	Designation :	Signature :	Date :
Dalton Gibbs	Area Manager South Biodiversity Management Branch		

Supported / Not Supported:

Name :	Designation :	Signature :	Date :
Clifford Dorse	Biodiversity Co-ordinator Biodiversity Management Branch		

Supported / Not Supported:

Name :	Designation :	Signature :	Date :
Dr Patricia Holmes	Biophysical Specialist Biodiversity Management Branch		

Supported / Not Supported:

Name :	Designation :	Signature :	Date :
Julia Wood	Head Biodiversity Management Branch		

Supported / Not Supported:

Name :	Designation :	Signature :	Date :
Osman Asmal	Director Environmental Resource Management Department		



22 Feb. 2010 15:527

Fire Safety LUTION 021 5901621

No. 9794
JF OF ... OWN
18IXEKO SASEKAPA
STAD KAAPSTAD

CMC AIR POLLUTION

AUTHORITY: APPROVAL OPEN BURNING

After careful considering all the relevant information the Council hereby grants approval for open burning to take place.

Name of Applicant: Greater Zandvlei Estuary Nature Reserve	Details of premises where burning is to take place: Erf No: 00-87402-1
Address: Bath Road	Street Address: Bath Road Block 18
Suburb: Muizenberg	Suburb: Muizenberg
	Tel: (021) 701 7542 Fax: (021) 701 7542 Cell: 083 713 7926

Description of burning to be conducted: Alien Vegetation
Approximate period of proposed burning:

CONDITIONS

1. The following Departments and surrounding neighbours are to be telephonically notified prior to any burning taking place:

Air Pollution Control	590-1419	Fire Dept	590-1900	FPO		SA Police	
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- No burning shall be undertaken between 12:00 on any Friday and 07:00 the following Monday or on any public holiday;
- All heaps will be kept within manageable size to enable the fire to be doused rapidly in the event of a sudden wind arising;
- Adequate fire breaks or tracers will be made around the area or heaps to be burned;
- Burning must be limited to between 8:00 and 18:00 daily and all burning material must be extinguished by 16:00 unless a prescribed block burn;
- Under no circumstances is the fire to be left unattended until it is completely doused with no glowing embers left;
- Smoke may not cause any traffic hazard or a nuisance to neighbouring properties; Burning must be limited to the approved areas only;
- Only burn in compliance with NFDRS, within the following guidelines TEMPERATURE less than 28°C; HUMIDITY more than 25%; WIND SPEED less than 10 km/h;
- The controlling authority has the right to suspend or prevent any burning activities should the need arise;
- The extinguishing medium and associated equipment/resources are to be readily available at all times while burning takes place.
- Observe the conditions of the National Veld Fire and Forest Act 101 of 88;
- Accept full responsibility for any damage which may occur to any property as a result of the spreading of the fire outside the boundaries of your property and be liable for all cost incurred by fire fighting teams extinguishing runaway fires;
- A competent person to be present at all times when burning

AIR POLLUTION CONTROL REQUIREMENTS

- This approval must be implemented in conjunction with the application submitted to the Air Pollution Control Section.
- The Air Pollution Control Section reserves the right, at the discretion of the Air Pollution Control official, to call upon the applicant to cease burning for a given period of time as may be determined by the said official.

The above conditions are to be strictly adhered to at all times, failure to comply there-to may result in the revocation of the permit. The permit to be available for scrutiny at all times when open burning is conducted.

This permit is valid from 1 March 2010 to 3 May 2010
Additional requirements see attached YES/NO

APPROVAL: AIR POLLUTION CONTROL

Approval to conduct open burning in terms of Section 14(1) of the Air Pollution Control By-law promulgated in Provincial Gazette No.5978 dated 4 February 2003.

Name of Officer: Bethwell Mbete

Signature:

Date: 22 February 2010

Contact No: (021) 590-1419

APPROVAL: FIRE SERVICES

Approval to conduct open burning in terms of sub-section 35(4) of the Community Fire Safety By-law No. 5832 dated February 2002.

Name of Officer:

Signature:

Date:

Contact No:

CITY OF CAPE TOWN
FIRE & RESCUE SERVICE
Fire & Life Safety: WEST

NO OBJECTION

for CHIEF OFFICER

Ask for: Mrs Desiree Mentor
Tel: 7842011
Fax: 7821185
E-Mail: Desiree.Mentor@capetown.gov.za
Ref: Filename:

Cela: Nksk Desiree Mentor
Umnxoba: 7842011
Ifeksi: 7821185

Vra vir: Mev Desiree Mentor
Tel: 7842011
Faks: 7821185

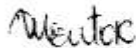
CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

South Peninsula Subcouncil (19)

ENVIRONMENTAL HEALTH DEPARTMENT

APPLICATION FOR AUTHORISATION TO CARRY OUT OPEN BURNING IN TERMS OF THE CITY OF CAPE TOWN: AIR POLLUTION CONTROL BY-LAW: GREATER ZANDVLEIESTUARY NATURE RESERVE, ERF 00-87402-1 BATH ROAD18, MUIZENBERG

Please note the Chairperson, Demetri Qually and the Subcouncil Manager, Desiree Mentor considered the above application and in view of time constraints and IN TERMS OF DELEGATION 61.11



MANAGER: SOUTH PENINSULA SUBCOUNCIL (19)

12/3/2010

DATE



CHAIRPERSON: SOUTH PENINSULA SUBCOUNCIL (19)

12/3/2010

DATE



For official use only Application No: _____ File No: _____		CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD	
APPLICATION <i>Application to burn combustible material in terms of Sub-section 35(4) of the Community Fire Safety By-law and to cause emissions by open burning in terms of Sub-section 14 (1) of the Air Pollution By-law of the City of Cape Town</i>			
Directorate: City Health Air Quality Management PO Box 2815 CAPE TOWN 8000		Tel: (021) 590-1419 Fax: (021) 590-1621	
Name of applicant: Greater Zandvlei Estuary Nature Reserve			
Address: Coniston Avenue Retreat			
Contact Numbers	Tel: 021 701 7542	Fax: 021 701 7542	Cell: 083 713 7925
Street Address: Off Coniston Avenue Retreat			
Suburb: Retreat			
Owner of premises: City of Cape Town, Environmental Resource Management			
Does the premises fall within the Cape Peninsula / or Helderberg Basin Fire Protection Association area? (If yes provide the details.) Yes, south Peninsula Fire Protection Association			

SECTION 2 - DETAILS OF PREMISES WHERE THE PROPOSED BURNING IS TO TAKE PLACE	
Erf No: These are all the erf numbers comprising Greater Zandvlei Estuary Nature Reserve, only one or two of these are going to be used to burn brush piles. Main areas are within the original reserve (off Coniston Avenue: North of main water body) 00-124684 00-83078 00-145079 00-145080 00-83068 00-83066 00-0000-27 00-83045 00-83070 00-835350 00-83067 00-84816 00-85351 00-84811-1 00-84817 00-84818 00-84819 00-84811-2 00-83527 00-83541 00-93391 00-93404 00-93602 00-94080 00-93688 00-112587 00-93942 00-83061	
Complete the following giving concise answers and/or motivation. Use separate sheet if necessary.	
Supply full description of the type and estimated quantity of material to be burned, time period of burning, location as well as the estimated cost of the burning operation. Burning of brush piles to reduce flammable biomass on site, mostly as part of alien vegetation management. Burning will take place through months of winter (June to August) when conditions ensure that fire will not spread. FDI, wind and humidity will be taken into account.	
Does the material originate on the land described in Section 2 above? Yes	

Detail the alternatives, including cost, for reducing, reusing or recycling the material that have been investigated. Most brush is situated in areas of the nature reserve where truck access is restricted, reducing the ability and increasing the cost of manual removal. Some of the material is mulched.
Detail the alternative means, including cost, of disposal that have been investigated as well as cost implication. Alternative usage/recycling of material has been investigated. Some of the material is chipped and used as mulch/path lining as well as brush being used to prevent illegal vehicle access on beaches etc., however excessive amounts of brush become a fire risk in the Nature Reserve due to higher fuel loads and are not economical to remove manually. Decomposition of these brush piles has a negative effect on the soil nutrient levels (which are nutrient poor in Strandveld) and change the soil horizon over time which leads to loss of indigenous plant and animal species. In accordance with the Biodiversity Strategy, we are obliged to prevent this from occurring. Burning of this material volatilises nutrients and they therefore do not leach back into the system, providing habitat for red data species and rehabilitation of post alien infested areas that have been cleared. Cost of burning excess brush is minimal: labour to supervise burn, time, resources. Less than R1000 per day Cost of alternatives to burning: chipping: chipping equipment, time, resources, nutrient loading on biodiversity (negative effect), transport, In excess of R3000 per day landfill site: transport, equipment, time, resources, space of landfill site, labour In excess of R2500 per day
Is the proposed burn site 100m away from buildings or structures? All brush piles are situated far away from buildings, structures, overhead powerlines and roads to prevent any damage.
Will the open burning pose a hazard to human health, safety, private property or the environment? Motivate answer. Burning of brush piles situated far away from houses and residential dwellings decreases any possibility of damage to health or safety.

Has the owners and occupiers of adjacent properties been notified in writing of the details of the proposed burn and their right to object in writing to the Council within 7 days of being notified? Supply copy of notification and full details of properties notified.

Residential properties in the area are situated far away from sites of burning. Burning of brush piles is advertised each year in various forms: Zandvlei Trust newsletter and website, the Echo etc.

APC Officer (signature)

Print name:

A certificate fee of R_____ is payable to _____ in respect of this application and subsequent inspection

Air Pollution Officer

Date

Name of receiving official

Designation

SECTION 4 – FIRE SERVICE

Is the land on which the proposed burning of combustible material will take place State land, a farm, small holding or land within a proclaimed township not used for residential purposes? State Land

Describe the fire fighting measures that will be put in place during the proposed brush pile burn:

All staff have received current fire fighting training and have experience in fire suppression and mop up operations. Sufficient fire beaters, rakos, spades, knapsack sprayers, hoses, portable pumps and bakkie sakkies are available on site. All staff have been trained in the usage of this equipment. Fire fighting overalls, first aid kits, fire goggles, gloves and fire boots have been provided to staff.

All the relevant safety measures will be adhered to in accordance with the fire burning permit.

Is the area around the proposed combustible material free of material which is likely to spread the fire?

Brush piles are made in areas which are sandy and open with little combustible material in the immediate vicinity.

Are the heaps of such a size that should a sudden wind arise the fire can be easily doused using equipment on site?

Heaps are not larger than 3m X3m in size to ensure that the brush piles burn consistently and totally. All coals are then raked into the central area and doused with water until completely out.


Signature of applicant:

Address: PO Box 30028 Tokai

Telephone No: 021 701 7542

For Chief Fire Officer: (signature)

Print name:

A certificate fee of R_____ is payable to _____ in respect of this application and subsequent inspection.

Chief fire officer

Date

Name of receiving Official

Designation



For official use only Application No: _____ File No: _____		CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD	
APPLICATION <i>Application to burn combustible material in terms of Sub-section 35(4) of the Community Fire Safety By-law and to cause emissions by open burning in terms of Sub-section 14 (1) of the Air Pollution By-law of the City of Cape Town</i>			
Directorate: City Health Air Quality Management PO Box 2815 CAPE TOWN 8000		Tel: (021) 590-1419 Fax: (021) 590-1621	
Name of applicant: Greater Zandvlei Estuary Nature Reserve			
Address: Coniston Avenue, Retreat			
Contact Numbers	Tel: 021 701 7542	Fax: 021 713 0510	Cell: 083 713 7925
SECTION 2 - DETAILS OF PREMISES WHERE THE PROPOSED BURNING IS TO TAKE PLACE			
Erf No: 00-85352 (See attached photograph)			
Street Address: Entrance from end of Park Island Way, Marina da Gama			
Suburb: Muizenberg/Marina da Gama			
Owner of premises: City of Cape Town			
Does the premises fall within the Cape Peninsula / or Helderberg Basin Fire Protection Association area? (If yes provide the details.) Yes – South Peninsula FPA			
SECTION 3 - AIR POLLUTION			
Complete the following giving concise answers and/or motivation. Use separate sheet if necessary.			

Supply full description of the type and estimated quantity of material to be burned, time period of burning, location as well as the estimated cost of the burning operation. Material consists of cut brush stacked into small manageable brush piles placed into cleared areas away from other vegetation. Most of this has been generated from alien clearing, rehabilitation efforts and garden refuse from maintenance. Species include: <i>Acacia Cyclops</i>, <i>Acacia saligna</i>, <i>Typha capensis</i>, <i>Phragmites australis</i>, <i>Acacia longifolia</i>, <i>Acacia mearnsii</i>, <i>Pennisetum clandestinum</i>, <i>Vicia sativa</i>, <i>Ricinus communis</i>, <i>Myoporum tenuifolium</i>, etc
Does the material originate on the land described in Section 2 above? Yes.
Detail the alternatives, including cost, for reducing, reusing or recycling the material that have been investigated. Some of the material has already been chipped and removed from site, however the majority of the material is too dry to chip without causing damage to the chipping machine. The chipping machine that was used belongs to another department which makes securing the usage of it difficult. The brush as it stands cannot be used for any purpose and it is currently creating a fire hazard.
Detail the alternative means, including cost, of disposal that have been investigated as well as cost implication. Carting away to the landfill site: will take at least 30 loads (1400 Nissan bakkie is only vehicle at our disposal for removal) which will be extremely expensive in terms of staff allocation, time and resources. This will also be charged to our department per load at the landfill site: R251 per load.
Is the proposed burn site 100m away from buildings or structures? Yes, there are various options of suitable brush pile burning areas on the island.
Will the open burning pose a hazard to human health, safety, private property or the environment? Motivate answer. No, the island is removed from residential properties and is surrounded by waterways. All staff are equipped with personal fire fighting equipment and have had sufficient training and experience. Burning will only take place with correct wind and weather conditions to ensure that smoke does not travel to residential houses.

Has the owners and occupiers of adjacent properties been notified in writing of the details of the proposed burn and their right to object in writing to the Council within 7 days of being notified? Supply copy of notification and full details of properties notified.

All owners of adjacent properties are aware that brushpile burning takes place annually. Each year articles are published in the newsletters and local newspapers to inform residents of the burning. The owners of immediate adjacent properties will be informed by way of a standard burning flier of the Biodiversity management branch (attached) at least one week prior to the burn window.

APC Officer (signature)

Print name:

A certificate fee of R_____ is payable to _____ in respect of this application and subsequent inspection

Air Pollution Officer

Date

Name of receiving official

Designation

SECTION 4 – FIRE SERVICE

Is the land on which the proposed burning of combustible material will take place State land, a farm, small holding or land within a proclaimed township not used for residential purposes?

The land is state land owned by City of Cape Town, managed by the Biodiversity Management Branch.

Describe the fire fighting measures that will be put in place during the proposed open burn:

Bakkie sakkies, beaters, rakos etc will be on site. Staff are equipped and correctly trained. Fire control and Lakeside are informed of the brush pile burning on the morning and given the permit number for reference. All regulations and permit conditions will be adhered to.

Is the area around the proposed combustible material free of material which is likely to spread the fire?

Fire breaks are put in place, vegetation surrounding the brushpiles is cleared of combustible material prior to the burn taking place.

Are the heaps of such a size that should a sudden wind arise the fire can be easily doused using equipment on site?

All brush piles are of a size no larger than 5m X4m X 2m and area packed in such a way as to ensure quick combustibility and easy dousing there after.

All nature conservation staff have had fire fighting training and wild fire suppression experience. There will be a bakkie sakkie on the site as well as beaters, rake hoes and knapsack sprayers.



Signature of applicant:

23/11/2010

Address: Coniston Avenue, Retreat

Telephone No: 021 701 7542

For Chief Fire Officer: (signature)

Print name:

A certificate fee of R_____ is payable to _____ in respect of this application and subsequent inspection.

Chief fire officer

Date

Name of receiving Official

Designation

4. May. 2011 12:46 old mutual
27215901621

AIR QUALITY MGMT

No. 6729 P. 1 01/01
CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

27215901621

AUTHORITY: APPROVAL OPEN BURNING

After careful considering all the relevant information the Council hereby grants approval for open burning to take place.

Name of Applicant: Greater Zandvoort Estuary Nature Reserve Owner of Property: City of Cape Town Address: Coniston Avenue Suburb: Retreat I.D. No: Municipal Rates Account No: Postal Address:	Details of premises where burning is to take place: Erf no: 00-85352 Street Address: Entrance from end of Park Island Way, Marina da Gama Suburb: Muizenberg Tel: (021) 701 7501 Fax: (021) 713 0510 Cell: 083 713 7925
(To which account must be rendered)	
Description of burning to be conducted: Alien Vegetation	
Approximate period of proposed burning:	

CONDITIONS

1. The following Departments and surrounding neighbours are to be telephonically notified prior to any burning taking place:

Air Quality Management	Fire Dept	FPA	SA Police
021 590-1419	021 590-1900		

- No burning shall be undertaken between 12:00 on any Friday and 07:00 the following Monday or on any public holiday;
- All heaps will be kept within manageable size to enable the fire to be doused rapidly in the event of a sudden wind arising;
- Adequate fire breaks or tracers will be made around the area or heaps to be burned;
- Burning must be limited to between 8:00 and 16:00 daily and all burning material must be extinguished by 16:00 unless a prescribed block burn;
- Under no circumstances is the fire to be left unattended until it is completely doused with no glowing embers left
- Smoke may not cause any traffic hazard or a nuisance to neighbouring properties; Burning must be limited to the approved areas only;
- Only burn in compliance with NFDRS, within the following guidelines TEMPERATURE less than 28°C; HUMIDITY more than 25%; WIND SPEED less than 10 km/h;
- The controlling authority has the right to suspend or prevent any burning activities should the need arise;
- The extinguishing medium and associated equipment/resources are to be readily available at all times while burning takes place.
- Observe the conditions of the National Veld Fire and Forest Act 101 of 88;
- Accept full responsibility for any damage which may occur to any property as a result of the spreading of the fire outside the boundaries of your property and be liable for all cost incurred by fire fighting teams extinguishing runaway fires;
- A competent person to be present at all times when burning

AIR QUALITY MANAGEMENT CONTROL REQUIREMENTS

- This approval must be implemented in conjunction with the application submitted to the Air Pollution Control Section.
- The Air Pollution Control Section reserves the right, at the discretion of the Air Pollution Control official, to call upon the applicant to cease burning for a given period of time as may be determined by the said official.

The above conditions are to be strictly adhered to at all times, failure to comply thereto may result in the revocation of the permit. The permit to be available for scrutiny at all times when open burning is conducted.

This permit is valid as from 2 May 2011 to 30 September 2011

Approved By Subcouncil 19 dated: 20 May 2011

Additional requirements see attached YES/NO

RECOMMENDATION: AIR QUALITY MANAGEMENT
Recommended that approval be granted to conduct open burning in terms of Section 20(1)(2) of the Air Quality Management By-law promulgated in Provincial Gazette No. 6772 dated 30 July 2010.

Name of Officer: Bethwell Mbete

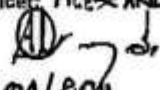
Signature: 

Date: 01 April 2011

Contact No: (021) 590 1419

APPROVAL: FIRE SERVICES for CHIEF OFFICER
Approval to conduct open burning in terms of sub-section 35(4) of the Community Fire Safety By-law No. 5832 dated February 2002.

Name of Officer: ALEXANDER N

Signature: 

Date: 28/04/2011

Contact No: 021 797 6842

CITY OF CAPE TOWN
FIRE & RESCUE SERVICE
Fire & Life Safety: WEST

28 APR 2011

NO OBJECTION

AUTHORITY: APPROVAL OPEN BURNING

After careful considering all the relevant information the Council hereby grants approval for open burning to take place.

Name of Applicant : Zandvlei Estuary Nature Reserve	Details of premises where burning is to take place: Erf No: 00-83049-1; 00-83061; 00-82622; 00-85352
Address: Coniston Avenue	Street Address: Coniston Avenue
Suburb: Muizenberg	Suburb: Muizenberg
	Tel: (021) 701 7542
	Fax: (021) 701 7542
	Cell: 089 713 7925

Description of burning to be conducted : Alien Vegetation
Approximate period of proposed burning:

CONDITIONS

1. Adequate fire brakes or tracers will be made around the area or heaps to be burned;
2. All heaps will be kept within manageable size to enable the fire to be doused rapidly in the event of a sudden wind arising;
3. The following Departments and surrounding neighbours are to be telephonically notified prior to any burning taking place:

Air Pollution Control	590-1419	Fire Dept	590-1900	FPO		SA Police
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4. No burning shall be undertaken between 12:00 on any Friday and 07:00 the following Monday or on any public holiday;
5. Burning must be limited to between 06:00 and 16:00 daily and all burning material must be extinguished by 16:00 unless a prescribed block burn;
6. Under no circumstances is the fire to be left unattended until it is completely doused with no glowing embers left;
7. Smoke may not cause any traffic hazard or a nuisance to neighbouring properties;
8. Burning must be limited to the approved areas only;
9. Only burn when weather conditions are favourable, within the following guidelines TEMPERATURE less than 28°C; HUMIDITY more than 25%; WIND SPEED less than 10 km/h;
10. The controlling authority has the right to suspend or prevent any burning activities should the need arise;
11. The extinguishing medium and associated equipment/resources are to be readily available at all times while burning takes place.
12. Observe the conditions of the National Veld Fire and Forest Act No 101 of 98;
13. Accept full responsibility for any damage which may occur to any property as a result of the spreading of the fire outside the boundaries of your property and be liable for all cost incurred by fire fighting teams extinguishing runaway fires;
14. A competent person to be present at all times when burning

AIR POLLUTION CONTROL REQUIREMENTS

1. This approval must be implemented in conjunction with the application submitted to the Air Pollution Control Section.
2. The Air Pollution Control Section reserves the right, at the discretion of the Air Pollution Control official, to call upon the applicant to cease burning for a given period of time as may be determined by the said official.

The above conditions are to be strictly adhered to at all times, failure to comply there-to may result in the revocation of the permit. The permit to be available for scrutiny at all times when open burning is conducted.

This permit is valid from 4 May to 30 September 2009.

APPROVAL: AIR POLLUTION CONTROL Approval to do open burning in terms of Section 14(1) of the Air Pollution Control By-law promulgated in Provincial Gazette No.5979 dated 4 February 2003. Name of Officer: Bethwell Mbete Signature:  Date: 20 April 2009 Contact No: (021) 590-1419	APPROVAL: FIRE SERVICES Approval to conduct open burning in terms of sub-section 35(4) of the Community Fire Safety By-law No. 5832 dated February 2002. Name of Officer: _____ Signature: _____ Date: _____ Contact No: _____
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APPROVAL: DEPARTMENT OF WATER AFFAIRS AND FORESTRY The applicant is permitted to burn in accordance with the above mentioned undertaking in terms of permission issued under delegated powers in accordance with the provisions of Government Notice Number	
Name of Officer: _____	
Signature: _____	
Date: _____	
Contact No: _____	Permit No:

24 APR 2008 12:21

CMC AIR POLLUTION 021 5901621

NO. 550 CITY: 3 CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

AUTHORITY: APPROVAL OPEN BURNING

After careful considering all the relevant information the Council hereby grants approval for open burning to take place.

Name of Applicant: Zandvlei Estuary Nature Reserve	Details of premises where burning is to take place: Erf No: 00-83049-1; 00-83061; 00-82822; 00-85352
Address: Coniston Avenue, Entrance off Military Road	Street Address: Coniston Avenue, Entrance off Military Road
Suburb: Retreat / Muizenberg	Suburb: Retreat / Muizenberg
	Tel: : (021) 701 7542
	Fax : (021) 701 7542
	Cell : 083 713 7925

Description of burning to be conducted: Alien Vegetation
Approximate period of proposed burning:

CONDITIONS

1. Adequate fire brakes or tracers will be made around the area or heaps to be burned;
2. All heaps will be kept within manageable size to enable the fire to be doused rapidly in the event of a sudden wind arising;
3. The following Departments and surrounding neighbours are to be telephonically notified prior to any burning taking place:

Air Pollution Control	590-1419	Fire Dept		FPO		SA Police	
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4. No burning shall be undertaken between 12:00 on any Friday and 07:00 the following Monday or on any public holiday;
5. Burning must be limited to between 08:00 and 16:00 daily and all burning material must be extinguished by 16:00 unless a prescribed block burn;
6. Under no circumstances is the fire to be left unattended until it is completely doused with no glowing embers left;
7. Smoke may not cause any traffic hazard or a nuisance to neighbouring properties;
8. Burning must be limited to the approved areas only;
9. Only burn when weather conditions are favourable, within the following guidelines TEMPERATURE less than 28°C; HUMIDITY more than 25%; WIND SPEED less than 10 km/h;
10. The controlling authority has the right to suspend or prevent any burning activities should the need arise;
11. The extinguishing medium and associated equipment/resources are to be readily available at all times while burning takes place.
12. Observe the conditions of the National Veld Fire and Forest Act No 101 of 88;
13. Accept full responsibility for any damage which may occur to any property as a result of the spreading of the fire outside the boundaries of your property and be liable for all cost incurred by fire fighting teams extinguishing runaway fires;
14. A competent person to be present at all times when burning

AIR POLLUTION CONTROL REQUIREMENTS

1. This approval must be implemented in conjunction with the application submitted to the Air Pollution Control Section.
2. The Air Pollution Control Section reserves the right, at the discretion of the Air Pollution Control official, to call upon the applicant to cease burning for a given period of time as may be determined by the said official.

The above conditions are to be strictly adhered to at all times, failure to comply there-to may result in the revocation of the permit. The permit to be available for scrutiny at all times when open burning is conducted.

This permit is valid until: 30 September 2008

APPROVAL: AIR POLLUTION CONTROL Approval to do open burning in terms of Section 14(1) of the Air Pollution Control By-law promulgated in Provincial Gazette No. 5979 dated 4 February 2003. Name of Officer: Bethwell Mbete Signature:  Date: 25 March 2008 Contact No: (021) 590-1418	APPROVAL: FIRE SERVICES Approval to conduct open burning in terms of sub-section 35(4) of the Community Fire Safety By-law No. 5832 dated February 2002. Name of Officer: _____ Signature: _____ Date: _____ Contact No: _____
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APPROVAL: DEPARTMENT OF WATER AFFAIRS AND FORESTRY

The applicant is permitted to burn in accordance with the above mentioned undertaking in terms of permission issued under delegated powers in accordance with the provisions of Government Notice Number

Name of Officer: _____

Signature: _____

Date: _____

Contact No: _____

Permit No:

022311716
CMC AIR POLLUTION 021 5981621
15 JUN 2005 0015:5712- FILE JALITY

NO. 364 P. 2/3
No. 3947- P. 1-0

CMC AIR POLLUTION

CITY OF CAPE TOWN
MUNICIPALITY
BYAD KAAPSTAD

AUTHORITY: APPROVAL OF OPEN BURNING

After careful consideration of all the relevant information the Council hereby grants approval for open burning to take place.

Name of Applicant: Farrel Feldman-Zandvat Nature Reserve	Details of premises where burning is to take place: Off No: WAGN, 85523, 88049 Street Address: Off Lonsdale Road, Lonsdale Park Suburb: Steenberg
Address: PO Box 30023	Tel: (021) 200-1500
Suburb: Tokai, 7866	Fax: (021) 200-1500
	Cell: 101-7542

Description of burning to be conducted: **All in Vegetation**
Approximate period of proposed burning:

CONDITIONS

1. Adequate fire breaks or fences will be made around the area or heaps to be burned;
2. All heaps will be kept within manageable size to enable the fire to be doused rapidly in the event of a sudden wind change;
3. The following Departments and surrounding neighbours are to be telephonically notified prior to any burning taking place:

Air Pollution Control	850-1418	Fire Dept		MPD		SA Police	
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4. No burning shall be undertaken between 1200 on any Friday and 0700 on the following Monday or on any public holiday.
5. Burning must be limited to between 0800 and 1800 daily and all burning material must be extinguished by 1800 unless a prescribed black day.
6. Under no circumstances is the fire to be left unattended until it is completely doused with no glowing embers left.
7. Smoke may not cause any traffic hazard or a nuisance to neighbouring properties.
8. Burning must be limited to the approved areas only.
9. Only burn when weather conditions are favourable, within the following guidelines TEMPERATURE less than 25°C; HUMIDITY more than 25%; WIND SPEED less than 10 km/h.
10. The controlling authority has the right to suspend or prevent any burning activities should the need arise.
11. The extinguishing medium and associated equipment/resources are to be readily available at all times while burning takes place.
12. Observe the contents of the National Veld Fire and Forest Act No 101 of 88.
13. Accept full responsibility for any damage which may occur to any property as a result of the spreading of the fire outside the boundaries of your property and be liable for all costs incurred by fire fighting teams extinguishing runaway fires.
14. A competent person to be present at all times when burning.

AIR POLLUTION CONTROL REQUIREMENTS

1. This approval must be implemented in conjunction with the application submitted to the Air Pollution Control Section.
2. The Air Pollution Control Section reserves the right, at the discretion of the Air Pollution Control official, to call upon the applicant to cease burning for a given period of time as may be determined by the said official.

The above conditions are to be strictly adhered to at all times, failure to comply therewith may result in the revocation of the permit. The permit to be available for scrutiny at all times when open burning is conducted.

This permit is valid until **31 September 2005**

APPROVAL: AIR POLLUTION CONTROL

Approval to do open burning in terms of Section 14(1) of the Air Pollution Control By-law promulgated in Provincial Gazette No. 5978 dated 4 February 2003.

Name of Officer: **Rehaneh Mboe**

Signature: *[Signature]*

Date: **24 May 2005**

Contact No: **(021) 680-1418**

APPROVAL: FIRE SERVICES

Approval to conduct open burning in terms of sub-section 38(4) of the Community Fire Safety By-law No. 6838 dated 1 February 2002.

Name of Officer: **D. A. Lantier**

Signature: *[Signature]*

Date: **8-06-2005**

Contact No: **7976842**

APPROVAL: DEPARTMENT OF WATER AFFAIRS AND FORESTRY

The applicant is permitted to burn in accordance with the above mentioned undertaking in terms of permission issued under delegated powers in accordance with the provisions of Government Notice Number **1297 of 2003**.

Name of Officer: **J. H. S. S. S.**

Signature: *[Signature]*

Date: **19/6/2005**

Contact No: **021-808-2735**

Permit No:



CITY OF CAPE TOWN
DIRECTORATE: STRATEGY & PLANNING
BRANCH: NATURE CONSERVATION
VELD FIRE LOGSHEET

Brush Pile Burning
with Permit

Date:	6/6/2007	District:	South	Location:	Nursery block behind the EE Centre and old nursery land: medicinal garden area	GPS Coordinates:		Area (Ha):	>1
Date of fire start:	6/6/2007	Time of fire start	09h00	Date of fire stop (site safe):	12h00	Time of fire stop (evac):	13h00	Total time spend on fire:	4hrs
Weather Conditions: Heavily overcast, drizzle to rain later, light north westerly wind.									
F/c Max Temp deg C	15	F/c Min RH %		F/c Wind Speed km/h		Fire Danger Index	None: Very wet and cold conditions		
Personnel & Equipment: Fire beaters, rakos, garden forks, hosepipe									
Number of personnel:	4	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:		Other:	
Number of skid units:		Number of Fire Engines:		Number of unimogs:		Number of helicopters:		Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit		Boltcutter		Photo	
4x2 Vehicle	1	Fire beaters	4	Fire hoses & fittings	1	Ladders			
Trucks		Rake hoes	1	Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	2	Portable pump		First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe					
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Controlled burning of two brush piles: intentional			Approximate damage (Rand value):	None				
Notes:	Found under moved brushpile: 1X bee hive, 1X male Leopard Toad, 1X short legged seps, 1X Marble leaf toed gecko, 1X Pygmy mouse.								
Compiled by:	C. Sheasby Reserve Manager			Signed:					

CITY OF CAPE TOWN



DIRECTORATE: STRATEGY & PLANNING
DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT
BRANCH: NATURE CONSERVATION
VELD FIRE LOGSHEET

Brush Pile Burning
with Permit

Date:	7/16/2007	District:	South	Location:	Jetty Brush Pile	GPS Coordinates:		Area (Ha):	>1
Date of fire start:	16/07/2007	Time of fire start	09h00	Date of fire stop (site safe):	13h00	Time of fire stop (evac):	14h00	Total time spend on fire:	5 hrs
Weather Conditions: Heavily overcast, drizzle to rain later, light north westerly wind.									
F/c Max Temp deg C		F/c Min RH %		F/c Wind Speed km/h	15 North Westerly	Fire Danger Index	None: Very wet and cold conditions		
Personnel & Equipment: Fire beaters, rakos, garden forks, hosepipe									
Number of personnel:	5	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:		Other:	
Number of skid units:		Number of Fire Engines:		Number of unimogs:		Number of helicopters:		Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit		Boltcutter		Photo	
4x2 Vehicle	1	Fire beaters	4	Fire hoses & fittings		Ladders			
Trucks		Rake hoes	2	Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	2	Portable pump		First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe					
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Controlled Brush pile intentional burn			Approximate damage (Rand value):	None				
Notes:	No fauna found in or near brush pile								
Compiled by:	C. Sheasby Reserve Manager			Signed:					



CITY OF CAPE TOWN

DIRECTORATE: STRATEGY & PLANNING

DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT

BRANCH: NATURE CONSERVATION

VELD FIRE LOGSHEET

Brush Pile Burning with Permit

Date:	7/17/2007	District:	South	Location:	Behind nursery area	GPS Coordinates:		Area (Ha):	>1
Date of fire start:	7/17/2007	Time of fire start	09h00	Date of fire stop (site safe):	13h00	Time of fire stop (evac):	14h00	Total time spend on fire:	5 hrs
Weather Conditions: Heavily overcast, drizzle to rain later, light north westerly wind.									
F/c Max Temp deg C		F/c Min RH %		F/c Wind Speed km/h	10 South Westerly	Fire Danger Index	None: Slight breeze,		
Personnel & Equipment: Fire beaters, rakos, garden forks, hosepipe									
Number of personnel:	5	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:		Other:	
Number of skid units:		Number of Fire Engines:		Number of unimogs:		Number of helicopters:		Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit		Boltcutter		Photo	
4x2 Vehicle	1	Fire beaters	4	Fire hoses & fittings		Ladders			
Trucks		Rake hoes	2	Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	2	Portable pump		First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe					
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Controlled Brush pile intentional burn			Approximate damage (Rand value):	None				
Notes:	No fauna found in or near brush pile								
Compiled by:	C. Sheasby Reserve Manager			Signed:					



CITY OF CAPE TOWN
DIRECTORATE: STRATEGY & PLANNING
DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT
BRANCH: NATURE CONSERVATION
VELD FIRE LOGSHEET

Brush Pile Burning with Permit

Date:	7/19/2007	District:	South	Location:	Wetland to be, next to parking.	GPS Coordinates:		Area (Ha):	>1
Date of fire start:	7/19/2007	Time of fire start	09h00	Date of fire stop (site safe):	13h00	Time of fire stop (evac):	14h00	Total time spend on fire:	5 hrs
Weather Conditions: Heavily overcast, drizzle to rain later, light north westerly wind.									
F/c Max Temp deg C		F/c Min RH %		F/c Wind Speed km/h	10 South Westerly	Fire Danger Index	None: Slight breeze,		
Personnel & Equipment: Fire beaters, rakos, garden forks, hosepipe									
Number of personnel:	5	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:		Other:	
Number of skid units:		Number of Fire Engines:		Number of unimogs:		Number of helicopters:		Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit		Boltcutter		Photo	
4x2 Vehicle	1	Fire beaters	4	Fire hoses & fittings		Ladders			
Trucks		Rake hoes	2	Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	2	Portable pump		First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe					
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Controlled Brush pile intentional burn and grass fire intentional			Approximate damage (Rand value):	None				
Notes:	Two leopard Toads found in vegetation, alive. One adult, one juvenile.								
Compiled by:	C. Sheasby Reserve Manager			Signed:					

CITY OF CAPE TOWN
DIRECTORATE: STRATEGY & PLANNING
DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT
BRANCH: NATURE CONSERVATION
VELD FIRE LOGSHEET

Brush Pile Burning with
Permit

Date:	9/25/2007	District:	South	Location:	Jetty edge	GPS Coordinates:	S 34 04' 55.8" E 18 27' 55.6"	Area (Ha):	>1
Date of fire start:	9/25/2007	Time of fire start	10h00	Date of fire stop (site safe):	200/09/25	Time of fire stop (evac):	13h00	Total time spend on fire:	5hrs
Weather Conditions: Heavily overcast, drizzle to rain later, light north westerly wind.									
F/c Max Temp deg C	23	F/c Min RH %		F/c Wind Speed km/h	5 South	Fire Danger Index	None: Slight breeze,		
Personnel & Equipment: Fire beaters, rakos, garden forks, hosepipe									
Number of personnel:	4	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:		Other:	
Number of skid units:		Number of Fire Engines:		Number of unimogs:		Number of helicopters:		Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit		Boltcutter			
4x2 Vehicle	1	Fire beaters	2	Fire hoses & fittings		Ladders			
Trucks		Rake hoes		Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	1	Portable pump	1	First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe		Water drums	5		
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Controlled Brush pile intentional burn			Approximate damage (Rand value):	None				
Notes:	Number of brush piles burnt:1 Vegetation: Morella cordifolia								
Compiled by:	C. Sheasby Reserve Manager			Signed:					



CITY OF CAPE TOWN
DIRECTORATE: STRATEGY & PLANNING
DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT
BRANCH: NATURE CONSERVATION
VELD FIRE LOGSHEET

Brush Pile Burning with
Permit

Date:	9/25/2007	District:	South	Location:	New wetland site	GPS Coordinates:	S 34 04' 53.5 E 18 28' 13.4"	Area (Ha):	>1
Date of fire start:	9/25/2007	Time of fire start	11h00	Date of fire stop (site safe):	9/25/2007	Time of fire stop (evac):	14h00	Total time spend on fire:	3hrs
Weather Conditions: Fine, sunny with some cloud									
F/c Max Temp deg C	23	F/c Min RH %		F/c Wind Speed km/h	10 South Easter	Fire Danger Index	None: Slight breeze,		
Personnel & Equipment: Fire beaters, rakos, garden forks, hosepipe									
Number of personnel:	4	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:		Other:	
Number of skid units:		Number of Fire Engines:		Number of unimogs:		Number of helicopters:		Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit		Boltcutter		Photo	
4x2 Vehicle	1	Fire beaters	2	Fire hoses & fittings		Ladders			
Trucks		Rake hoes		Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	1	Portable pump	1	First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe		Water drums	5		
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Controlled Brush pile intentional			Approximate damage (Rand value):	None				
Notes:	Number of brush piles burnt:1 Vegetation: Alien vegetation								
Compiled by:	C. Sheasby Reserve Manager			Signed:					



CITY OF CAPE TOWN
 DIRECTORATE: STRATEGY & PLANNING
 DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT
 BRANCH: NATURE CONSERVATION
 VELD FIRE LOGSHEET

Brush Pile Burning with Permit

Date:	9/26/2007	District:	South	Location:	Behind Environmental Education Centre	GPS Coordinates:	S 34 04' 51.9 E 18 28' 18.4"	Area (Ha):	>1
Date of fire start:	9/26/2007	Time of fire start	08h15	Date of fire stop (site safe):	9/26/2007	Time of fire stop (evac):	13h00	Total time spend on fire:	5hrs
Weather Conditions: Fine, sunny, very little wind									
F/c Max Temp deg C	24	F/c Min RH %		F/c Wind Speed km/h	5 South	Fire Danger Index	None:		
Personnel & Equipment: Fire beaters, rakos, garden forks, hosepipe									
Number of personnel:	4	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:		Other:	
Number of skid units:		Number of Fire Engines:		Number of unimogs:		Number of helicopters:		Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit		Boltcutter			
4x2 Vehicle	1	Fire beaters	2	Fire hoses & fittings		Ladders			
Trucks		Rake hoes		Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	1	Portable pump	1	First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe		Water drums	5		
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Controlled Brush pile intentional burn			Approximate damage (Rand value):	None				
Notes:	Number of brush piles burnt:3 Vegetation: Alien vegetation mostly Rooikranz. No animals in the brush piles, juvenile Blacksmith lapwing in vicinity with parents.								
Compiled by:	C. Sheasby Reserve Manager			Signed:					

CITY OF CAPE TOWN
DIRECTORATE: STRATEGY & PLANNING
DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT
BRANCH: NATURE CONSERVATION
VELD FIRE LOGSHEET

Date:	05/05/2008	District:	South	Location:	Zandvlei Nature Reserve	GPS Coordinates:		Area (Ha):	1ha
Date of fire start:	05/05/2008	Time of fire start	09h00	Date of fire stop (site safe):	12h30	Time of fire stop (evac):	13h00	Total time spend on fire:	4hrs
Weather Conditions: slightly overcast, breeze in morning picking up to strong south easter wind in afternoon. Cool.									
F/c Max Temp deg C	24	F/c Min RH %	45	F/c Wind Speed km/h	35	Fire Danger Index	38 Green		
Personnel & Equipment:									
Number of personnel:	5	Number of personnel (Fire & Rescue):	0	Number of students:	2	Number of volunteers:	4	Other:	
Number of skid units:	0	Number of Fire Engines:	0	Number of unimogs:	0	Number of helicopters:	0	Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit		Boltcutter			
4x2 Vehicle	1	Fire beaters	4	Fire hoses & fittings		Ladders			
Trucks		Rake hoes		Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	5	Portable pump		First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe		Buckets	3		
Other		Brush cutter		Knapsack sprayers	3				
Cause of fire:	Intentional burning of two brush piles and a small vegetated area by Nature Reserve staff. Adjacent to each other.			Approximate damage (Rand value):	None				
Notes:	One chameleon walked out of the fire, many rain spiders ran out.								
Compiled by:	Cassy Sheasby			Signed:					





CITY OF CAPE TOWN
DIRECTORATE: STRATEGY & PLANNING
DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT
BRANCH: NATURE CONSERVATION
VELD FIRE LOGSHEET

Date:	25/06/2008	District:	South	Location:	Zandvlei Nature Reserve	GPS Coordinates:	*	Area (Ha):	<1ha
Date of fire start:	25/06/2008	Time of fire start	08h00	Date of fire stop (site safe):		Time of fire stop (evac):	14h00	Total time spend on fire:	7hrs
Weather Conditions: slightly overcast, breeze in morning picking up to strong south easter wind in afternoon. Cool.									
F/c Max Temp deg C	24	F/c Min RH %	45	F/c Wind Speed km/h	35	Fire Danger Index	38 Green		
Personnel & Equipment:									
Number of personnel:	3	Number of personnel (Fire & Rescue):	0	Number of students:	2	Number of volunteers:	3	Other:	
Number of skid units:	0	Number of Fire Engines:	0	Number of unimogs:	0	Number of helicopters:	0	Other:	
4x4 Vehicle		Drip torch		"Bakkie sakkie" skid unit	1	Boltcutter		Photo	
4x2 Vehicle	1	Fire beaters	3	Fire hoses & fittings	1	Ladders			
Trucks		Rake hoes	4	Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	3	Portable pump		First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe		Buckets			
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Intentional burning of four brush piles by Nature Reserve staff. Adjacent to each other. Brush consisted of Morella cordifolia which was cleared during April and May 2008.			Approximate damage (Rand value):	None				
Notes:	Two Cape Dwarf Chameleons were relocated as well as one Clicking Stream Frog and one Brown Water Snake. One Short Legged Seps which had burrowed underground was found dead. Brush piles were adjacent and behind the plant propagation room. Size of brush piles approximately 5m in diameter, two meters tall.								
Compiled by:	Cassy Sheasby			Signed:					



CITY OF CAPE TOWN
DIRECTORATE: STRATEGY & PLANNING
DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT
BRANCH: NATURE CONSERVATION
VELD FIRE LOGSHEET

Date:	2/19/2008	District:	South	Location:	POS adjacent to ZENR next to railway line	GPS Coordinates:	See notes below	Area (Ha):	300 m ²
Date of fire start:	2008/02/19	Time of fire start	09h20	Date of fire stop (site safe):	2/19/2008	Time of fire stop (evac):	11h00	Total time spend on fire:	2 hrs
Weather Conditions:									
F/c Max Temp deg C		F/c Min RH %	18	F/c Wind Speed km/h	6km/hour	Fire Danger Index			
Personnel & Equipment:									
Number of personnel:	5	Number of personnel (Fire & Rescue):	14	Number of students:	1	Number of volunteers:	0	Other:	
Number of skid units:	0	Number of Fire Engines:	0	Number of unimogs:	3	Number of helicopters:	0	Other:	
4x4 Vehicle	0	Drip torch	0	"Bakkie sakkie" skid unit	0	Boltcutter	0	Photo	
4x2 Vehicle	2	Fire beaters	1	Fire hoses & fittings	0	Ladders	0		
Trucks	0	Rake hoes	0	Suction pipes	0	Torches / Worklamp (Vehicle or handheld)	0		
Unimogs	1	Spades	6	Portable pump	0	First Aid Kit	1		
Trailers (Fire or other)	0	Chain saw	0	Ground hydrant standpipe	0				
Other		Brush cutter	0	Knapsack sprayers	0				
Cause of fire:	Arson: Suspect apprehended by SAPS and Nature Conservation			Approximate damage (Rand value):					
Notes:	GPS co-ordinates: S 34 05' 11.4" E 018 27' 49.0" S 34 05' 11.8 E 018 27' 49.2" S 34 05' 12.1" E 018 27' 49.4" S 34 05' 12.2" E 18 27' 49.7"								
Compiled by:	Cassy Sheasby: Reserve Manager Zandvlei Estuary NR			Signed:					

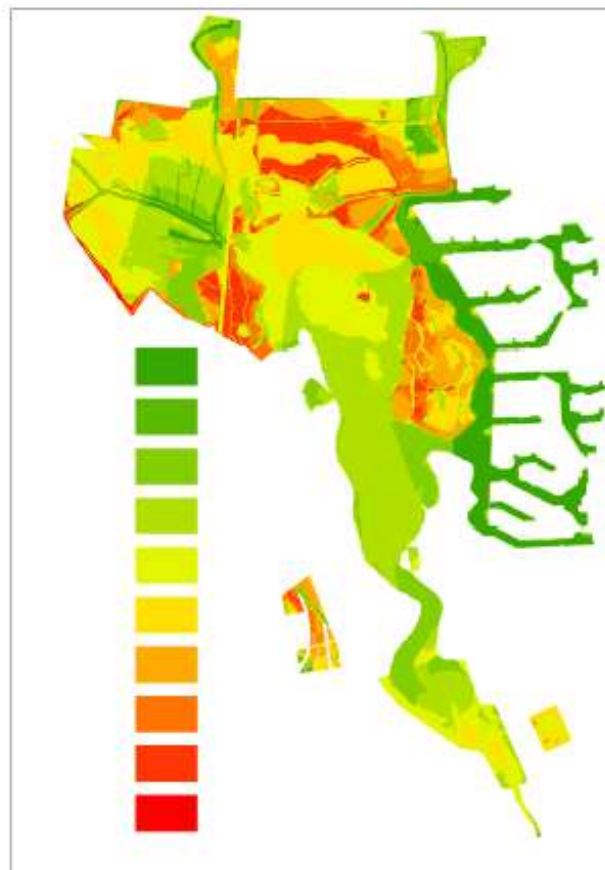
		CITY OF CAPE TOWN DIRECTORATE: STRATEGY & PLANNING DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT BRANCH: NATURE CONSERVATION VELD FIRE LOGSHEET							
Date:	13/04/2010	District:	Deep South	Location:	Bath Road Block 18	GPS Coordinates:		Area (Ha):	0.5
Date of fire start:	13/04/2010	Time of fire start	09h00	Date of fire stop (site safe):	13:00	Time of fire stop (evac):	14:00	Total time spend on fire:	
Weather Conditions:									
F/c Max Temp deg C	1900/01/25	F/c Min RH %		F/c Wind Speed km/h	15knots south easterly	Fire Danger Index			
Personnel & Equipment:									
Number of personnel:	30	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:	1	Other:	
Number of skid units:	1	Number of Fire Engines:	0	Number of unimogs:	1	Number of helicopters:	0	Other:	
4x4 Vehicle		Drip torch	2	"Bakkie sakkie" skid unit		Boltcutter		Photo	
4x2 Vehicle	1	Fire beaters	3	Fire hoses & fittings		Ladders			
Trucks		Rake hoes		Suction pipes		Torches / Worklamp (Vehicle or handheld)			
Unimogs		Spades	4	Portable pump		First Aid Kit	1		
Trailers (Fire or other)		Chain saw		Ground hydrant standpipe	1				
Other		Brush cutter		Knapsack sprayers					
Cause of fire:	Intentional block burn			Approximate damage (Rand value):	None				
Notes:	2 Vlei rats, 3 striped field mice, 1 Marble leaf toed gecko, 1 cocktail ant nest moved on the morning.								
Compiled by:	Cassy Sheasby			Signed:					

		CITY OF CAPE TOWN DIRECTORATE: STRATEGY & PLANNING DEPARTMENT: ENVIRONMENTAL RESOURCE MANAGEMENT BRANCH: NATURE CONSERVATION VELD FIRE LOGSHEET						 CITY OF CAPE TOWN ISIGQIBO BASERABA ISIMO KAAPSTADT THIS CITY WORKS FOR YOU	
Date:	24/06/2011	District:	South	Location:	Zandvlei Nature Reserve	GPS Coordinates:		Area (Ha):	
Date of fire start:	24/06/2011	Time of fire start	09:00	Date of fire stop (site safe):	14:00	Time of fire stop (evac):	15:00	Total time spend on fire:	6hrs
Weather Conditions:									
F/c Max Temp deg C	18	F/c Min RH %	10	F/c Wind Speed km/h	20km/h	Fire Danger Index	10		
Personnel & Equipment:									
Number of personnel:	4	Number of personnel (Fire & Rescue):	0	Number of students:	1	Number of volunteers:	1	Other:	
Number of skid units:	0	Number of Fire Engines:	0	Number of unimogs:	0	Number of helicopters:	0	Other:	
4x4 Vehicle	0	Drip torch	0	"Bakkie sakkie" skid unit	0	Boltcutter	0	Photo	
4x2 Vehicle	1	Fire beaters	2	Fire hoses & fittings	0	Ladders	0		
Trucks	0	Rake hoes	0	Suction pipes	0	Torches / Worklamp (Vehicle or handheld)	0		
Unimogs	0	Spades	3	Portable pump	0	First Aid Kit	1		
Trailers (Fire or other)	0	Chain saw	0	Ground hydrant standpipe	0				
Other		Brush cutter	0	Knapsack sprayers	2				
Cause of fire:	Brush pile burning			Approximate damage (Rand value):	None				
Notes:	Two brush piles burnt. 2 leopard Toads 3 marble leaf toed geckos removed, one house snake fatality								
Compiled by:	Cassandra Quinton Sheasby			Signed:					

Appendix 15: Sensitivity-value analysis and zoning

Zandvlei Sensitivity value and zonation report_FINAL_REPORT.doc

SENSITIVITY- VALUE ANALYSIS AND ZONATION PROCESS: Greater Zandvlei NATURE RESERVE



Prepared for the Biodiversity Branch and Environmental Management Systems Branch
OCTOBER 2010

Arne Purves
Natural Resource Specialist
Arne.purves@capetown.gov.za



**REPORTING
PROGRESS IN URBAN
PROTECTED AREAS**

*A Site-level rapid assessment tool
based on the World Bank & WWF's
"Management Effectiveness Tracking
Tool"*

*Prepared for the
City of CapeTown
by
Howard Langley & Paul Britton
22 May 2007*

**Greater Zandvlei Estuary
Nature Reserve**

REPORTING PROGRESS AT PROTECTED AREA SITES: DATA SHEET

Name of protected area	Greater Zandvlei Estuary Nature Reserve	
Location of protected area (country and if possible, map reference)	South Africa, Cape Town 34 05' 24" S 18 28' 42" E	
Date of establishment (distinguish between agreed and gazetted)	Agreed	Gazetted 26-Oct-06
Ownership details (i.e. owner, tenure rights etc.)	City of Cape Town	
Management Authority	City of Cape Town Biodiversity Management Branch	
Protected area size (ha)	200ha	
Staff numbers	Permanent 3	Temporary 1
Budget	Pool area budget: Rondevlei, Zandvlei, Zeekoevlei, Strandfontein: Problematic.	
Designation (ICUN category), World Heritage, RAMSAR etc	Local Authority Nature Reserve	
Reason for designation	Wetland and Estuary Conservation	
Brief detail of World Bank funded project or projects in PA	None	
Brief detail of WWF funded project or projects in PA	None	
Brief detail of other relevant projects in PA	None	
List two of the primary protected area objectives		
Objective 1	Biodiversity conservation	
Objective 2	Environmental Education	
List the top two most important threat to the PA (and indicate reasons why they are selected)		
Threat 1	Disjointed management within the different department so of city.	
Threat 2	Influence of upstream urban impacts which produce floating waste and affect water quality.	
List top two critical management activities		
Activity 1	Day to day crisis management	
Activity 2	Environmental Education	
Date assessment carried out:	29-May-07	
Name of assessor:	Cassandra Sheasby	

Howard Langley

Paul Britton

22 May 2007

MANAGEMENT EFFECTIVENESS TRACKING TOOL

1: Context : Where are we now?	Criteria	Value	Score	Comments	Next steps
1.1 Legal status Does the PA have secure permanent conservation legal status?	The PA's permanent legal conservation status is not secured by its current legal status eg Public Open Space.	0		For the reserve to be a proclaimed as a nature reserve.	To find out the process for this to happen. Who would take responsibility of the process. And remind people of the task that has to happen
	There is a formal agreement that the PA should be afforded the highest possible legal protection, but the process has not yet begun.	1	1		
	The PA is in the process of being afforded the highest possible legal protection.	2			
	The PA has Local Authority Nature Reserve status, or a higher level of legal protection.	3			
1.2. Protected Area regulations	There are no legal mechanisms for controlling inappropriate land use and activities in the PA	0	0	As an interim measure the park can be zoned as a city park/open space area to protect the park from inappropriate land use and activities	Reasoning the area
	Legal mechanisms for controlling inappropriate land use activities in the PA exist but are not being implemented.	1			
	Legal mechanisms for controlling inappropriate land use and activities in the PA exist but there are some problems in effectively implementing them.	2			
	Legal mechanisms for controlling inappropriate land use and activities in the PA exist and are being effectively implemented	3			
1.3. Law enforcement PA has capacity/resources to enforce regulations & bylaws well enough?	PA has no effective capacity/resources to enforce regulations & bylaws	0		There is a limited knowledge of the regulations and by-laws, that lies with reserve manager alone. There are no regular patrols, but rather adhoc when the staff and manager is available	To fill the law enforcement post for the area that the site falls under, and to strengthen our relationships with the other law enforcement authorities in the area.
	There are major deficiencies in capacity/resources to enforce regulations & bylaws (e.g. lack of skills, no patrol budget)	1	1		
	PA has acceptable capacity/resources to enforce regulations & bylaws but some deficiencies remain	2			
	PA has excellent capacity/resources to enforce regulations & bylaws	3			
1.4. Protected Area boundary demarcation Is the boundary known and demarcated?	The boundary of the PA is not known by the management authority or local residents/neighbouring land users	0		As the site is reasonably small, the sites boundaries are known, to the local authority, and a large number of the surrounding community.	The park has a conservation development framework that gives ideas for the demarcation of the boundaries. The management needs to identify the resources we have to start with it, and the ones we need to find fundin for.
	The boundary of the PA is known by the management authority but is not known by local residents/neighbouring land users	1			
	The boundary of the PA is known by both the management authority and local residents but is not appropriately demarcated	2	2		
	The boundary of the PA is known by the management authority and local residents and is appropriately demarcated	3			
1.6. Resource Inventory Do you have enough information to manage the area?	There is little or no information available on critical habitats, species and cultural values of the PA	0		At the moment there is lot of information scattered on little pieces of paper and in people's head. We are in the process of documenting this information.	Once the information has been documented, the next step would be for us to identify what are the gaps in our knowledge and start researching. Getting knowledgeable people to assist with the research
	Information on critical habitats, species and cultural values of the PA is not sufficient to support planning and decision making	1	1		
	Information on critical habitats, species and cultural values of the PA is sufficient for key areas of planning/decision making but the necessary survey work is not being maintained	2			

MANAGEMENT EFFECTIVENESS TRACKING TOOL

2: Planning: Where do we want to be?	Criteria	Value	Score	Comments	Next steps
2.1. Protected area design Does the protected area need enlarging, corridors etc to meet its objectives?	Inadequacies in design mean achieving the PA's major management objectives is impossible	0		There is huge demand for space of this area from the various users. Not only buildings but for people that use the area for walking. And to offer a space for people to experience a larger open space.	To look at adding the open spaces around Edith Stephens and peaking to other departments managing the area.
	Inadequacies in design mean that achievement of major objectives are constrained to some extent	1	1		
	Design is not significantly constraining achievement of major objectives, but could be improved	2			
	Reserve design features are particularly aiding achievement of major objectives of the PA	3			
2.2 Management plan Is there a management plan (compliant with Protected Areas Act) and is it being implemented?	There is no standard Management Plan for the PA	0		A draft management plan has been done, but was done in 2001 and not been reviewed.	To review the management plan and get it approved. Check who would be tasked with it in our department.
	A standard Management Plan is being prepared or has been prepared, but is not yet approved.	1	1		
	An approved Management Plan exists and is being implemented, but has not been updated/reviewed during the past five years.	2			
	An approved Management Plan exists, is being implemented and has been updated/reviewed during the past three years	3			
2.3. Conservation Development Framework (CDF) Is there a visitor use zoning system indicating position and nature of operation & visitor infrastructure?	There is no CDF for the PA	0		A CDF was drawn up, but after a workshop with various stakeholders it was decided that the CDF needs to be amended.	Needs to get interim official approval. Look at getting the CDF amended with the help of other departments in the City of Cape Town. And making sure the amendments take into consideration the stakeholders opinions.
	A CDF is being prepared or has been prepared but is not being implemented	1	1		
	An approved CDF exists but it is only being partially implemented because of funding constraints or other problems	2			
	An approved CDF exists and is being implemented	3			
Additional points	The planning process allows adequate opportunity for key stakeholders to influence the management plan	1	1	We do communicate and interact with the community, institutional and other partners we work with.	
	There is an established schedule and process for periodic review and updating of the management plan	1			
	The results of monitoring, research and evaluation are routinely incorporated into planning	1			
Subtotal Score: Planning		12	4		

MANAGEMENT EFFECTIVENESS TRACKING TOOL

3: Inputs: What do we need?	Criteria	Value	Score	Comments	Next steps
3.1. Research Is there a programme of management-orientated research work?	Research needs have not been identified nor is any research work taking place in the PA	0		Monitoring is done on an ad hoc basis, mostly by students. The baseline monitoring of rain is done by residents, water quality testing is done by scientific services.	Need for a M & E system for the biodiversity mgt branch.
	Research needs have been identified, but other than for ad hoc research, no management orientated research is being done.	1	1		
	There is considerable research work but only limited "management" orientated research is being done.	2			
	There is considerable research work being undertaken, which is relevant to management needs	3			
3.2. Human Resource capacity Does the PA have sufficient HR capacity to manage the protected area?	The PA has no HR capacity	0		There are places on the organogram for more staff, however City is not employing anybody now and the organogram has not been approved. Four staff members to manage a 200ha Nature Reserve.	Need to motivate for staff members.
	HR capacity is inadequate for critical management activities	1	1		
	HR capacity is sufficient, but there are deficiencies in necessary skills for critical management activities	2			
	HR capacity and expertise is adequate for management needs	3			
3.3. Current budget Is the current budget sufficient?	There is no dedicated budget for the PA	0		Zandvlei shares a budget with Rondevlei Nature Reserve, Zeekoewiel Nature Reserve and Strandfontein Birding Area. The budget is insufficient most of the time.	
	The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage	1	1		
	The available budget is acceptable, but could be further improved to fully achieve effective management	2			
	The available budget is sufficient and meets the full management needs of the PA	3			
Additional points	The budget is secure/guaranteed for the PA on an annual cycle	1	1	The budget for the Branch is secured, but no specific budget is secured for the PA	
	The budget is secure/guaranteed on a three year cycle	2	0		
	The PA is not reliant on external funding	2	2		
Subtotal		14	6		

MANAGEMENT EFFECTIVENESS TRACKING TOOL

4. Process : How do we go about it?	Criteria	Value	Score	Comments	Next steps
4.1. Annual Plan of Operation (APO) Is there an annual work plan/APO that is approved by the organisation?	No approved/standardised APO exists	0		The manager uses the APO to monitor progress, however it is never really checked by senior management.	
	An approved APO exists but activities are not monitored against the plan's targets	1	1		
	An approved APO exists and actions are monitored against the plan's targets, but many activities are not completed	2			
	Actions are monitored against the approved APO's targets and most or all prescribed activities are completed	3			
4.2. Resource management Is the protected area adequately managed (e.g. for fire, invasive species, poaching)?	Requirements for active management of critical ecosystems, species and cultural values have not been assessed	0			
	Requirements for active management of critical ecosystems, species and cultural values are known but are not being addressed	1	1		
	Requirements for active management of critical ecosystems, species and cultural values are only being partially addressed	2			
	Requirements for active management of critical ecosystems, species and cultural values are substantially or fully addressed	3			
4.3. Staff training Is there enough training for staff?	Staff are untrained	0		There is seldom money on the corporate budget for training and when there is, the training is all pushed through in May and June to get it done by the end of the Financial year which puts huge pressure on the staff and operational requirements of the reserve.	
	Staff training and skills are low relative to the needs of the PA	1	1		
	Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management	2			
	Staff training and skills are in tune with the management needs of the PA, and with anticipated future needs	3			
4.4. Budget management Is the budget managed to meet critical management needs?	Budget management is poor and significantly undermines effectiveness	0		The on the ground managers do not have access to the budgets which is managed by the cost centre manager. No information is passed down as to the state of the budgets unless expressly enquired for.	
	Budget management is poor and constrains effectiveness	1	1		
	Budget management is adequate but could be improved	2			
	Budget management is excellent and aids effectiveness	3			
4.5. Operational equipment & infrastructure (as required for operational management purposes, but excluding tourism/visitor facilities)	There is little or no operational equipment & infrastructure	0		The equipment is sufficient in most cases, however infrastructure to house it is totally insufficient and the servicing of the machinery is on an ad hoc basis or when something breaks.	
	There is some equipment & infrastructure but these are wholly inadequate	1			
	There is equipment and infrastructure, but still some major gaps that constrain management	2	2		
	There is adequate operational equipment and infrastructure	3			
4.6. Maintenance of equipment & infrastructure Is equipment & infrastructure (including tourism/visitor facilities) adequately maintained?	There is no approved Maintenance Plan and no maintenance is taking place	0	0		
	There is no Maintenance Plan and maintenance is taking place to an unsatisfactory standard	1			
	There is no Maintenance Plan, but maintenance is taking place to a satisfactory standard	2			
	There is an approved Maintenance Plan that is being fully implemented to a high standard	3			

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MANAGEMENT EFFECTIVENESS TRACKING TOOL

4.7. Education and awareness programme Is there a planned education programme?	There is no education and awareness programme	0		Very poor facilities.	Need establish a branch policy and coordination of EE activities. If EE centre is to remain at Zandvlei then new custom designed facilities (as part of the CDF) will be needed.
	There is a limited and <i>ad hoc</i> education and awareness programme, but no overall planning for this	1			
	There is a planned education and awareness programme but there are still serious gaps	2	2		
	There is a planned & effective education & awareness programme fully linked to the objectives and needs of the PA	3			
4.8. Government & commercial neighbours Is there co-operation with adjacent land users?	There is no contact between managers and neighbouring official or corporate land users	0		There are meetings such as the Zandvlei Advisory Committee meetings which take place between neighbouring land users where issues are discussed, however the other departments dealing with areas in Zandvlei seldom contact the manager before activities that may impact on the estuary are undertaken.	Establish an interdepartmental coordination team.
	There is limited contact between managers and neighbouring official or corporate land users	1	1		
	There is regular contact between managers and neighbouring official or corporate land users, but only limited co-operation	2			
	There is regular contact between managers and neighbouring official or corporate land users, & substantial co-operative management	3			
4.9. Advisory committee/forum An Advisory Committee of local representatives and specialists advises on PA management & development issues.	There is no Advisory Committee/forum	0		An advisory committee does exist, however few people attend from the other relevant departments and few solutions to problems are found.	The Status needs to be improved.
	An Advisory Committee/forum is in the process of being established communities	1			
	An Advisory Committee/forum exists, but does not contribute significantly to the management/development of the PA.	2	2		
	A well represented Advisory Committee/forum contributes significantly to the proper management/development of the PA.	3			
4.10. Community partners Do community partners have input to management decisions via the Advisory Committee?	Community partners have no input into decisions relating to the management of the PA	0			
	Community partners have limited input into the PA's management decisions via local governance structures	1			
	Community partners contribute to some decisions relating to management via the PA's Advisory Committee	2	2		
	Community partners are fully representative on the PA's Advisory Committee and directly participate decisions making.	3			
4.11. Commercial tourism Do commercial tour operators contribute to protected area management?	There is little or no contact between managers and tourism operators using the PA	0	0	Tourism is not taken into account, the Reserve has no entrance fees and visitors are free to roam the Reserve Monday to Friday from 07:30 to 16:00 unless they request a guided walk and talk.	
	There is contact between managers and tourism operators but this is largely confined to administrative or regulatory matters	1			
	There is limited co-operation between managers and tourism operators to enhance visitor experiences and maintain conservation values	2			
	There is excellent co-operation between managers and tourism operators to enhance visitor experiences, protect values and resolve conflicts	3			
4.12. Monitoring & evaluation	There is no monitoring and evaluation in the PA	0			
	There is some <i>ad hoc</i> monitoring & evaluation, but no overall strategy and/ or no regular collection of results	1	1		
	There is an agreed and implemented monitoring & evaluation system but results are not systematically used for management	2			
	A good monitoring & evaluation system exists, is well implemented and used in adaptive management	3			
Additional points	There is open communication and trust between local stakeholders and PA managers	1	1		
Subtotal		37	15		

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MANAGEMENT EFFECTIVENESS TRACKING TOOL

5: Outputs/Outcomes: What were the results/achievements?	Criteria	Value	Score	Comments	Next steps
5.1. Visitor facilities	There are no visitor facilities and services	0		There are plans for improvement to the visitor facilities in the future.	
Are visitor/tourism facilities good enough and sufficient to prevent damage to the PA?	Visitor facilities and services are inappropriate for current levels of visitation or are under construction	1	1		
	Visitor facilities and services are adequate for current levels of visitation but could be improved	2			
	Visitor facilities and services are excellent for current levels of visitation	3			
Additional points	There are active programmes for restoration of degraded areas within the PA and/or in associated buffer zone	1	1	Done on an ad hoc basis when resources are available.	
5.2. Ecological & Cultural condition assessment	Important biodiversity, ecological and cultural values are being severely degraded in the PA	0		Ignorance of the public often leads to inappropriate land usage such as sensitive areas being dug up and used for BMD ramping.	The people need to be educated and if this does not persuade them, prosecuted.
Is the protected area being managed consistent to its objectives?	Some biodiversity, ecological and cultural values are being severely degraded	1	1		
	Some biodiversity, ecological and cultural values are being partially degraded but the most important values have not been significantly impacted	2			
	Biodiversity, ecological and cultural values are predominantly intact	3			
5.3. Access assessment	Protection systems (patrols, permits etc) are ineffective in controlling access or use of the PA in accordance with designated objectives	0		Unmanned access gate is open during daylight hours. There are no regular patrols. Access can be made from unfenced boundaries onto the water and from there access the protected natural areas.	
Are the available management mechanisms working to control access or use?	Protection systems are only partially effective in controlling access or use of the PA in accordance with designated objectives	1	1		
	Protection systems are moderately effective in controlling access or use of the PA in accordance with designated objectives	2			
	Protection systems are largely or wholly effective in controlling access or use of the PA in accordance with designated objectives	3			
5.4. Economic benefit assessment	The existence of the PA has reduced the options for economic development of the local communities	0		The PA provides many types of recreation as well as green space to the public.	Strive for greater cooperation with recreational department in the management of recreational areas.
Is the Protected Area providing economic benefits to local communities?	The existence of the PA has neither damaged nor benefited the economy of the local economy	1	1		
	There is some flow of economic benefits to local communities from the existence of the PA but this is of minor significance to the regional economy	2			
	There is a significant or major flow of economic benefits to local communities from activities in and around the PA (e.g. employment of locals, locally operated commercial tours etc)	3			
5.5. Community benefit assessment (other than economic) e.g. recreation & education facilities, community hall, sport facilities etc.	The existence of the PA has not delivered any direct or indirect community benefits	0		Many activities are provided to all user groups surrounding the PA. Open space, braai areas, camping, canoeing, yatching, bird watching, hiking, picnicing etc etc.	
	The existence of the PA has delivered some minor short term community benefits	1			
	The PA delivers some quantifiable long term community benefits that make a difference to the lives of local communities	2	2		
	The PA delivers considerable quantifiable long term community benefits that make a real difference to the lives of local communities	3			
Subtotal Score: Outcomes		18	7		

1: CONTEXT	VALUE	SCORE
1.1. Legal status	3	3
1.2. Protected Area regulations	3	2
1.3. Law enforcement	3	1
1.4. Protected area demarcation	3	1
1.5. Resource Inventory	3	1
Subtotal	15	8
2: PLANNING		
2.1. Protected area design	3	1
2.2. Management plan	3	0
2.3. Conservation Development Framework	3	0
Additional Points	3	1
Subtotal	12	2
3: INPUTS		
3.1. Research	3	1
3.2. Staff numbers	3	1
3.3. Current budget	3	1
Additional Points	5	3
Subtotal	14	6
4: PROCESS		
4.1. Annual Plan of Operation	3	1
4.2. Resource management	3	1
4.3. Staff training	3	1
4.4. Budget management	3	1
4.5. Operational equipment & infrastructure	3	2
4.6. Maintenance of equipment & infrastructure	3	0
4.7. Education & awareness	3	2
4.8. Government & commercial neighbours	3	1
4.9. Advisory committee	3	2
4.10. Community partners	3	2
4.11. Commercial Tourism	3	0
4.12. Monitoring & Evaluation	3	1
Additional Points	1	1
Subtotal	37	15
5: OUTPUTS/OUTCOMES		
5.1. Visitor facilities	3	1
5.2. Condition assessment	3	1
5.3. Access assessment	3	1
5.4. Economic benefit assessment	3	1
5.5. Community benefit assessment	3	2
Additional Points	1	1
Subtotal	16	7
TOTAL SCORE	94	38

40%

Summary and comment on score. This nature reserve has opportunities to provide quality "wild" environmental experiences in spite of the proximity of the urban area. It is however on the receiving end of a large number of impacts which unless managed can rapidly degrade environmental quality. A management plan which looks holistically at the reserve in the context of being at the receiving end of many urban impacts on the rivers entering the areas urgently needed. A multidisciplinary and inter-departmental team needs to be established to ensure greater cooperation between different Departments. Current ad hoc attempts to provide facilities should be pending until a comprehensive CDF is in place.

Howard Langley

Paul Britton

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