CITY OF CAPE TOWN
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# Milnerton Erosion Response Guideline

**DEPARTMENT:** Environmental Management, Coastal Management Branch

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# Acronyms

| | |
|---|---|
| CMB: | Coastal Management Branch |
| CPP: | Coastal Public Property |
| EA: | Environmental Authorisation |
| EMP: | Environmental Management Plan |
| ICM Act: | Integrated Coastal Management Act |
| DEA&DP: | Provincial Department of Environmental Affairs and Development Planning |
| DEFF: | National Department of Environment, Forestry and Fisheries |
| HWM: | High Water Mark |
| MERG : | Milnerton Erosion Response Guideline |
| MEF: | Milnerton Erosion Forum |
| MMP: | Maintenance Management Plan |
| NCMP: | National Coastal Management Programme |
| NEMA: | National Environmental Management Act |
| RODs: | Records of Decision |
| WCPCMP: | Western Cape Provincial Coastal Management Plan |
| WMO: | World Meteorological Organisation |

# Introduction and rationale for the Milnerton Erosion Response Guideline

## Introduction

The stretch of coastline from the northern boundary of the Cape Town Port up to and including the Milnerton Golf Course in the North (approximately 3km – Figure 1) is one of Cape Town's greatest 'hotspots' in terms of exposure to coastal erosion. Having receded by approximately 100m over the last century (Brundrit, 2016), and bound by both City and private infrastructure, this stretch of coastline requires special focus in respect of addressing the challenges associated with coastal erosion. Due to the close proximity of various properties to the shoreline, there is limited potential for the shoreline to naturally adjust to erosion events. The vulnerability of this stretch of coastline is likely to escalate given the pressures associated with climate change induced sea-level rise. Demonstrating the climate risks, the World Meteorological Organisation (WMO) reported in 2019 that the last four years have been the warmest years on record (WMO, 2019). In 2016, each month experienced a new monthly global temperature record, all of which were greater than 1°C above the 20th century average (WMO, 2019).

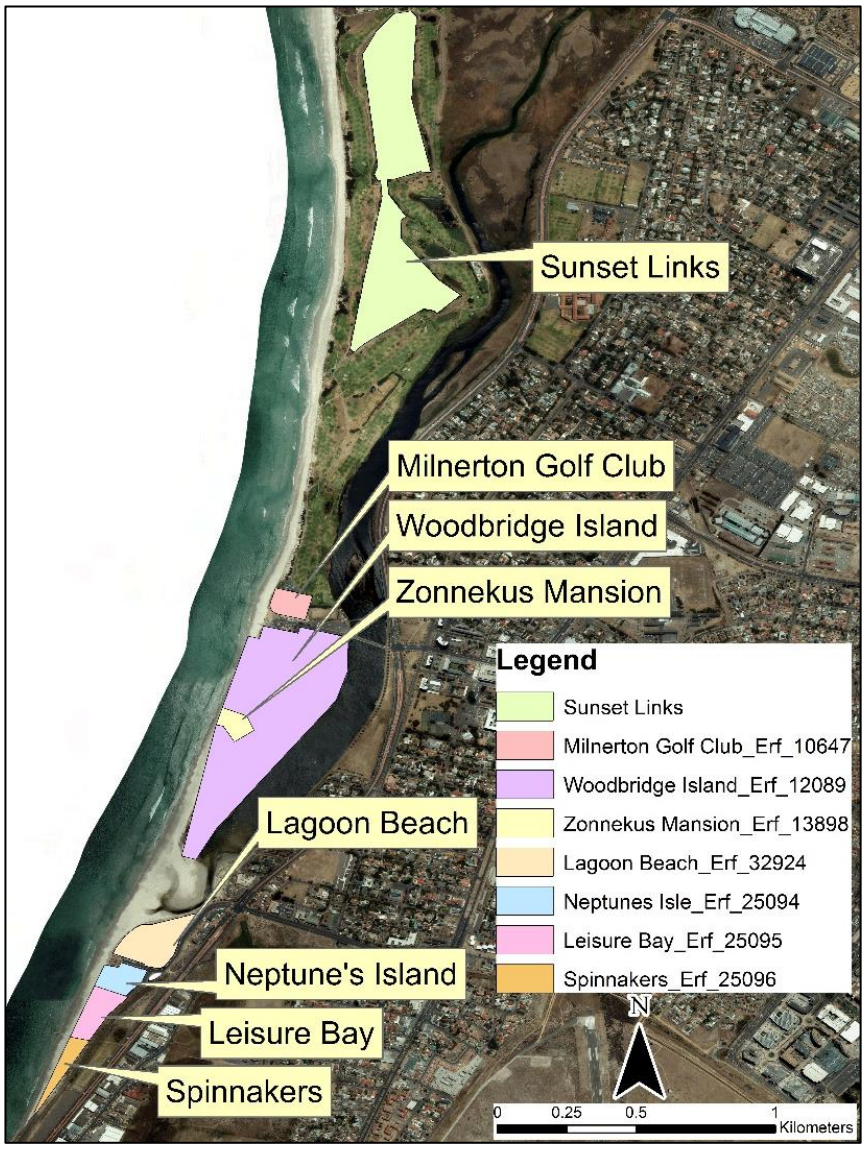


Figure 1: Area applicable to the Milnerton Erosion Response Guideline

Whilst the stretch of coast along Milnerton is considered vulnerable, it is also a popular recreational and tourist destination used for a wide range of activities by a diverse range of ethnic groups from a wide geographical area (Sowman, Scott, & Sutherland, 2016). It goes without saying that this node is also an important contributor to the local economy (Cartwright & Morgan 2016). ***In this regard any effort made at protecting both public and private infrastructure must be undertaken in such a way that does not compromise the social, economic and environmental value of beaches as democratic public spaces.***

The principles and guidelines contained in the Milnerton Erosion Response Guideline (MERG) are consistent with principles as defined in the City's Coastal Management Policy (2014:9), namely:

- "The coastal environment is a shared asset held in trust for the common good of all. Equitable and ease of public access to coastal areas and associated opportunities for the entire coastline is central to this value. The right of each individual to enjoy the coastline in the way of their choice without impacting on other users' enjoyment must be protected" and
- "Strategic, proactive, consistent and risk-averse coastal decision-making will be made in the best interests of the broader community of Cape Town, including the implementation of proactive and progressive measures now to reduce coastal risk from climate change, sea level rise and storm surge events. This decision making process will include public participation".

Further, the principles contained in the MERG are consistent with the principles enshrined in both the National Coastal Management Programme as well as the Western Cape Provincial Coastal Management Programme specifically as it relates to responding to coastal erosion:

**NATIONAL COASTAL MANAGEMENT PROGRAMME (NCMP)**
https://www.environment.gov.za/sites/default/files/docs/nationalcoastal_managementprogramme.pdf

Relevant sections in the NCMP as it relates to coastal erosion, risk and vulnerability include the following:

**Section 4: Vision and priorities for Coastal Management**
Subsection 4.2.1: Effective planning for coastal vulnerability to global change……pg.64
**Section 5: National management objections and actions**
Subsection 5.1: Coastal vulnerability……pg.69
Subsection 5.2: Public access……pg.70

**WESTERN CAPE PROVINCIAL COASTAL MANAGEMENT PROGRAMME**
https://www.westerncape.gov.za/eadp/files/atoms/files/Final_Western%20Cape%20Coastal%20Management%20Programme%202016.pdf

Relevant sections in the Western Cape Provincial Coastal Management Programme as it relates to coastal erosion, risk and vulnerability include the following:

**Chapter 4: Integrated Coastal Management**
Subsection 2.1.4: Climate change adaptation and disaster risk management……..pg.6
**Chapter 5: Priorities for Coastal Management**
Subsection 5.4.3: Facilitation of coastal access……pg.33
Subsection 5.4.4: Climate change, dynamic coastal processes and building resilient communities…… pg.33
**Chapter 6: The five-year programme: priority areas, coastal management objectives and implementation strategies**
Subsection 6.3: Facilitation of coastal access……...pg.40
Subsection 6.4: Climate Change, dynamic coastal processes and building

## Rationale for the Milnerton Erosion Response Guideline

**An important consideration in the management of coastal erosion is the fact that ad hoc, piecemeal and ill-informed decision making in respect of protecting coastal infrastructure and property may in effect compound coastal erosion. Further, uncoordinated and ill-informed interventions may lead to a range of negative socio-economic and environmental consequences.** Amongst others, such impacts include health and safety hazards associated with defence interventions for the beach-going public, deteriorating quality of the beach environment as a valuable recreational space, negative aesthetic impacts, impact on viewscapes etc. Piecemeal responses employed by each of the body-corporates are also likely to be less effective than a consistent approach adopted and applied by all stakeholders along the affected coast. A more wide-spread and consistent approach together with considerations of economy of scale is likely to make a collective effort in responding to coastal erosion more effective and less burdensome from a financial perspective. In view of this, the MERG has been developed with the intent to:

- Provide information on the drivers of coastal erosion along this stretch of coastline;
- Provide a reference document for affected parties on short term 'best practice' responses to coastal erosion;
- Encourage consistency in decision making by the various parties along the Milnerton coastline;
- Provide clarity on applicable legislation as it relates to activities along the coastline;
- Provide clarity on the role of the various spheres of government as it relates to the management of coastal erosion, and
- Provide information on appropriate communication channels between affected land-owners and the three spheres of government.

It must be noted that the MERG does not replace the various Environmental Management Plans (EMPs) and reports that have been approved as part of the Records of Decision (RODs) for the various developments along this stretch of coastline. Similarly, it is not the responsibility of the City nor any other sphere of government to rehabilitate and manage dune systems or any other coastal land that does not fall on City land or other government land. As per the RODs it remains the responsibility of the various body corporates to uphold and implement the recommendations made in the various reports and EMPs. The various EMPs and reports include the following:

- **Spinnakers**: Spinnakers Managed Environmental Area: Maintenance Guidelines, compiled by Amathemba Environmental Management Consulting (2003)
- **Neptune's Isle and Leisure Bay**: Neptune's Isle and Leisure Bay Guidelines for Dune Management and Maintenance (GDMM) compiled for Faircape, Stage Homes, and Knight Hall Hendry and Associates (1977)
- **Lagoon Beach Hotel**: Milnerton Lagoon Mouth Development Environmental Management Plan (1989)
- **Woodbridge Island**: Management of coastal dune vegetation, commissioned by Greenachre Estates, 1989 and Milnerton Lagoon Mouth Development Environmental Management Plan (1989)
- **Milnerton Golf Club**: Coastline stability and erosion problems at Milnerton CSIR (October 1996)

In addition to the EMPs, the contents of the MERG do not replace or supersede any legislation or policies at a provincial and national level and may be subject to amendment and alignment with national and provincial guidelines as and when required.

# Problem statement: Multiple factors contributing to coastal erosion at Milnerton

Coastal erosion at Milnerton cannot be attributed to any single factor, but is likely to be a consequence of a combination of factors. Although not properly understood, the following factors, to varying degrees, are considered drivers to coastal erosion at Milnerton (CSIR, 1972, 1983, 1986,1996, 2003).

- There is a general sand deficit in Table Bay. The proposed expansion of the container terminal of Cape Town Port was stopped as a direct consequence of a lack of sand in the bay which was required for construction purposes. The lack of sand in the bay limits the ability of beaches to recover after erosion events caused by wave action;
- Dredging of the Diep River Lagoon and removal of sediment from the littoral active zone for the construction of the Woodbridge Island complex;
- Construction of the Ben Schoeman Dock, Cape Town Port: the construction of Ben Schoeman dock altered the wave climate in Table Bay which has resulted in Table Bay, particularly in the Milnerton region, finding a new equilibrium through erosive forces.
- Climate change induced impacts:
    - Storms: An upward trend in the strength and impact of extreme storms is being detected. An analysis of annual maximum significant wave heights approaching Cape Town between 1980 and 2010 shows an increasing trend of 0.5m per decade (Brundrit, 2009).
    - Sea-level rise: the rate of sea-level rise is accelerating. Church and White (2011) estimate that the rate of global mean sea-level rise has almost doubled from 2.1 ± 0.2 mm $yr^{-1}$ in the last decade of the twentieth century to reach 3.3 ± 0.4mm $yr^{-1}$ in the first decade of the twenty first century. The International Panel on Climate Change (IPCC) Fifth Assessment Report estimates that sea levels will rise by between 9cm – 15cm by 2030, between 16cm – 32cm by 2050 and 28 – 98cm by 2100 (IPCC, 2013) (Figure 2).

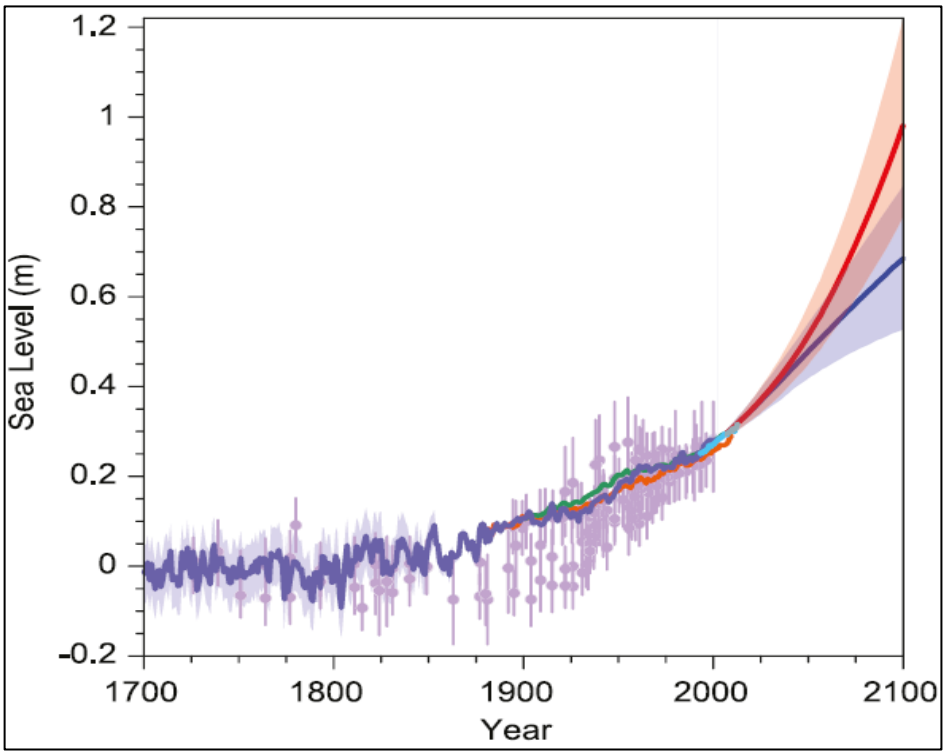


Figure 2: Historical sea-level rise and predicted rate of rise up to 2100.

(Red line post 2000 denotes trajectory of sea-level rise where there is no significant reduction in Greenhouse Gas (GHG) emissions, whist the red line post 2000 denotes sea-level rise where there is significant reduction in GHG emissions)

Although sea levels have been rising at different rates over the last 20,000 years (Fairbanks, 1989; Harvey & Nichols, 2008), a warming climate as a consequence of anthropogenic influences is leading to accelerated rates of increase since the end of the 18th century (Church & White, 2011; Jevrejeva et al., 2008). The rate of sea-level rise may differ on a regional scale due to influences in adjustments of landmasses, ocean dynamics and other regional or local phenomena such as currents, ocean temperatures and wind regimes (Goschen et al., 2009). Within South Africa, for example, the rate of rise on the west coast is different to that in the east. Mather et al. (2009) estimate that the sea-levels on the west coast are rising by +1.87 $mm.yr^{-1}$, the south coast by +1.47 $mm.yr^{-1}$ and the east coast by +2.74 $mm.yr^{-1}$. The variation in these levels are attributed to the differences in vertical movements of land masses between the east and west coasts of South Africa as well as the influence of different oceanographic processes occurring along the east and west coasts (Mather et al., 2009).

Even if greenhouse gas emissions were to be theoretically stopped with immediate effect, sea-levels would continue to rise until the next millennium (Washington et al., 2009; IPCC, 2013). Some argue that due to time scales associated with climate processes sea-levels would continue to rise for the next 1000 years (Solomon et al., 2009). Due to the close proximity of various properties and infrastructure to the shoreline along this stretch of coast, there is limited potential for the dune systems to slump and re-nourish the beach (as would naturally happen) during erosion events. In this respect this stretch of coastline has lost its resilience (Brundrit, 2016) and is a concern in respect of anticipated future erosion events.

Although unsubstantiated and difficult to prove, there are additional theories that describe the loss of sediment to Table Bay and are related to the interruption of sediment supply to the Atlantic seaboard:

- Hout Bay/Sandy Bay sediment by-pass system: This has been caused by development in Hout Bay that has now cut off the sediment by-pass system from Hout Bay to Sandy Bay. The consequence is that no more sediment is entering the Atlantic seaboard at this point. The longshore sediment drift in a northerly direction means that this sediment is no longer being transported northwards along Cape Town's west coast.
- Development of the Cape Flats: historically large sections of the Cape Flats consisted of wind-driven sand dune systems. The summer south-easter had the potential to mobilize sand from these systems and transport this sand to the southern section of Table Bay. Large scale development in the Cape Flats has however obstructed any potential transfer that may have taken place historically. The obstruction of this sediment supply to the Milnerton may have contributed to the lowering of beach levels.

# Legislative framework

## Introduction

There are two main sets of legislation that are applicable to the coastal environment and which have implications for the manner in which coastal erosion is dealt with. These include the National Environmental Management Act (Act 107 of 1998) as well as the Integrated Coastal Management Act (Act 24 of 2008). This legislation is important as it determines a number of activities that require authorisation from the competent authority as well as defines the correct processes to be followed should any property owner engage in coastal protection activities in response to coastal erosion.

If the various Body Corporates wish to undertake works other than that which were approved in the various EMPs as detailed in the Section 1, such works will be subject to an environmental assessment and authorization from the competent authority – in this case the Provincial Department of Environmental Affairs and Development Planning (DEA&DP). This assessment and authorisation will be undertaken in terms of the NEMA, Environmental Impact Assessment Regulations (as amended) as well as the Integrated Coastal Management Act. Such assessment will also need to consider various alternatives to whatever intervention is planned. No works will be permitted to be undertaken without such authorization. When planning for a prospective intervention to protect a property from coastal erosion, no structure or part of the intervention is permitted below the HWM. The strict regularisation of these activities are due mainly to ensure that risk from coastal erosion is not compounded, to ensure that the sensitive coastal environment is not adversely impacted upon, and to ensure that the general public have rights of access to the beach in a safe manner as coastal public property. The following sets of legislation are applicable activities that may be undertaken in response to coastal erosion:

## The National Environmental Management Act

The National Environmental Management Act (NEMA - Act 107 of 1998) determines a number of listed activities that cannot be undertaken without prior approval from DEA&DP as the competent authority in this regard. Should an activity be undertaken that triggers these listed activities in terms of the NEMA EIA regulations, an environmental authorization will be required from DEA&DP as the competent authority. **Annexure A lists the activities as relevant to the coastal environment from a coastal erosion defense perspective.**

## The Integrated Coastal Management Act

In addition to the NEMA requirements and criteria for environmental authorisations, the Integrated Coastal Management Act (the ICM Act) provides for additional criteria that must be considered by the relevant competent authority when evaluating an application for an activity which will take place in the coastal zone. The ICM Act is a specific environmental management Act (SEMA), under the over-arching umbrella of the NEMA and must be read in conjunction with the NEMA. The ICM Act is South Africa's principal coastal legislation. As such, if there is a conflict between the ICM Act and any other legislation, the ICM Act makes it clear that if the conflict relates to a coastal management issue, the ICM Act shall prevail. The following aspects of the ICM Act bare relevance to managing coastal erosion at Milnerton.

## Coastal Public Property

Coastal Public Property (CPP) is essentially the beach area and is protected in terms of the ICM Act. The use of the term "coastal public property" and the need to protect it is a result of the people-centred approach to coastal management that is promoted by the ICM Act. The emphasis on a people centred approach is driven by the need to promote restorative and distributive justice as a consequence of South Africa's unequal and divisive past. The intention of regularising CPP in terms of the ICM Act is therefore to prevent exclusive use, and privatisation of the coast by facilitating access to, and sustainable use of, coastal resources for the benefit of all South Africans. The relevance of this to coastal erosion is that no defence structures may be placed on CPP (any area seaward of the HWM) as this is obstructive to the use of CPP for the general public and in contravention of the ICM Act.

The ICM Act unequivocally vests ownership of CPP in the citizens of South Africa. The State remains, however, the trustee of CPP on behalf of the citizens of the Republic. CPP cannot be transferred, sold, attached or acquired by prescription[1], nor can the rights over it be acquired by prescription. In essence, CPP includes a number of components such as the actual water of the coast, the land below that water, islands, the seashore (between the low-water mark and the HWM), and other state land such as the Admiralty Reserve[2]. The area below the HWM will almost always be classified as CPP.

## Access to CPP

The ICM Act entrenches rights of access for the public to CPP provided that such access by persons:

- Do not negatively affect the rights of other users of CPP;
- Do not hinder the State in performing its duties as the custodian of CPP, and
- Do not cause harm to the coastal environment.

## The High-Water Mark

The High-Water Mark (HWM) is defined as the highest line reached by the coastal waters, but excluding any line reached as a result of:

- exceptional or abnormal weather or sea conditions, or
- an estuary being closed to the sea.

[1] Prescription denotes the process of acquiring rights and in particular obtaining a title to land as a result of the passage of time. Thus any perceived rights of private ownership of CPP cannot be acquired by the prescriptive rule.
[2] Any strip of state-owned land on the inland side of the HWM and includes land shown on an official plan, deed of grant etc. as "beach reserve", "government reserve", "coastal forest reserve", etc.

The position of the HWM is relevant to coastal property owners and other users of CPP because it defines the position of CPP. Due to dynamic natural processes such as erosion and accretion, the position of the HWM is not static or accurate over extended time periods. Due to climate change induced sea-level rise, CPP is anticipated to gradually move inland. Both the vegetation or debris line may be used as a crude proxy from which to determine the position of the HWM.

## What happens when the HWM moves?

As per the ICM Act, the movement of the HWM has various implications, and where such implications are dependent upon the type of boundary a property has. If a property's boundary is defined by the HWM, the property boundary will move with the moving HWM, whether it is inland or seaward. However, if a property has a fixed (straight line or curvilinear) boundary, as do the properties along the Milnerton coastline, then the following applies:

**Movement of the HWM inland (section 14 of the ICM Act)**: if the HWM moves inland of a straight line property boundary the owner of that land bounded by the HWM loses ownership any land that falls below the HWM to the extent that such land becomes CPP. The inland movement of the HWM is generally a consequence of naturally occurring coastal erosion and in the long term, it will be a function of sea-level rise.

## Responding to erosion or accretion on Coastal Public Property

In essence, the ICM Act prohibits any acts or physical response to erosion or accretion on CPP. This means that no person may construct, maintain or extend any structure, or take any other measures to prevent or promote erosion or accretion of the seashore. Neither may any person compel or require the State, or other person to take such action, unless the erosion is caused by an intentional act or omission of that organ of state or other person.

**Property owners may take measures to prevent erosion of the seashore, as long as these measures are situated within their own property boundaries and not on CPP**. However, any such measures may require an environmental authorisation in terms of the NEMA if they trigger a listed activity as outlined in Section 3.

## Enforcement of the ICM Act

The ICM Act empowers organs of state to issue cease and desist orders in respect of the coastal environment[3]. In this respect the State may issue the following:

**A coastal protection notice:** This notice is used to prohibit, stop or postpone an activity if the State has reason to believe that a person has or may cause an adverse effect on the coastal environment due to such activities; or
**A coastal access notice:** It is a criminal offence to prohibit a person from accessing CPP. Thus a coastal access notice may be used if the right of any natural person to use, enjoy or gain access to CPP is being adversely affected by any person.

In addition, the ICM Act allows an organ of State to issue a written repair or removal notice to any person responsible for a structure on or within the coastal zone if the structure contravenes the ICM Act or is having or is likely to have an adverse effect on the coastal environment, or if it has been erected, constructed or upgraded unlawfully.

[3] The Minister may delegate most powers or duties assigned to him or her in terms of the ICM Act. Consequently, the Minister may delegate powers to issue notices to the MEC (who may sub-delegate this power to a municipality) or an official in the Department of Environmental Affairs.

**Failure to comply with notices**
If a person does not comply with a coastal protection, coastal access or a repair and removal notice, or if the person responsible is not identified after the publication of the notices, the State may instruct the appropriate persons to carry out the requirements of the notice and recover the reasonable costs that result from carrying out the required actions on behalf of the responsible person.

**Offences and penalties in terms of the ICM Act**
The ICM Act makes provision for two different categories of offences. Each category attracts a different penalty depending on the severity of the offence. Annexure B summarises the offences, the ICM Act section contravened and the penalty associated with the first conviction of such an offence. It is important to note that a person who is convicted of a category two or a category three offence for the second time may be sentenced as if they had committed a category one or two offence, and be penalised accordingly.

# Best practice principles for responding to coastal erosion

## Lessons learned – International Experiences

International case studies have provided a range of experiences in relation to cost benefit, trade-offs and environmental sensitivity in respect of responding to coastal erosion. Responses to coastal erosion may typically be categorised into three general types of interventions. These include hard engineering interventions, soft engineering interventions and planned retreat.

**Hard engineering interventions**

Typically, hard engineering interventions includes the use of sea walls, revetments, dolosse or any other hard structure that is used to deflect wave energy, to prevent coastal erosion of the shoreline and which is generally permanent in nature. Lessons learnt from hard protection techniques include the following (taken from Breetzke *et al*., 2008):

- Positive effect restricted to the intended site;
- Expensive to construct with a continued maintenance burden;
- Aesthetically offensive;
- Deflection of wave energy to neighbouring properties and the exacerbation of erosion for these properties;
- Requires expansion to adjacent areas as their impacts extend beyond the affected area;
- Increases turbulence and sediment scouring;
- Likely to result in the loss of beach adjacent to such structure, especially in the long term;
- Disrupts longshore sediment transport;
- Limits option retention into the future;
- Impeded access to and along coastal public property as a consequence of such interventions;
- Loss of coastal public property (beach) adjacent to hard engineering defence interventions;
- Loss of beach amenity, and
- Such impacts are likely to remain in place at a multi-generational scale;

**Soft engineering interventions**

Soft engineering interventions typically include approaches such as the establishment and maintenance of dune systems as natural buffers, the placement of geofabric sand bags, or any other approach that does not employ hard or permanent infrastructure. Lessons learnt from soft protection techniques include the following:

- Soft coasts require soft solutions;
- Cost effective relative to hard protection measures;
- Growing popularity with proven effectiveness;
- Requires continuous maintenance;
- Reduced safety hazard;
- Coastal dune rehabilitation improves slope stability, consolidates beach sediment and reduces wave energy;
- Enables option retention into the future, and
- Provides a greater opportunity for the continuation of natural coastal processes.

**Planned retreat**

Planned retreat is the deliberate and strategic relocation of infrastructure away from areas that are vulnerable to coastal hazards. Lessons learnt from such an approach included the following:

- Expensive;
- Often not an option in highly transformed urban environments;
- Managed retreat is likely to be less expensive than the cost of construction and ongoing maintenance of sea defence if considered against a long term time horizon, and
- Sound environmental solution.

## Short term best practice principles applicable to Milnerton

The following principles are considered best practice guidelines when responding to coastal erosion and which is specific to the Milnerton context:

- The spatial extent to which coastal erosion is taking place at Milnerton is such that multiple parcels of land (erven) owned by different entities are exposed to the same threat: erosion;
- Interventions at the scale of individual erven are therefore unlikely to be effective in addressing coastal erosion which is taking place at a much broader scale;
- Interventions of sea defence structures that differ between neighbouring properties are less likely to be effective than a single consolidated intervention at the spatial extent to which coastal erosion is taking place,
- A single consolidated intervention across multiple erven is not only likely to be more effective in mitigating coastal erosion, but is also likely to be cost effective from an economy of scale perspective.

## Short-term responses post erosion events at Milnerton

When erosion of property frontage takes place, the following short-term interventions may be undertaken:

1. Reshape the steep face of the dune manually so that there is a more gradual transition from the top of the dune to the beach (gradient of between 15 and 30 degrees is ideal), rather than leaving an abrupt step. This is required to make the area safe through the prevention of slumping, especially if the dune contains foreign objects such as builders' rubble. Should re-shaping be done mechanically with a vehicle, a permit is required in terms of the Control of the Use of Vehicles in the Coastal Zone Regulations as administered by the National Department of Environment, Forestry and Fisheries;
2. Replant the reshaped face with indigenous vegetation (see Annexure E on '*Indigenous dune plant species to Cape Town*', pg. 78);
3. Avoid replanting with indigenous vegetation that bears fruit, flowers or has any medicinal value to avoid attracting people to this vegetation and destabilising the dunes in the process;
4. Irrigation of the planted vegetation may be required if planting takes place during the dry summer months to help vegetation establish. Consideration must also be given water restrictions;
5. Do not place any structures (such as fences and plastic bags) seaward of the base of the eroded dune. To do so is in contravention of both the NEMA and ICM Act and may be subject to legal processes;
6. Where relevant, re-align existing defence structures landward of the eroded edge;
7. Remove foreign debris (i.e. sand bags, rocks and rubble) from the dune toe and beach area and discard at a registered landfill site. Do not place this material back on the dune cordon, and
8. Allow kelp to remain in its natural distribution on the beach. Do not collect it from the beach and 'stockpile' it at the toe of the dune (see section on Kelp Management for further detail and rationale on this).

For further detail on dune maintenance and rehabilitation options, please refer to Annexure D which details the *City of Cape Town's Maintenance Management Plan: Dunes and Beaches*. The principles and approaches contained in this document, materials used, planting seasons etc. are applicable to City owned land. The principles contained therein may be used within boundaries of private properties in consultation with the City's CMB.

**A common short term response to coastal erosion is to dump sand and other foreign material on the eroded edge as a means to limit further erosion. This practice is advised against for the following reasons:**

1. Dumping sand or foreign objects is not aligned with the recommendations of the original EMPs applicable to each of the body corporates;
2. Such practice would require authorisation in terms of NEMA and the ICM Act;
3. The use of sand to replenish the frontal dune necessitates the use of sand with the same grain size. Sand may not be taken from the beach, and sourcing of sand with the same grain size from other areas is difficult, expensive, and such sand is unlikely to remain in place in the short term, and
4. Foreign material, such as stone, rocks and building rubble, will eventually be distributed across the wider beach due to the dynamic nature of the beach environment. This not only detracts from the recreational value of beaches, it poses health and safety hazards and is also aesthetically offensive to the general public that use beaches.

Should any person wish to drive on the beach for purposes of dune protection and rehabilitation, or any other reason, a permit is required in terms of the Control of the Use of Off-road vehicles in the Coastal Zone Regulations. The competent authority in respect of processing applications and issuing permits rests with the National Department of Environment, Forestry and Fisheries. Details of relevant contact

persons are listed in Table 1 (see section 'Communication channels with the various spheres of government, pg. 18).

### Potential options for the longer term

In this context 'longer term' is considered to be 10 years and beyond. Responding to coastal erosion in the long term is a complex challenge. A key obstacle to the effective management of coastal erosion is the sheer expense associated with it. In whichever form the response to coastal erosion may take, whether it be to defend or to retreat, the costs associated with either approach are astronomical and often beyond the financial means of property owners to implement. An additional challenge is the need to achieve a delicate, and often tricky, balance when responding to coastal erosion. This balance includes the need to not only to consider private property interests, but to ensure that in doing so, the interests of the general beach going public and their use of CPP is also protected in perpetuity.

Long term responses to coastal erosion require the re-appraisal of financial models to support any adaptive interventions as the current financial models are not equipped to deal with the enormity and expense of the problem. In addition to this is the importance of improving sea-level and coastal process models with the view to refine our understanding of what is likely to happen in problem areas into the future. Given scientific uncertainty regards the rate at which sea-levels are rising into the future and emergent properties associated with coastal risks and hazards, the improvement of such models based on the latest science must be an ongoing process. Lastly, in order to develop a feasible, long-term and sustainable solution for Milnerton, the potential impact of proposed coastal protection structures on the beach and adjacent shoreline has to be determined through a comprehensive study. This impact also needs to factor in other environmental and social impacts (i.e. aesthetics, construction activities, etc.) as well as financial and maintenance considerations.

## Management of kelp on beaches at Milnerton

### The value of kelp to the City and its residents

In terms of mitigating against coastal hazards, kelp provides an invaluable service to the City and its residents for the following reasons:

- Kelp forests absorb energy from high seas. This translates into reduced energy (in the form of waves) reaching the coast, thus playing a role in mitigating against coastal erosion.
- Kelp wrack (kelp washed up on beaches) plays an important role in trapping wind-blown sand. Trapping sand on beaches elevates beach levels which in return mitigates against coastal erosion. It is critical that this process is encouraged during at all times to encourage as much growth in beach height and width as possible.
- Kelp wrack contributes to the organic content of beach sand and assists in the establishment of pioneer vegetation and the formation of embryo dunes, again important in mitigating against coastal erosion.
- Kelp wrack, if left in its natural distribution across the beach, also contributes to the protection of dune cordons during storms and high seas. During high seas kelp naturally washes up against dunes which typically takes place during the first high-tide that coincides with the storm event. Kelp remains stacked against the dune and is effective at buffering the dune against additional high tides that may take place for the duration of the storm (typically lasting two-three days.

The City has a Kelp Cleaning Protocol in place which identifies the stretch of coast along Milnerton as a kelp zone. This means that kelp is not removed from this stretch of coast by the City's Solid Waste Management Department. It is imperative that should any member of the public witness kelp being removed, that this is reported to the CMB as per the appropriate channels identified in Chapter 7: Communication channels with the relevant spheres of government. It must be noted that in terms of the Marine Living Resources Act (Act 18 of 1998) it is illegal to collect kelp from the beach for commercial purposes without a permit.

# Managing the Diep River Estuary

## Legal provisions and institutions

The City of Cape Town has developed a number of Maintenance Management Plans (MMPs) for estuaries in Cape Town. These MMPs have been established in accordance with the Environmental Impact Assessment (EIA) authorisation process for the City's routine stormwater management and maintenance programme (Environmental authorisation dated 13 February 2015, EIA Reference # 16/3/1/3/1/A7/4/2031/12).

In terms of the approval received from DEA&DP, the City and its duly appointed and supervised contractors are authorised to undertake a range of routine stormwater maintenance tasks provided that the provisions of the Environmental Management Programme (EMPr) are adhered to, and that a site/reach specific MMP is compiled and adhered to for each work area. One such activity includes the management of river/estuary mouths whereby the estuary mouth may be breached and/or redirected to towards the sea for purposes of the prevention of flooding, as well as flushing the system should a pollution incident occur.

## Diep River Estuary Mouth Management Protocol

**Institutional arrangements**

Consultations between the City of Cape Town Environmental Management Department and the Catchment Planning branch of the Water and Sanitation Services Department led to an agreement that the Table Bay Nature Reserve Manager will coordinate any mouth management interventions, since the lagoon forms part of the Table Bay Nature Reserve. Such mouth management interventions will take place in accordance with the aforementioned estuary MMP. The working agreement is that the Nature Reserve Manager will consult with the relevant Catchment Planning official to determine whether the Diep River Mouth needs to be breached or not. A WhatsApp group was established to facilitate coordination between Environmental Management as well as Catchment Planning. When agreement is reached to breach the mouth, Catchment Planning will be requested to make a digger-loader and an operator available at a date and time prescribed by the Nature Reserve Manager.

**Monitoring**

Prior to determining whether the mouth needs to be breached, various water level benchmarks will be monitored on a daily basis to determine whether water levels in the lagoon are approaching a critical threshold. These benchmark points include the seawall at the Palm Site (near the Chevron pipeline) and a stormwater outlet pipe at Woodbridge. Weather predictions are also monitored in order to evaluate when rainfall could lead to elevated water levels.

**Environmental requirements for breaching**

In order to breach the estuary mouth successfully, an adequate head of water is required to build up so that the flow is strong enough to scour the sand bar. Trying to breach the mouth when the water levels are not high enough could lead to failure. As such the water level must be allowed to build up to the critical threshold, but the decision to breach the mouth must however be taken in advance to ensure that no additional flow will push the levels over the threshold. It will also be a condition that the mouth is breached on an outgoing tide. Attempting to breach the mouth on an incoming tide could be counter-productive and ineffective.

It must be noted that the nearby Milnerton golf course will experience some minor flooding in certain areas close to the river. Unfortunately, this flooding is unavoidable as enough water to breach the mouth is required, and without which, such breaching will be ineffective.

**Additional considerations**

If water levels are expected to rise to critical levels over weekends or public holidays, such circumstances will be pre-empted in and planned for in accordance with the MMP. At all times when breaching operations take place on the ground, the Nature Reserve Manager will be present on site to direct the digger-loader operator and to handle public complaints and enquiries on site.

It must also be noted that the breaching of the mouth will result in a rapid drawdown of the water levels, but it will not ensure that the mouth remains open. After a breaching, the mouth condition would still be subject to the dynamic interactions between river and the sea and as well as the movement of sediments associated with these forces.

Records of all breaching activities must be reported on the estuary management agenda item at the quarterly Protected Area Advisory Committee meetings of the Nature Reserve, for record purposes.

# Communication channels with the various spheres of government

Table 1: Contact details of various officials and their roles

| CITY OF CAPE TOWN | | | |
|---|---|---|---|
| **Name** | **Position** | **Contact details** | |
| Gregg Oelofse | Manager: Coastal Management | 021 487 2355<br>0839408143 | Gregg.Oelofse@capetown.gov.za |
| Howard Gold | Head: Coastal Management | 021 4442605 | Howard.Gold@capetown.gov.za |
| Natalie Newman | Senior Environment Professional: Coastal Management | 021 4872123<br>072 495 9715 | Natalie.Newman@capetown.gov.za |
| Darryl Colenbrander | Head: Coastal Policy Development and Management Programmes | 021 487 2355<br>082 312 3443 | Darryl.Colenbrander@capetown.gov.za |
| Charlene McKie | Biodiversity Area Manager: Table Bay Nature Reserve | 021 444 7219 | Charline.Mckie@capetown.gov.za |
| Ben De Wet | Head: Catchment Planning, Region 1 | 021 4005036 | Ben.Dewet@capetown.gov.za |
| **PROVINCIAL DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING** | | | |
| Ieptieshaam Bekko | Environmental Control Officer: Biodiversity and Coastal Management | 021483 2885 | Ieptieshaam.Bekko@westerncape.gov.za |
| Mellisa Naiker | Control Environmental Officer: Biodiversity and Coastal Management | 021486 2885 | Mellisa.Naiker@westerncape.gov.za |
| Zaahir Toefy | Director: Development Management | 0214832700 | Zaahir.Toefy@westerncape.gov.za |
| **NATIONAL DEPARTMENT OF ENVIRONMENT, FORESTRY AND FISHERIES: OCEAN AND COASTAL MANAGEMENT** | | | |
| Ryan Peter | Acting Director: Coastal Conservation Strategies | 021 819 2490 | Rpeter@environment.gov.za |
| Mzondeleli Dlulane | Environmental Management, Grade 1 Inspector | 021 402 3441 | MDlulane@environment.gov.za |
| Nontsasa Tonjeni | Control Environmental Officer | 021 819 2451 | NTonjeni@environment.gov.za |

# Additional sources of information relevant to coastal erosion, risk and vulnerability

The following links provide access to websites and portals that provide information on coastal dynamic processes, risk and vulnerability

## National Oceans and Coastal Information Management System: Coastal Flood Hazard

https://www.ocims.gov.za/hazardlines/#/?_k=a3nmur (supported by Google Chrome browser)

### South African Weather Service: Wave forecasts

http://marine.weathersa.co.za/Forecasts_HighResWaves.html#

### South African Weather Service: Storm Surge Forecasts

http://marine.weathersa.co.za/Forecasts_Surge.html

### User friendly guide to the Integrated Coastal Management Act

https://www.environment.gov.za/sites/default/files/reports/updateduserfriendlyguide_SAICMAct.pdf

### Western Province Coastal Management Programme

https://www.westerncape.gov.za/eadp/files/atoms/files/Final_Western%20Cape%20Coastal%20Management%20Programme%202016.pdf

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# Contributors

| | |
|---|---|
| Darryl Colenbrander: | Head Coastal Policy Development and Management Programmes, CCT |
| Natalie Newman: | Senior Professional Officer: Coastal Management, CCT |
| Gregg Oelofse: | Manager: Coastal Management, CCT |
| Maria LeRoux: | Head: Coastal Engineering and Optimisation, CCT |
| Brenton Herron: | Head: Coastal Engineering and Optimisation, CCT |
| Pierre Roux | Professional Officer: Marine and Coastal Engineer, CCT |
| Koos Retief: | Biodiversity Area Coordinator, CCT |
| Howard Gold: | Head: Coastal Management, CCT |
| Nicky Rheeder | Councillor, CCT |
| Fabian Ah Sing | Councillor, CCT |
| Joy McCarthy | Councillor, CCT |
| Xavier Rebello: | PhD Candidate, University of Cape Town/CCT |
| Curtis Grootboom: | Coastal Management Assistant, CCT |
| Ryan Peter: | Acting Director: National Department of Environment, Forestry and Fisheries: Oceans and Coasts |
| Richard Rundle: | Woodbridge Island Body Corporate member |
| Caroline Marx: | Greater Milnerton Ratepayers Association member |
| Omar Parak: | Kwa-Zulu Natal Department of Economic Development, Tourism and Environmental Affairs: Coastal and Biodiversity Management |
| Ieptieshaam Bekko | Control Environmental Officer: DEA&DP, Sub-Directorate: Coastal Management Directorate: Biodiversity and Coastal Management Chief Directorate: Environmental Sustainability |
| Mellisa Naicker | Control Environmental Officer: DEA&DP, Sub-Directorate: Coastal Management Directorate: Biodiversity and Coastal Management Chief Directorate: Environmental Sustainability |
| Elena Piller | Coastal Management Intern, Coastal Management Branch, CCT |

# ANNEXURE A: NEMA EIA LISTED ACTIVITIES

(Adapted from National Environment Management Act (Act 107 of 1998))

**Listing notice 1: Activity 15**

"The development of structures in the coastal public property where the development footprint is bigger than 50 square metres, excluding—
(i) the development of structures within existing ports or harbours that will not increase the development footprint of the port or harbour;
(ii) the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;
(iii) the development of temporary structures within the beach zone where such structures will be removed within 6 weeks of the commencement of development and where coral or indigenous vegetation will not be cleared; or
(iv) activities listed in activity 14 in Listing Notice 2 of 2014, in which case that activity applies"

**Listing notice 1: Activity 17**

Development—

*i) in the sea;*
*ii) in an estuary;*
*iii) within the littoral active zone;*
*iv) in front of a development setback; or*
*v) if no development setback exists, within a distance of 100 metres inland of the* high-water mark of the sea or an estuary, whichever is the greater;

in respect of—
(a) fixed or floating jetties and slipways;
(b) tidal pools;
(c) embankments;
(d) rock revetments or stabilising structures including stabilising walls; or
(e) infrastructure or structures with a development footprint of 50 square metres or more —

but excluding

(aa) the development of infrastructure and structures within existing ports or harbours that will not increase the development footprint of the port or harbour;
(bb) where such development is related to the port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.
(cc) the development of temporary infrastructure or structures where such structures will be removed within 6 weeks of the commencement of development and where coral or indigenous vegetation will not be cleared.
(dd) where such development occurs within an urban area.

**Listing notice 1: Activity 18**
"The planting of vegetation or placing of any material on dunes or exposed sand surfaces of more than 10 square meters, within the littoral active zone[4], for the purpose of preventing the free movement of sand, erosion or accretion, excluding where –

[4] The littoral active zone is defined as:

(i) the planting of vegetation or placement of material relates to restoration and maintenance of indigenous coastal vegetation undertaken in accordance with a maintenance management plan; or

(ii) such planting of vegetation or placing of material will occur behind a development setback".

**Listing notice 1: Activity 19**

"The infilling or depositing of any material more than 10 cubic meters into, or the dredging, excavation removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse;

But excluding where such infilling, depositing, dredging, excavation, removal or moving-

(a) will occur behind a development setback
(b) is for maintenance purposes undertaken in accordance with a maintenance management plan
(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;
(d) occurs within exiting ports or harbours that will not increase the development footprint of the port or harbour; or
(e) where such development is related to the development of a port or harbour, in which case activity 26 of Listing Notice 2 of 2014 applies.

**Listing notice 1: Activity 19A**

"The infilling or depositing of any material of more than 5 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from a watercourse —

but excluding where such infilling, depositing , dredging, excavation, removal or moving—
(a) will occur behind a development setback;
(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;
(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;
(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies."

**Listing notice 1: Activity 52**

"The expansion of structures in the coastal public property where the development footprint will be increased by more than 50 square metres, excluding such expansions within existing ports or harbours where there will be no increase in the development footprint of the port or harbour and excluding activities listed in activity 23 in Listing Notice 3 of 2014, in which case that activity applies."

**Listing notice 1: Activity 54**

"The expansion of facilities-

(i) in the sea
(ii) in an estuary
(iii) within the littoral active zone
(iv) in front of a development setback; or
(v) if no development setback exists, within a distance of 100 meters inland of the high-water mark of the sea or an estuary, whichever is the greater;

In respect of-

(a) fixed or floating jetties and slipways;
(b) tidal pools;
(c) embankments;
(d) rock revetment or stabilizing structures including stabilizing walls; or
(e) infrastructure or structures where the development footprint is expanded by 50 square meters or more;

but excluding-

(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; or
(bb) where such expansion takes place within an urban area.

**Listing notice 1: Activity 55**

"Expansion-

(i) in the sea
(ii) in an estuary
(iii) within the littoral active zone
(iv) in front of a development setback; or
(v) if no development setback exists, within a distance of 100 meters inland of the high-water mark of the sea or an estuary, whichever is the greater;

In respect of

in respect of —
(a) facilities associated with the arrival and departure of vessels and the handling of cargo;
(b) piers;
(c) inter- and sub-tidal structures for entrapment of sand;
(d) breakwater structures;
(e) coastal marinas;
(f) coastal harbours or ports;
(g) tunnels; or
(h) underwater channels;
but excluding the expansion of infrastructure or structures within existing ports or

harbours that will not increase the development footprint of the port or harbour.

**Listing notice 2: Activity 14**

The development and related operation of

(i) an anchored platform; or
(ii) any other structure or infrastructure-
on, below or along the sea bed.

Excluding

(a) development of facilities, infrastructure or structures for aquaculture purposes; or
(b) the development of temporary structures or infrastructure where such structures will be removed within 6 weeks of the commencement of development and where coral or indigenous vegetation will not be cleared.

**Listing notice 2: Activity 26**

Development—
(i) in the sea;
(ii) in an estuary;
(iii) within the littoral active zone;
(iv) in front of a development setback; or
(v) if no development setback exists, within a distance of 100 metres inland of the highwater mark of the sea or an estuary, whichever is the greater;
in respect of —
(a) facilities associated with the arrival and departure of vessels and the handling of cargo;
(b) piers;
(c) inter- and sub-tidal structures for entrapment of sand;
(d) breakwater structures;
(e) coastal marinas;
(f) coastal harbours or ports;
(g) tunnels; or
(h) underwater channels;
but excluding the development of structures within existing ports or harbours that will not increase the development footprint of the port or harbour.

Should any property owners wish to undertake any of the listed activities, or are uncertain as to whether any intervention may trigger any of the above listed activities, the DEA&DP must be approached to determine whether an environmental authorisation is required or not.

# ANNEXURE B: OFFENCES AND PENALTIES – INTEGRATED COASTAL MANAGEMENT ACT

(Adapted from Celliers et al., 2009)

| Offence category | Offences | ICM Act section contravened | Penalty |
|---|---|---|---|
| 1 | Discharging effluent from a source on land into coastal waters | 69 | Up to 5 million fine<br>Up to 10 years in prison<br>Or both |
| | Incinerating waste or other material at sea | 70 | |
| | Loading, importing or exporting waste to be dumped or incinerated at sea | 70 | |
| | Dumping waste or any other material at sea without a permit | 70 | |
| | Alternating any authorisation | 63, 65, 69, 71 | |
| | Fabricating or forging an authorisation | 63, 65, 69, 71 | |
| | Using or possessing any false documentation or authorisation | 63, 65, 69, 71 | |
| | Making a false statement or report to get authorisation or when objecting to an authorisation | 63, 65, 69, 71 | |
| 2 | Failure to comply with a repair and removal notice | 61 | Up to R500 000 fine |
| | Hindering a person to authorised to act in terms of the ICM Act | 79 | Up to five years in prison/community service |
| | False representation as a person authorised to act in terms of the ICM Act | 79 | |
| Offences not covered by the categories above | Offences in terms of regulations promulgated by the Minister (Section 83) or MEC (Section 84) | 85 | An appropriate fine<br>Up to two years in prison; or<br>Both |

# ANNEXURE C: KELP REMOVAL ZONES IN THE CITY OF CAPE TOWN

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

## KELP REMOVAL ZONES

## FOR THE

## CITY OF CAPE TOWN

## JULY 2017

Prepared by the Coastal Management Branch

| Beach | Extent of Kelp Removal Zone | Frequency of Kelp Removal | Solid Waste: Area Manager | Contact Details |
|---|---|---|---|---|
| **Melkbosstrand** | NO KELP REMOVAL | | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Big Bay** | NO KELP REMOVAL | | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Small Bay South** | Only kelp to be removed south of Peligrini Road to parking lot in Small Bay. | Throughout the year | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Milnerton** | NO KELP REMOVAL | | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Three Anchor Bay** | Entire beach | Throughout the year | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Rocklands** | Entire beach | Throughout the year | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Queen's Beach** | Entire beach | Throughout the year | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Saunders** | Entire beach | Throughout the year | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Clifton** | No kelp to be removed from Clifton 1st | Throughout the year | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Camps Bay** | No kelp to be removed from north of pump station. | Throughout the year | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Llandudno** | NO KELP REMOVAL | | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 392 5114 |
| **Hout Bay West** | Opposite the gravel parking area, extending from the concrete pier for approximately ¾ of the length of the parking area (± 50m from the river). | Throughout the year | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Hout Bay East** | NO KELP REMOVAL | | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **Fish Hoek** | Beach area adjacent to Jager's Walk until (but not including) the area opposite the gravel parking area. | Throughout the year | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Danger Beach** | No kelp to be removed north of tidal pool. | Seasonal | Xolisile Mama | Xolisile.Mama@capetown.gov.za<br>021 444 6355 |
| **St James** | Entire beach and tidal pool | Throughout the year | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |

| | | | | |
|---|---|---|---|---|
| **Muizenberg** | Area between Surfers' Corner and the Muizenberg Pavilion. | Throughout the year | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Sunrise Beach** | NO KELP REMOVAL | | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Strandfontein-** | NO KELP REMOVAL | Seasonal | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Blue Waters Coastal Resort** | Beach area directly opposite the paved pavilion at Blue Waters beach. | Seasonal | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Mnandi West** | NOKELP REMOVAL | | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Mnandi East** | NO KELP REMOVAL | | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Monwabisi** | Entire enclosed beach area to the east of the tidal pool. | Throughout the year | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Macassar** | NO KELP REMOVAL | | Denver Stevens | Denver.Stevens@capetown.gov.za<br>021 444 0866 |
| **Strand North** | NO KELP REMOVAL | | Peter Jaggers | Peter.Jaggers@capetown.gov.za<br>021 444 8824 |
| **Strand South** | NO KELP REMOVAL | | Peter Jaggers | Peter.Jaggers@capetown.gov.za<br>021 444 8824 |
| **Gordon's Bay** | Area opposite the parking lot on Beach Road, Gordon's Bay. | Seasonal | Peter Jaggers | Peter.Jaggers@capetown.gov.za<br>021 444 8824 |
| **Bikini Beach** | NO KELP REMOVAL | | Peter Jaggers | Peter.Jaggers@capetown.gov.za<br>021 444 8824 |

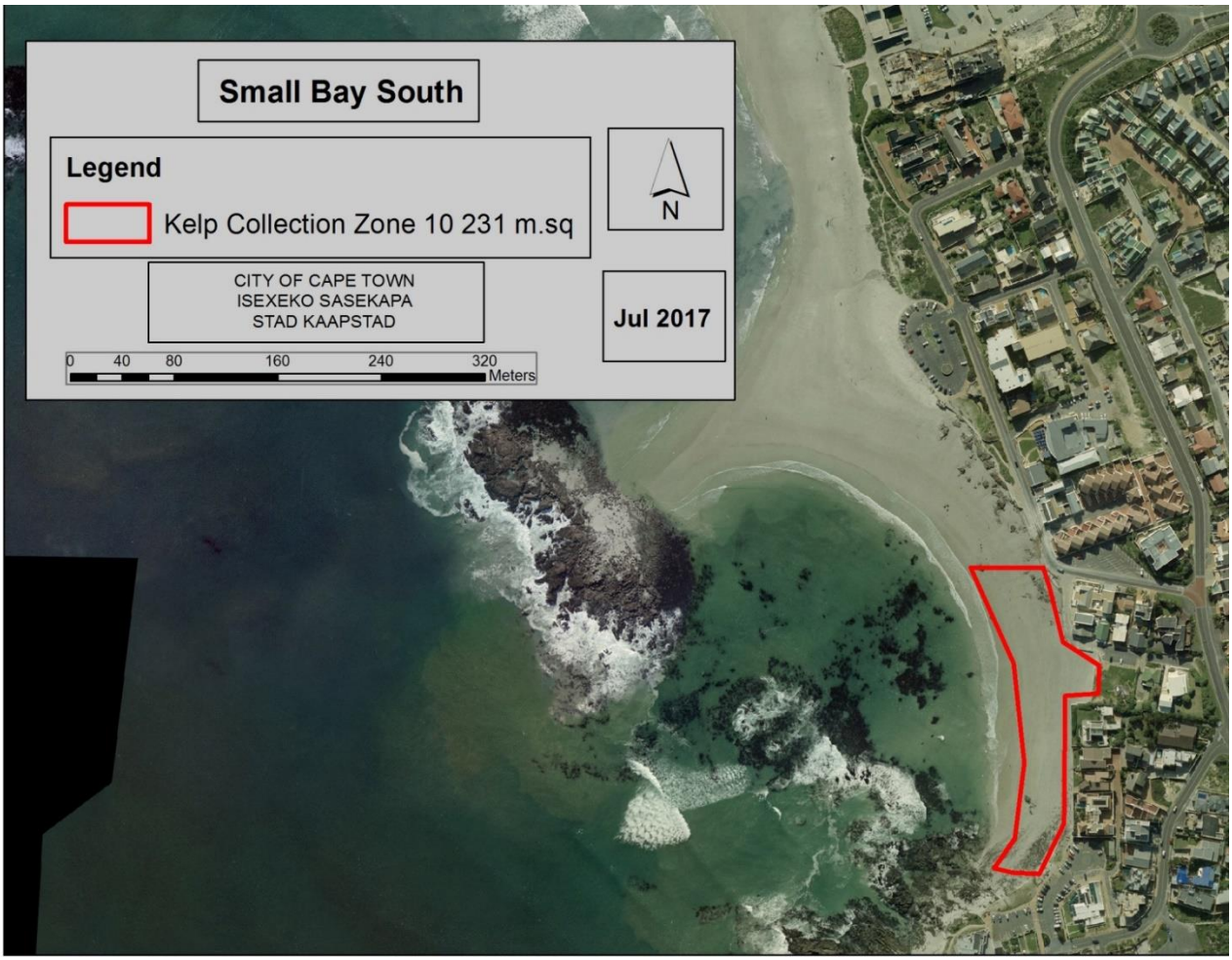
**General Beach Cleaning Protocols**

- All beaches will be managed as ecological systems;
- Under no circumstances will human waste be buried on the coast. Natural organic waste may under exceptional circumstances be buried on the coast/beach with permission from the Manager: Area Cleaning and the Head: Coastal Management.
- All marine mammal carcasses must be managed in accordance with the Large Marine Animal Stranding's Policy for the City of Cape Town;
    - In the event of a whale or dolphin carcass Disaster Management Call Centre must be contacted to initiate the Large Marine Animal Stranding Policy
    - All animal carcasses will be removed to the appropriate landfill site unless requested for dissection by National Department of Environment, Forestry and Fisheries.
- No litter bins or cleansing containers will be located on beaches or rocky shores but at the back of beaches and rocky shore and which are easily accessible to the public and for servicing.

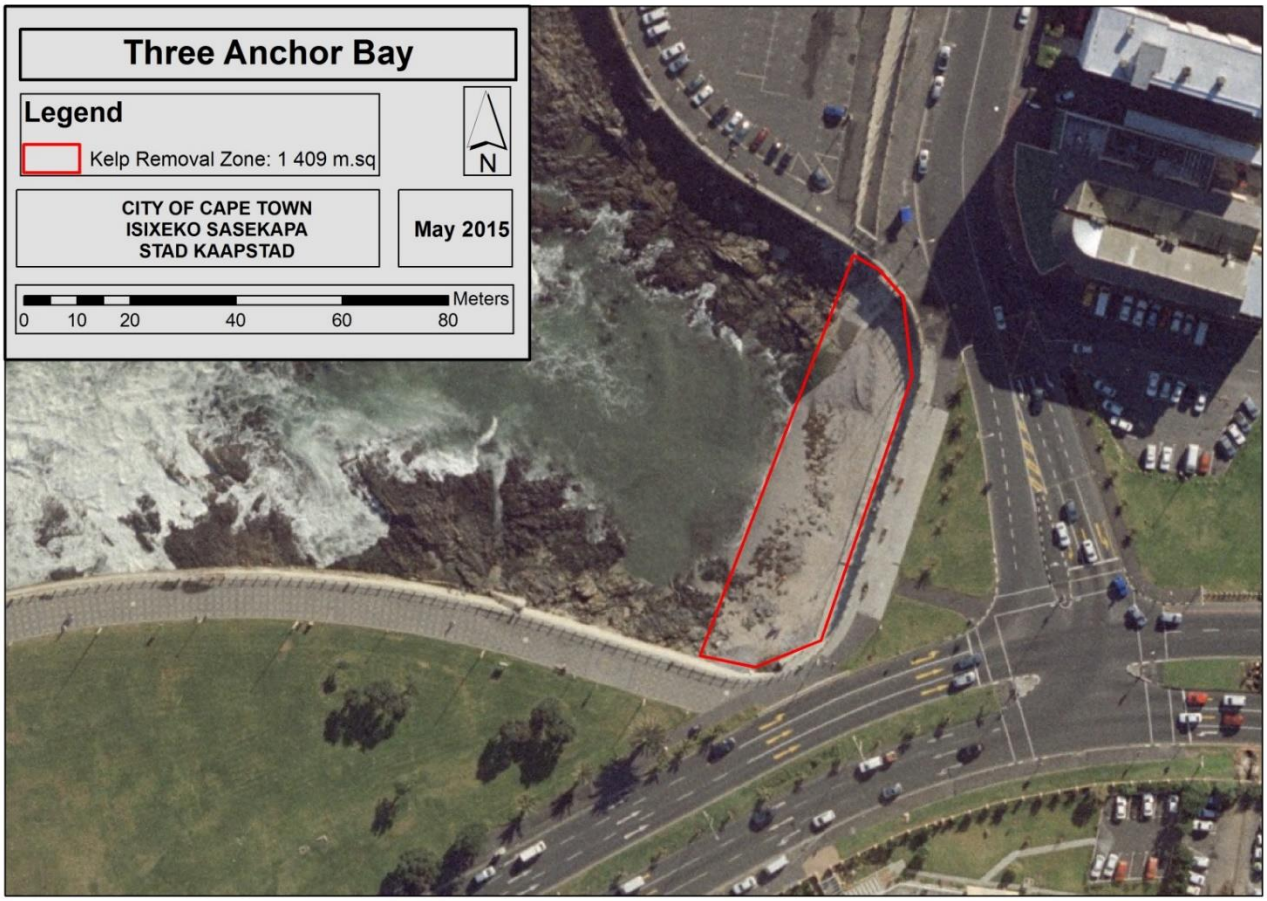
**Kelp Wrack and Red Bait**

- For all areas demarcated as Kelp Removal Zones (Annexure A) all kelp wrack and Redbait shall be removed from the coast and disposed at registered landfill sites. Disposal of kelp to a landfill will, however, be the last option in order to limit the impact of landfill sites. Other avenues for example use in composting or sand stabilisation should be actively explored.
- No kelp may be removed from the coast at any time by private individuals or organisations unless in possession of a permit issued by National Government
- All tidal pools to be kept free of kelp
- No kelp or Redbait is to be removed from any other area on the coast. Where extreme storm events result in abnormal amounts of kelp wrack being deposited, removal of kelp wrack from affected areas may be requested by Coastal Management. Completion of these ad hoc requests will be at the discretion of the Area Cleaning Manager.
- Frequency of kelp and Redbait removal from the demarcated areas will be done according to the Cleaning Schedule. This Cleaning Schedule will be determined by the Area Cleaning Manager in collaboration with Coastal Management
- The kelp removal will be frequent during summer months (1st November to 30th April) and reduced to as needed during winter (May to October).
- Kelp and Redbait may be stockpiled prior to removal. All stockpiling will be done at predetermined locations. No kelp or Redbait may be stockpiled for longer than three days;
- Where kelp wrack is not to be removed, it must be left on the beach in its natural position and must not be relocated or re-positioned within dunes, against the toe of dunes, or within dune blow-outs.

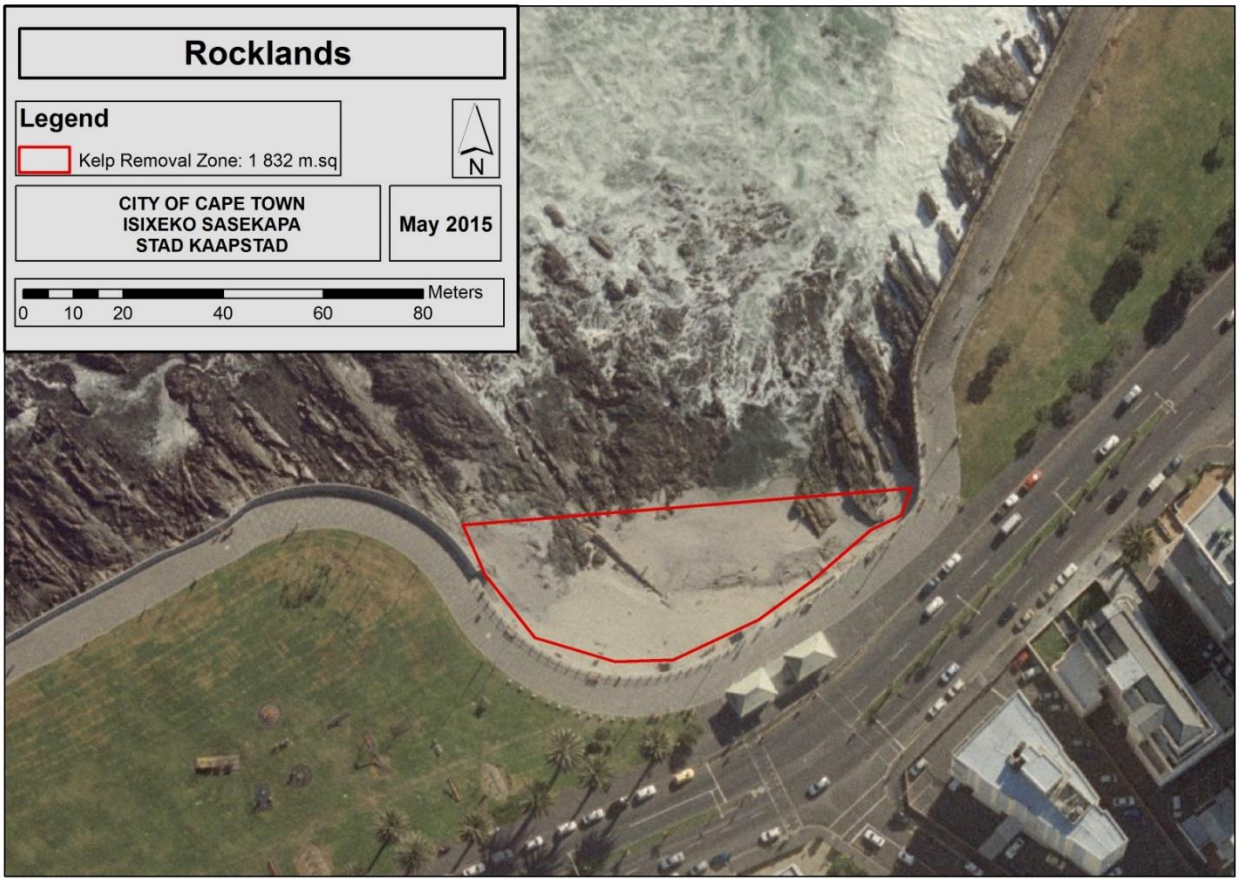
On the request of Coastal Management, collected kelp may be distributed to reasonable locations and central points if necessary for the use in dune rehabilitation/sand stabilisation.



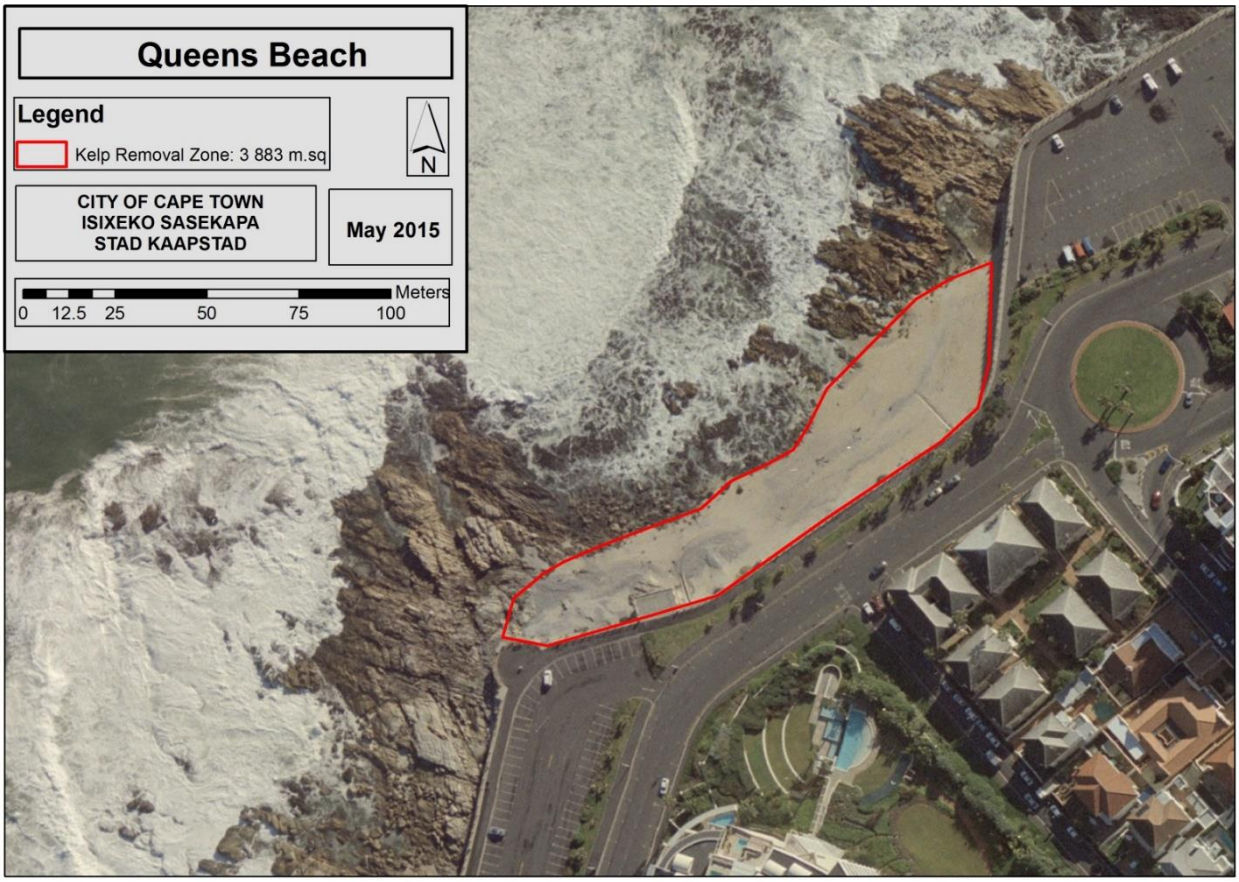

| | |
|---|---|
| **Area of kelp removal:** | South of Peligrini Road to parking lot in south of Small Bay |
| **Frequency of kelp removal:** | Throughout the year |



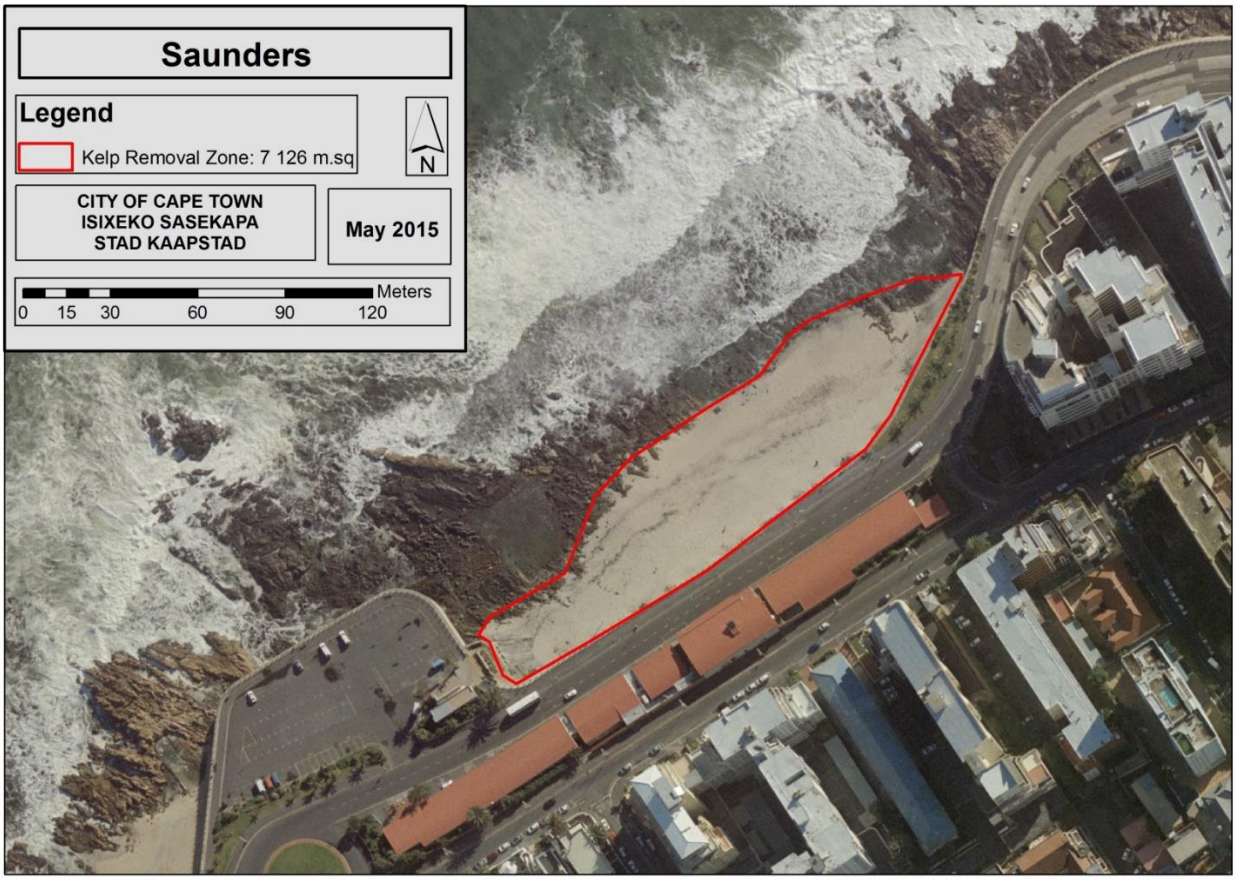

| | |
|---|---|
| **Area of kelp removal:** | Entire beach |
| **Frequency of kelp removal:** | Throughout the year |



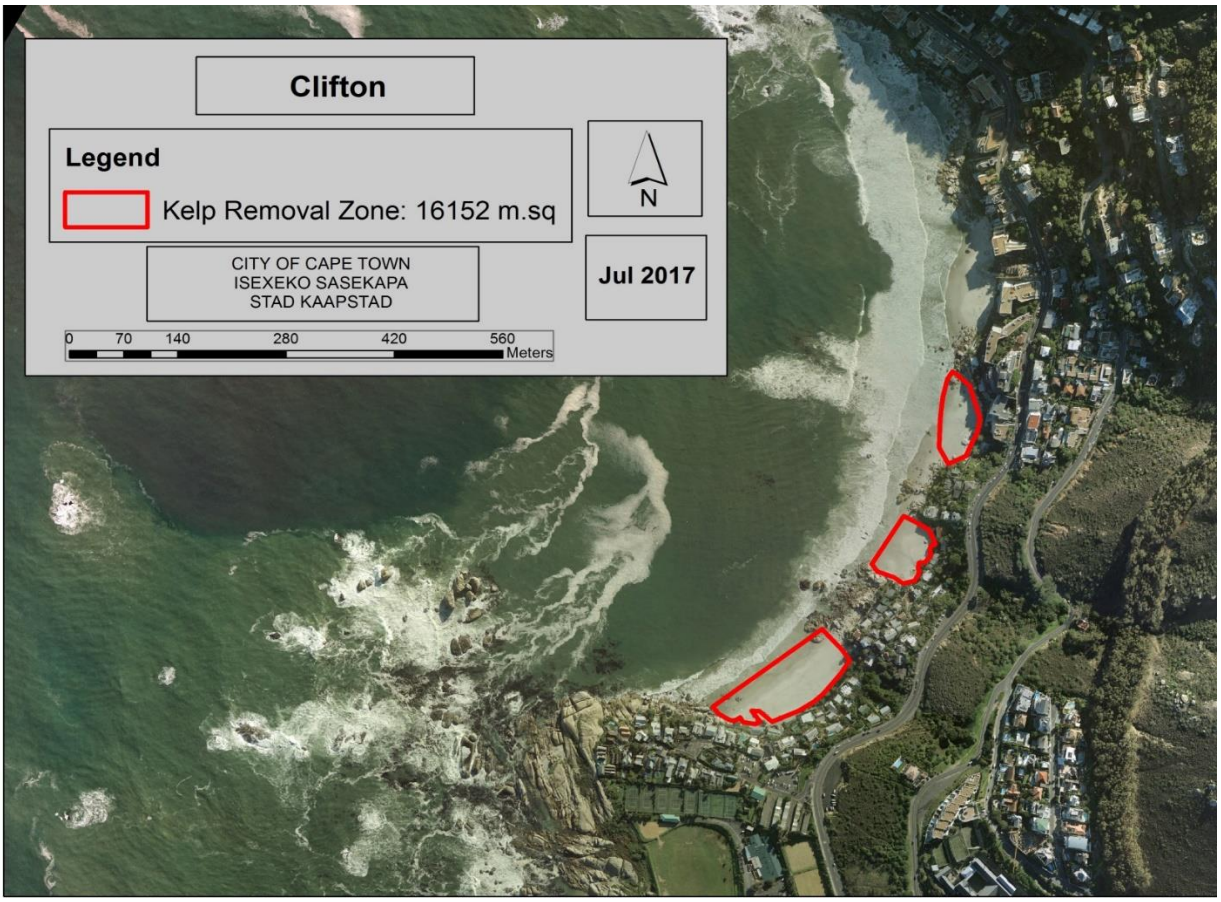

| | |
|---|---|
| **Area of kelp removal:** | Entire beach |
| **Frequency of kelp removal:** | Throughout the year |



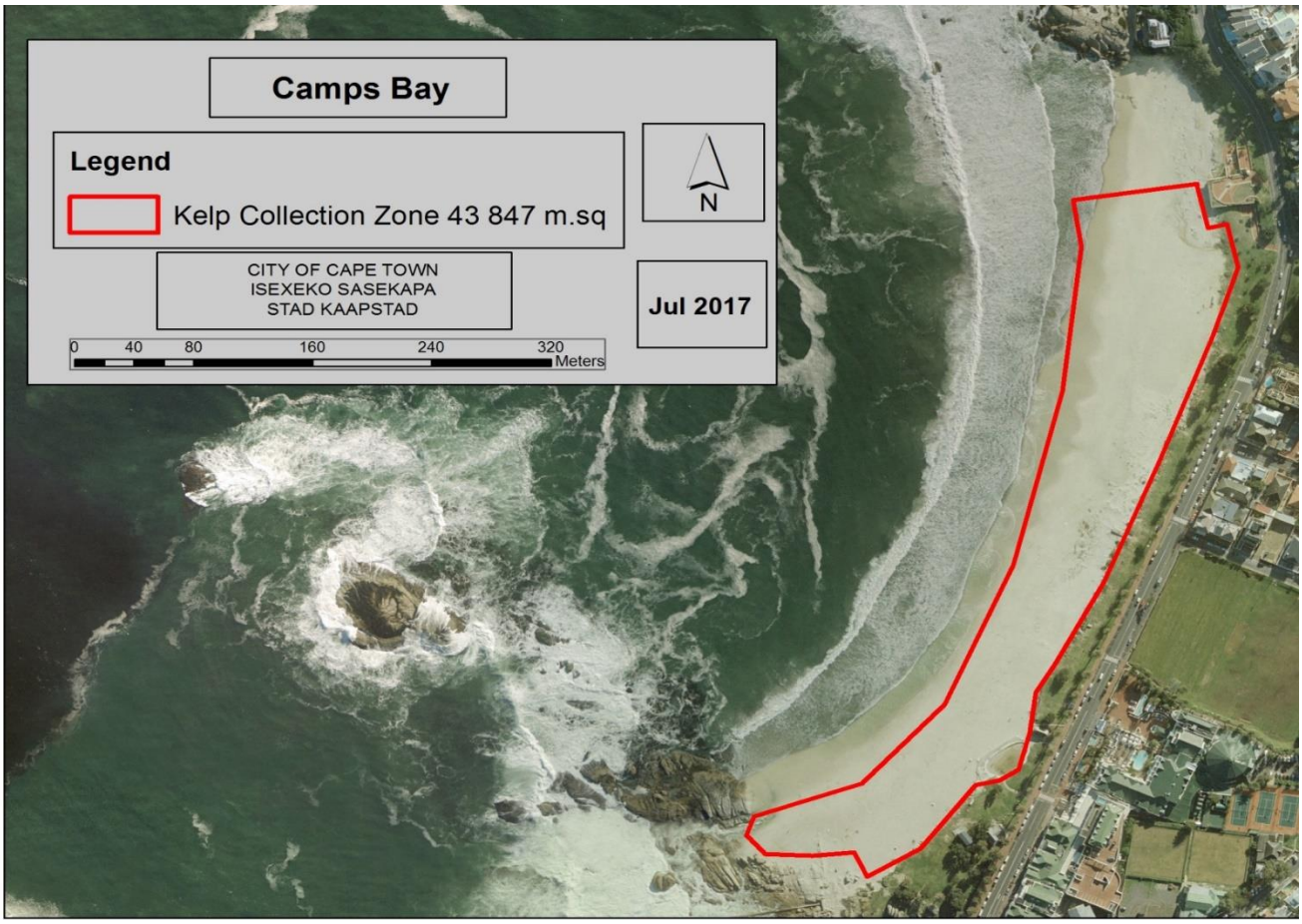

| | |
|---|---|
| **Area of kelp removal:** | Entire beach |
| **Frequency of kelp removal:** | Throughout the year |




| | |
|---|---|
| **Area of kelp removal:** | Entire beach |
| **Frequency of kelp removal:** | Throughout the year |

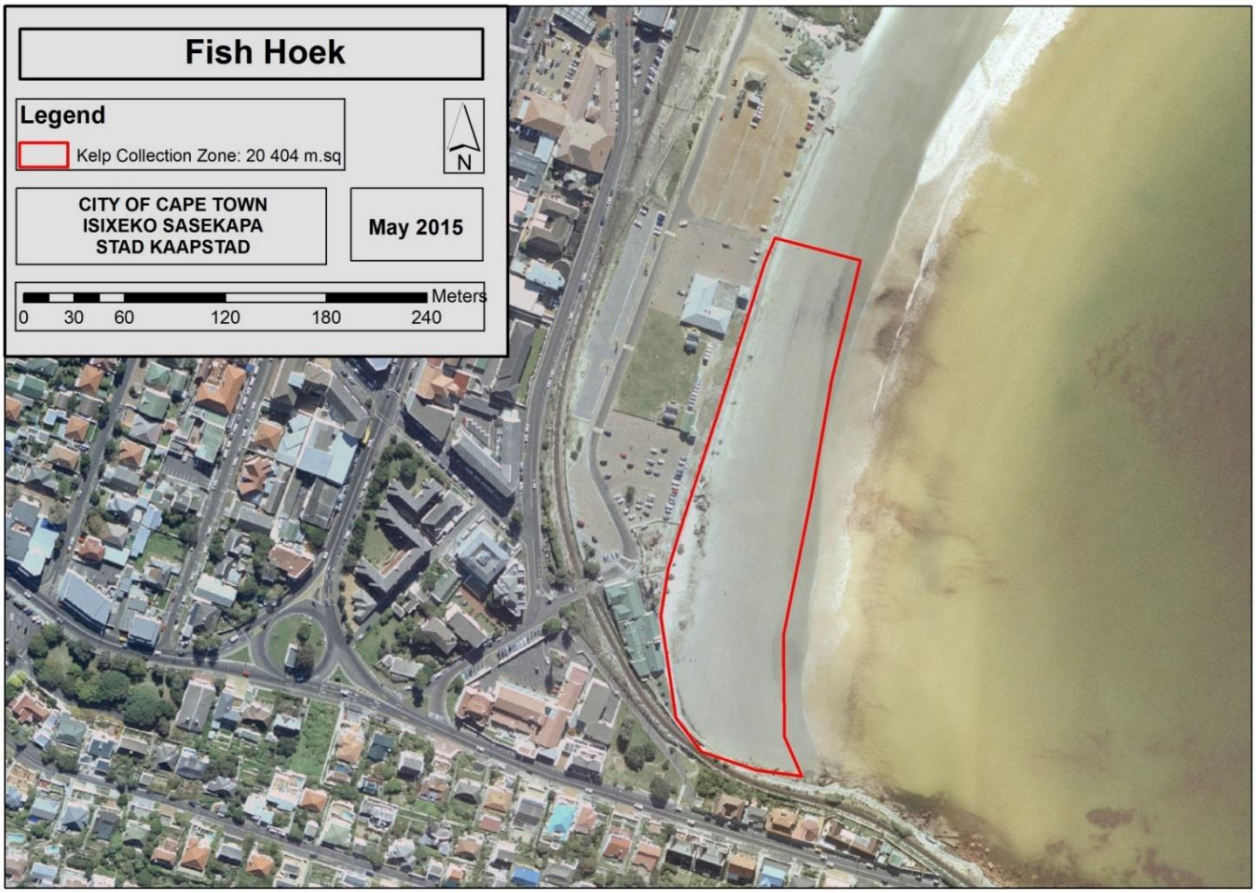



| | |
|---|---|
| **Area of kelp removal:** | No removal of kelp from Clifton 1st. |
| **Frequency of kelp removal:** | Throughout the year |
| | |




| | |
|---|---|
| **Area of kelp removal:** | No removal of kelp north of pump station. |
| **Frequency of kelp removal:** | Throughout the year |


| | |
|---|---|
| **Area of kelp removal:** | Opposite the gravel parking area, extending from the concrete pier for approximately ¾ of the length of the parking area (± 50m from the river). |
| **Frequency of kelp removal:** | Throughout the year |



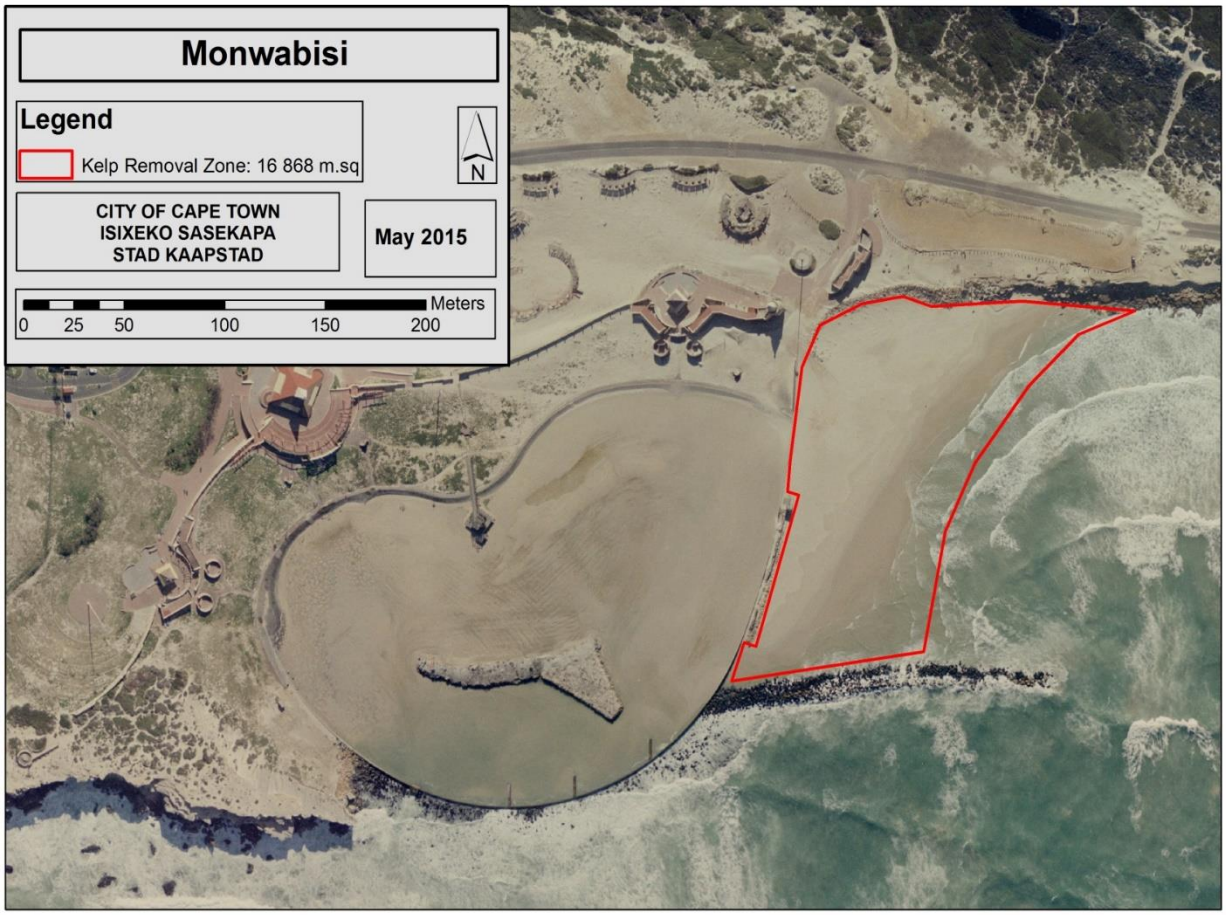

| | |
|---|---|
| **Area of kelp removal:** | Beach area adjacent to Jager's Walk until (but not including) the area opposite the gravel parking area. |
| **Frequency of kelp removal:** | Throughout the year |
| | |


| | |
|---|---|
| **Area of kelp removal:** | Entire beach |
| **Frequency of kelp removal:** | Seasonal |


| | |
|---|---|
| **Area of kelp removal:** | No removal of kelp north of tidal pool |
| **Frequency of kelp removal:** | Throughout the year |


| | |
|---|---|
| **Area of kelp removal:** | Area between Surfer's Corner and the Muizenberg Pavilion. |
| **Frequency of kelp removal:** | Throughout the year |


| | |
|---|---|
| **Area of kelp removal:** | Beach area directly opposite the paved pavilion at Blue Waters beach. |
| **Frequency of kelp removal:** | Seasonal |




| | |
|---|---|
| **Area of kelp removal:** | Entire enclosed beach area to the east of the tidal pool |
| **Frequency of kelp removal:** | Throughout the year |


| | |
|---|---|
| **Area of kelp removal:** | Area opposite the parking lot on Beach Road, Gordon's Bay. |
| **Frequency of kelp removal:** | Seasonal |

# ANNEXURE D: CITY OF CAPE TOWN MAINTENANCE MANAGEMENT PLAN: DUNES AND BEACHES

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

## Maintenance Management Plan: Dunes and Beaches


### Acknowledgements:

With thanks to the eThekwini Municipality: Coastal, Stormwater and Catchment Management Department for use of their dune EMP template and generic information as well as the KZN Department of Economic Development, Tourism and Environmental Affairs.


If you are viewing an electronic version of this report, please consider your environmental responsibility before printing it.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# Glossary of terms and abbreviations

| | |
|---|---|
| **Accretion:** | The process where coastal sediment returns to the visible portion of the beach through natural processes. |
| **Aeolian processes:** | Processes that are driven by winds, including the ability of the wind to shape the surface of the Earth. |
| **Beach:** | The sandy portion of the coastline between the LWM and HWM. |
| **Backshore:** | The portion of the beach between the foreshore (between LWM and HWM) and coastline. |
| **Beach berm:** | A beach berm is the nearly horizontal portion of a beach formed by the deposition of sediment by receding waves. The berm has a crest (top) and a face - the latter being the slope leading down towards the water from the crest. |
| **Beach maintenance:** | Re-profiling of beaches for purposes of preventing the accumulation of sand and subsequent smothering of adjacent infrastructure by wind and tides. |
| **Biodiversity:** | The variety of living organisms, their genetic makeup and ecological communities. |

| | |
|---|---|
| **CCT:** | City of Cape Town Metropolitan Municipality, established in terms of the Local Government: Municipal Structures Act, 1998 read with the Province of the Western Cape: Provincial Gazette 558 dated 22 September 2000. |
| **Contractor:** | Refers to the party/person contracted by the CCT to carry out dune or beach rehabilitation and maintenance. |
| **CPP:** | Coastal Public Property as defined in the ICM Act |
| **DEA&DP:** | Provincial Department of Environmental Affairs and Development Planning, Western Cape. |
| **Dune:** | A dune is a hill or mound of sand built by coastal processes. Dunes occur in different forms and sizes and are formed by interaction of the wind, waves and vegetation. |
| **Dune maintenance:** | The process of retaining the dune in a functional state before and after it has been rehabilitated. |
| **Dune rehabilitation:** | The process of restoring or reconstructing the dune after it has been damaged due to natural processes or human activities or a combination of both. |
| **ECO:** | Environmental Control Officer |
| **EIA:** | Environmental Impact Assessment |
| **EM:** | Environmental Management Department, CCT. |
| **Foredune:** | The first and often prominent ridge of sand behind and parallel to the beach above the HWM, usually vegetated. |
| **HWM:** | Refers to the highest line reached by coastal waters, but excluding any line reached as a result of:<br>- exceptional or abnormal weather or sea conditions; or<br>- an estuary being closed to the sea. |
| **Embryo dune:** | Small mounds of sand at the top of the beach, above the HWM and usually right in front of the foredune. This dune is the most dynamic dune type, growing upwards and outwards to the sea or can be completely removed by storm waves. |
| **Hummock dunes:** | A sand dune that forms around vegetation. |
| **ICM Act:** | Integrated Coastal Management Act (Act No. 24 of 2008). |
| **Indigenous species:** | Plant species native to Southern Africa. |
| **Invasive plant species:** | Are those plant species that do not occur naturally within a region and are able to establish themselves in a natural or semi-natural habitat. They impact destructively upon biodiversity, including degeneration or elimination of indigenous species. |
| **LWM:** | Refers to the lowest line to which coastal waters recede during spring tide. |
| **Maintenance:** | Actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint. |
| **MMP:** | Maintenance Management Plan for maintenance purposes defined or adopted by the competent authority. |
| **NEMA:** | National Environmental Management Act (Act No.107 of 1998). |
| **ORV:** | Off-road vehicle |
| **Primary dunes:** | The first dunes above the intertidal zone |

# Executive Summary

Given the extent of Cape Town's coastline (approximately 240km) and the frequent interventions that are required for beach and dune maintenance, applying for an Environmental Authorisation or getting a MMP approved (in terms of the requirements of NEMA) for each intervention on a piecemeal and ad hoc basis is not pragmatic for the CCT and places an administrative burden on both the CCT as well as the Competent Authority. A generic MMP is proposed in order to enable the CCT to conduct its dune and beach maintenance and rehabilitation on City owned land more efficiently whilst remaining compliant with the requirements of NEMA. This MMP has been prepared to enable the immediate and on-going management that is required and which has resulted from historically made poor land use and planning decisions as well as from cumulative and/or extreme coastal storm events This MMP is submitted in compliance with the requirement of Activity 18 and 19 of the 2014 NEMA regulations.

# Introduction

Coastal dunes are formed by aeolian and tidal processes which result in the accumulation of sand above and around the HWM. These dune systems may either be highly dynamic and mobile systems, or relatively sedentary if they are well vegetated Functional and vegetated dune systems form an integral part of Cape Town's coastal environment and are beginning to play a key role in building resilience to climate change induced pressures, such as sea-level rise, intense storms and associated high seas, as well as shifting wind regimes. Cape Town's coastal system is primarily a wind driven environment, affected by alternating seasonally dominant winds from the south-east and north-west, resulting in marked variations of seasonal sand deposition and erosion along Cape Town's beaches. These dynamics are further affected by winter swells and associated high seas.

Naturally occurring beach ecosystems consist of tidal zones, embryo dunes and hind dune areas. Well established and functional dune systems act as buffers which play an important role in protecting many aspects of the coastline (including property, infrastructure, recreational areas and biodiversity) against accretion, erosion, wave damage during storms, flooding, wind-stress and over wash. They also contribute to the aesthetic and cultural appeal of Cape Town's beaches. Dune systems also act as a reservoir of sand to replenish and maintain the integrity of the beach during and post erosion events. The sand barrier provided by dune systems also allows for the development of more complex plant communities to establish by preventing salt water inundation and protection from sea spray and strong winds.

Dune systems occupy the transitional space between land and sea masses and are thus subject to harsh environmental conditions. Vegetation cover plays a crucial role in the evolution of dune landscapes, acting as a windbreak and trapping the deposited sand particles by reducing wind energy. Natural erosion will always have some impact on dune systems but if additional anthropogenic pressures - such as inappropriate construction of hard infrastructure, run-off from stormwater systems, excessive trampling by pedestrians walking through dune areas etc. are not well managed, dune vegetation can be severely damaged or destroyed. Dunes stripped of vegetation are no longer effective at trapping and retaining windblown sand which, over time, leads to the disruption of the natural cycle of advance and retreat of the dune system. With the reduced vegetation cover, the loss of sand from such systems is likely to be expedited through erosion. The ability of dunes to act as effective coastal barriers will therefore be lost. Furthermore, when they become unstable they begin to migrate landward which results in an excess amount of sand in areas where is it undesired.

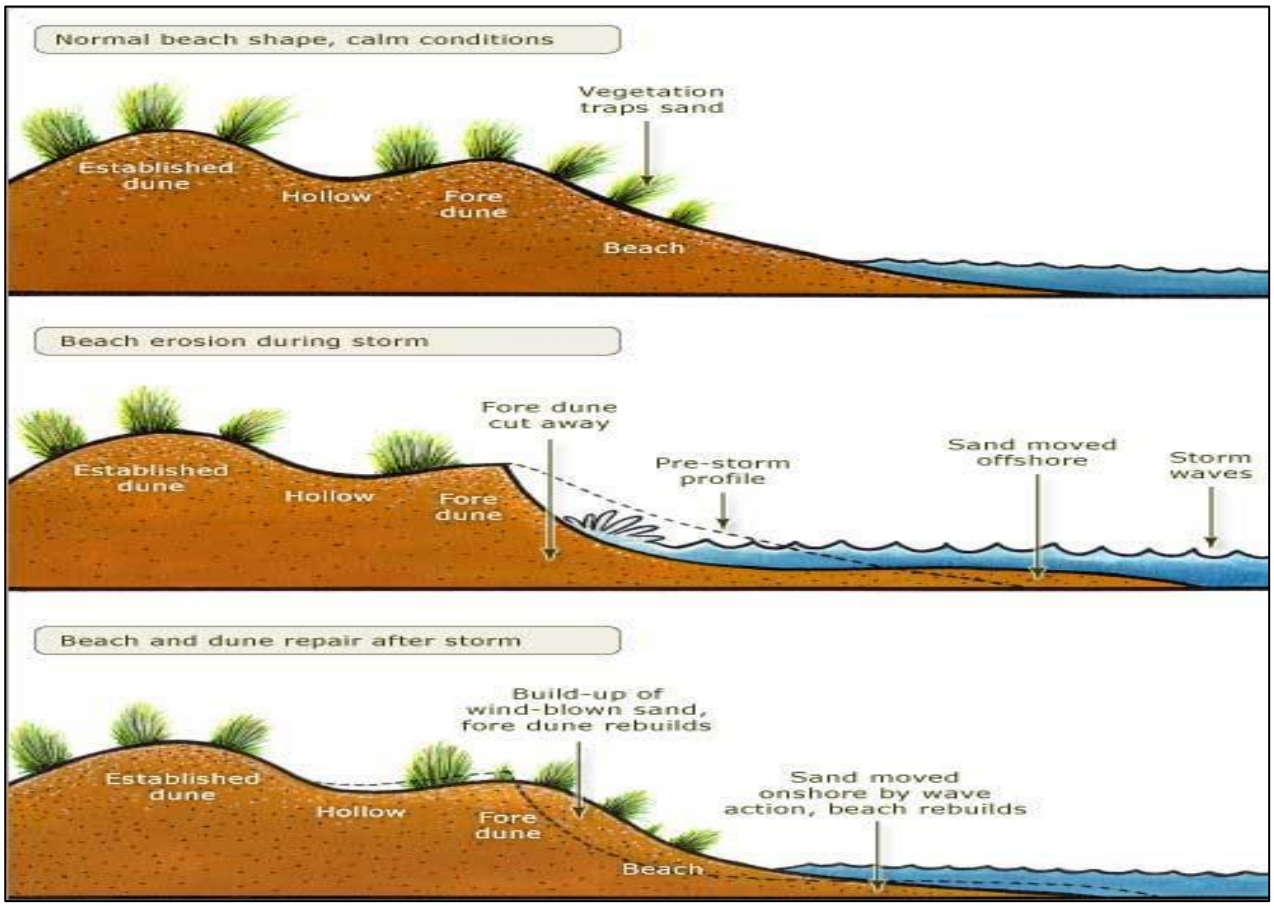


Figure 3: Beach and foredune profiles.

Beaches and fore dunes (the dunes closest to the sea) are in a constant state of change in response to waves and wind. Upper panel: fore dunes are formed when vegetation traps wind-blown sand. Middle panel: the front face of a fore dune is eroded when waves during storms crash onto the dunes and wash away plants and sand. Lower panel: the dunes form again as vegetation is re-established on an exposed site and begins to trap sand (eThekwini, 2011).

# Problem statement

## 1.1 Large scale alteration of Cape Town's coastline

Cape Town's coastline extends for 307 kilometres along the West Coast, around the Cape Peninsula, and beyond False Bay to the Kogelberg coast in the east. Historically, Cape Town's coastline consisted of mobile dune systems that migrated significant distances inland and which were, by and large, unimpeded by infrastructure. However, as a result of urban development over centuries, those expansive sand dune systems have been severely compromised and transformed (Figure 2).


Figure 4: sediment by-pass and dune systems that have been severely altered by coastal development.

Within Cape Town, and as a crude proxy for the degree of the state in which coastal ecosystems have been altered, approximately 75% of Cape Town's coastline within 100 metres of the HWM has been developed and altered by some form of infrastructure. In some areas along the coastline development has encroached upon the frontal dunes and bypass systems, disturbing the natural balance between erosion and replenishment, resulting in a loss of beach in some areas. Furthermore, the damage, degradation and destabilization of dunes may result in properties and infrastructure being subjected to large amounts of windblown sand, inundation from the ocean, structural damage from wave attack and undermining by erosion. With a diminished reservoir of sand, erosion of the beach may lead to shoreline regression. To avoid this, the maintenance and rehabilitation of dune and beach systems is important.

The majority of Cape Town's historic dune systems are now in a heavily altered state and no longer function naturally. Given the impracticality of phased retreat of most of the affected and relevant infrastructure along most of Cape Town's coastline these systems require intensive and integrated management approaches to stabilise them. The importance of this is realised given that the drivers of dune migration are still in place i.e. deposition of sediment from the ocean on beaches as well as persistent and strong south easterly and north westerly winds. Further, Cape Town's coastline is experiencing ongoing development, increasingly restricting the area within which these systems would normally function. Thus, the process of dune and beach rehabilitation and management is an important responsibility within local government and one which is on-going. If such systems are not managed correctly, they will revert to their historic and natural pathways with dire consequences for both public and private infrastructure (Figure 3).

Figure 5: mobile dune systems pose a significant threat to coastal infrastructure if not managed correctly and persistently

(Source: Aerial Perspective)

As a result of urbanisation in close proximity to the coast, these systems are now functioning within an altered environment often leading to:

- Excessive sand build-up altering the normal expected profile of fore-dunes;
- Excessive build-up of sand against or on hard infrastructure such as buildings, roads and walkways;
- Inability of natural dune vegetation to become established within a mobile sand environment;
- Loss of dunes, particularly embryo and hummock dunes;
- The loss of sediment-bypass systems with the result being the formation of dunes where they did not previously exist, and
- Loss of sediment supply on the lee side of sediment by-pass systems and ultimately the potential loss of beaches.

These challenges are further exacerbated by:

- Multiple informal access points across the dunes which creates blow-outs and erosion points;
- A net loss of sand from the system due to the removal of sand from hard infrastructure off site;
- Little to no active management of remaining dune belts;
- Pressures associated with a warming climate i.e. sea-level rise, intense storm and associated high seas, coastal erosion, beach regression and changing rainfall patterns.

It is important to recognise that due to the wind-dominated nature of Cape Town's coastline, dune systems are highly mobile and dynamic. With the increasingly altered and 'fixed' state of Cape Town's coastline as a result of extensive development, there is no alternative but to stabilise these systems and effectively retain them in a managed state. The extent, intensity, and value of coastal development (from both a real estate and service delivery perspective) by and large eliminates the option of phased retreat of infrastructure to make way for coastal processes, such as migrating dune systems. Thus, the on-going management and maintenance of vegetated coastal dunes and beaches is one of the most cost effective and ecologically sensitive means of managing the coastal environment in Cape Town. The value of this approach is also recognised in its contribution to the spectacular aesthetic and recreational appeal of Cape Town's beaches.

## 1.2 Compliance with NEMA EIA Regulations

The dynamic nature of Cape Town's extensive coastline in tandem with its highly altered and developed state requires that the CCT must intervene frequently to retain the functional integrity of dune systems or to mitigate against damage to coastal infrastructure from migrating dune systems. Typically, these activities include the following:

- Mechanical movement of sand that may have accumulated on, against or near infrastructure;
- Mechanical re-profiling of beaches to prevent the build-up, and over spilling of, beach sand onto, against or near coastal infrastructure;
- Bulk movement of sand to repair blow-outs and reshape compromised dune profiles;
- 'Topping', re-shaping and re-vegetating dunes that have grown too tall;
- Clearing access paths from sand build up and redistribution of sand on the beach, dunes or in inter-tidal areas;

- Reconstructing primary and hummock dunes that have been eroding by extreme storm events;
- Returning clean sand that has accumulated on roads and other built infrastructure to suitable areas on the beach or dunes;
- Manual removal of historic gravel and stone spoil from beach and dune areas;
- Planting of vegetation and installation of irrigation systems as part of dune rehabilitation projects;
- Stabilization of sand with brushwood, netting, kelp or mulch;
- Installation of post and rail fencing and barriers to prevent public from walking over sensitive dune systems;
- Installation of wooden/polywood walkways;
- Removal of alien vegetation;
- Removal of irrigation systems that require repair or replacement;
- Maintaining and repairing stormwater outlets along beaches and dune systems;
- Installation of refuse bins, benches, signage, fencing and bollards, and
- Removal of broken benches, fencing, signage, bollards, rubble and poles.

However, and in terms of the NEMA EIA regulations, some of these activities trigger listed activities (as identified in section 2.1) and as such require environmental authorisation.

## 1.3 A Maintenance Management Plan for Dunes and Beaches

The CCT is mindful that this MMP does not absolve the CCT from the general "Duty of Care" set out in Section 28(1) of the NEMA, viz.: "Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimize and rectify such pollution nor degradation of the environment".

The CCT further acknowledges that this MMP only relates to the listed activities as defined in section 2.1. If the CCT undertakes any other activity not defined in this MMP, the responsibility lies with the CCT in obtaining an Environmental Authorisation in terms of NEMA. Should it be necessary for the MMP to be amended, the CCT will consult with DEA&DP.

# Legislative Context

The following legislative bodies bare relevance to the rehabilitation and maintenance of dunes and beaches.

## 2.1 The National Environmental Management Act (Act No. 107 of 1998)

The following listed activities contained in the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations, 2014 defined in Government Notice (GN) No. R. 983, R. 984 and R. 985 (as amended) are identified as falling within the ambit rehabilitation and managements and maintenance of dunes and beaches.

**Activity 18 of GN No. R. 983 (as amended):**

"The planting of vegetation or placing of any material on dunes or exposed sand surfaces of more than 10 square meters, within the littoral active zone, for the purpose of preventing the free movement of sand, erosion or accretion, excluding where –

*(i) the planting of vegetation or placement of material relates to restoration and maintenance of indigenous coastal vegetation undertaken in accordance with a maintenance management plan; or*

*(ii) such planting of vegetation or placing of material will occur behind a development setback".*

**Activity 19A of GN No. R. 983 (as amended):**

*"The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from—*

*(i) the seashore;*

*(ii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater; or*

*(iii) the sea; —*

*but excluding where such infilling, depositing, dredging, excavation, removal or moving—*

*(a) will occur behind a development setback;*

*(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;*

*(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;*

*(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or*

*where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies."*

## 2.2 The Constitution of the Republic of South Africa (Act No. 108 of 1996)

The Constitution of the Republic of South Africa forms the foundation of all law, including environmental law, in South Africa. The Bill of Rights is fundamental to the Constitution of South Africa and in, section 24 of the Act, it is stated that:

"Everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

## 2.3 Integrated Coastal Management Act (Act No. 24 of 2008)

**Section 15: Measures affecting erosion and accretion**

Subsection (2): "No person may construct, maintain, or extend any structure, or take other measures on coastal public property to prevent or promote erosion or accretion of the seashore except as provided for in this Act, the National Environmental Management Act or any other specific environmental management Act"

## 2.4 Control of the Use of Vehicles in the Coastal Area Regulations

Control of vehicles in the Coastal Area Regulations (colloquially known as the Off-Road Vehicle Regulations (ORV)) makes provision for permissible activities. Section 3(1)(d) of these Regulations state a permissible activity as being: "the use of a vehicle by an employee or agent of an organ of state acting in the course and scope of their employment or mandate, or by any person contracted by an organ of state, for the purposes of performing the public duties of that organ of state mandated by law".

# Aims and Objectives of this MMP

## 3.1 Aims

The aim of this MMP is to provide a guiding framework to restore, manage and maintain the structure, function and diversity of dune ecosystems within Cape Town by undertaking dune rehabilitation activities timeously, effectively, sensitively and in accordance with applicable legislation. This MMP serves to identify the required management prescriptions for the successful rehabilitation and maintenance of dunes and beaches in Cape Town. Moreover, this plan incorporates the identification of further work required in the short term to improve the containment of wind-blown sand and serves as a guide for improved future management techniques.

## 3.2 Objectives

The MMP has the following objectives:

- To promote dune and beach rehabilitation and maintenance in an environmentally sensitive manner;
- To minimize management commitments by providing vegetation that regenerates naturally and which stabilizes dune systems;
- To reduce soil erosion and instability of dune systems;
- To stabilize dunes to minimize impacts of wind-blown sand on the natural and built environment adjacent to dunes;
- To facilitate safe public access through CPP within sensitive areas by defining access ways and public areas that can be maintained to a high standard with minimal impact on natural systems;
- To establish a sustainable habitat for coastal fauna and flora, and
- To enhance the visual amenity of Cape Town's beaches by applying best practice landscape design principles.

# Implementing the MMP

## 4.1 Practical application

A clear understanding is needed of the risks to humans and the natural environment, effectiveness and consequences of the various management decisions that are made for Cape Town's beaches. At all rehabilitation and maintenance sites the primary goal is to mitigate the impacts of wind-blown sand in as environmentally sensitive fashion as possible. Approaches to stabilise and rehabilitate dunes vary in cost, resources required, timeframes and techniques according to particular sites and conditions – some sites may be particularly degraded to such an extent that the entire system needs to be re-profiled and planted. Other locations, typically in less altered areas, may still remain relatively functional and which require less maintenance. The following aspects are considered central to a successful MMP:

- Identification of causal mechanisms:
    - Determining the cause of the deterioration and whether it has resulted from natural occurrences or anthropogenic activities.

  - Where human impact is the cause it should be assessed whether the harmful actions are on-going and if the prevention or control of such actions is possible.
- Design of rehabilitation measures
  - *Identify strategies to remove or control as far as possible the cause of the degradation.*
  - *With an understanding of the causal mechanisms, identify management interventions e.g. the type of earthmoving machinery, required volume of sand to be moved, vegetation and the various species to be planted, etc.*
  - *A time schedule must be determined that is cognisant of the growing and non-growing seasons for vegetation specific to Cape Town.*
  - *Timeous allocation of budget.*
- Implementation/Rehabilitation
  - *Reinstating and re-vegetation of the dune.*
  - *Public consultation through a media statement and informing the local Ward Councillor.*
- Maintenance and monitoring
  - *To ensure that rehabilitation is a success, maintenance will be on-going; periodical inspections and evaluations will be conducted until a satisfactory level of vegetation cover is reached.*

# Environmental Monitoring

Environmental monitoring will be undertaken on a regular basis in order to ensure compliance with all aspects of the MMP. This monitoring will take the form of regular site inspections as well as remotely, through the CCT's Coastal Monitoring Programme (dune and beach profiles extracted from LiDAR, change in vegetation cover through analysis of aerial imagery, drone photography, etc.)

## 5.1 Non-compliance with the MMP

Operational difficulties may be encountered that may result in non-compliance. Non-compliance may arise due to poor communication across the CCT's various line departments, staff turnover, budget shortfalls, logistical challenges etc. The CCT's Coastal Management Branch will put in place measures to ensure that the various CCT departments will remain compliant with the MMP as far as possible. Non-compliance with the MMP will be logged, and a report compiled on each non-compliance event will be submitted to DEA&DP post rehabilitation and maintenance work.

# Rehabilitation of Dunes

The CCT's Coastal Management Branch will conduct a thorough site assessment to determine whether dune rehabilitation is required or not. The following criteria will be used in this assessment:

- State of dune vegetation and general dune integrity;
- Dune height and the position in relation to the HWM
- Vegetation coverage;
- Species composition, and

- Mobility of the dune and whether this is having a negative impact on surrounding infrastructure.

Whilst this MMP is applicable to the entire area under the CCT's jurisdiction, there are certain areas that are considered priority in terms of dune rehabilitation and maintenance. The location of these, together with GPS coordinates, issue relating to dune maintenance, required intervention and status are included as Annexure A.

The following sections detail the methods that will be applied when conduction dune maintenance and rehabilitation.

## 6.1 Reforming (rebuilding and reshaping) dunes

Reconstruction of dunes may be necessary when the shape, size or topography has changed significantly. The dimensions of the reconstructed dunes will depend on those of the remnant dune, the location of the dune in relation to infrastructure and the type and availability of sand to be used for the reconstruction or previous design criteria. Several methods can be used to reshape dunes depending on the scale of degradation and resources available. These include the use of earthmoving equipment or sand trapping techniques such as wind-nets, hedgerows, spreading of brush matting and re-vegetation (see section 6.1 for further detail). The following factors will be taken into consideration with regard to the reforming and re-profiling of dunes:

### 6.1.1 Material

Dune rehabilitation may require various materials, natural or artificial. Availability, applications and costs will vary depending on location, desired appearance of the dune, environmental impact, life expectancy and public safety. Should sand replenishment be required, the sand used in dune reconstruction should match the grain size of the existing dune to allow for the establishment and growth of vegetation.

If it is not possible to use the preferred or matching grain size of sand and the median grain size is too coarse, the dune will be designed so that the top 300mm of its surface consists of finer sand capable of retaining moisture and which is supportive of plant growth.

Foreign materials such as rubble, concrete and clay will not be used as the differences in the permeability and transport characteristics differ and this may cause more problems e.g. dune drainage, introducing weeds, etc. Further, such substances may pose a health and safety hazard to the public as well as detracting from the aesthetic appeal.

### 6.1.2 Position

The position of a reconstructed dune will be aligned with the original location of the degraded dune or in keeping with previous design criteria which will take into consideration any structures that may be in close proximity to the dune. A reconstructed dune will run approximately parallel with the beach berm.

### 6.1.3 Slope and Shape

Dune gradients will vary considerably at different sites. Gentle gradients are preferable; however steeper slopes may be unavoidable in areas of limited space. Reconstructed dunes will be shaped in a way that is consistent with climatic conditions. In wind-driven systems, such as those in Cape Town, dune profiles will be shaped in a way that provides as less resistance to the prevailing winds as possible.

### 6.1.4 Height and width

The height and width of rebuilding dunes will depend on a number of factors including:

- Height and width of the existing dunes;
- Availability of sand and;
- Availability of space, considering the existing dunes, infrastructure and the position of the HWM, and
- Historical aspects of the affected dune system.

### 6.1.5 Sand Sources

Sand will be used form a variety of sources, with emphasis being placed on collecting wind-blown sand that has accumulated on CCT infrastructure. This sand will only be used provided it is not contaminated with any other debris such as rubble or litter. Sand from other sites with similar grain size and chemical composition will also be considered, again provided that such sand is not contaminated. Sand may also be obtained from the beach berm and below HWM where it is available. This will only be undertaken under the provision that the removal of such sand will not have an impact on the broader beach or dune environment or have any other negative impacts.

### 6.1.6 Dune rebuilding using dune forming materials

Dune forming fences, wind nets or hedgerows can be helpful with dune rebuilding as they reduce wind velocity and therefore cause sand to be deposited in the vicinity of the fence. These materials may be used to:

- build a dune where no dune exists
- fill gaps or blow-outs in the crest line of existing dunes;
- create a higher or wider dune, making it a more effective barrier to wave run-up, wind and wind-blown sand, and salt spray originating from the beach;
- build a new dune ridge seaward of an existing dune, and
- Raise the beach profile.

Dune forming fences are mainly used on smaller isolated blowouts which are still surrounded by functional dunes and vegetation; however, they can also be used for larger scale dune formation and at sites where new material cannot be imported. Dune-forming fences may be used in sensitive areas where it is undesirable to use earthmoving equipment or where access is difficult.

Dune-forming materials may also be installed after earthmoving activities have achieved desired dune profile. A benefit of dune forming fences is that public access may be guided by the placement of material. In the event fences are required, natural materials (such as branches obtained from alien invasive removal programmes) will be used in the construction of the fences. This is primarily because this material breaks down over time and does not offer any source of value from a theft perspective. If it is not possible to use natural material or specific results are required in which natural materials cannot achieve, fences from porous materials (such as shade cloth) will be used. Wooden slats laced together as well as hessian may also be used in addition to shade cloth. Other designs will be considered depending on local circumstances and availability of materials. To be most effective, dune forming fences should be positioned at right angles to the prevailing wind.

### 6.1.7 Dune reconstruction using earth moving equipment

Earthmoving machinery is not always required for dune reconstruction but can be useful where dunes require significant amount of earth moving in a short period of time. Earthworks may be required to push the sand up from the beach or from areas where the sand has accumulated. A variety of mechanical devices are available and selection will depend on the tasks required and available operating space. These include the following:

- Bulldozer - Useful for moving large amounts of readily available, compacted sand in large open areas, or when large areas need to be levelled or reshaped and the distance the sand needs to be moved is short. Many bulldozers can also be fitted with a 'ripper' which can plough soil, making planting easier;
- Front-end loader – Can be used in tight spaces, moving small amounts of sand over moderate distances. They are valuable for accurately placing sand where required with minimal environmental disturbance and for effectively transplanting/loading primary vegetation and other basic raw materials onto tip trucks;
- Excavator - May be used to excavate sand from the source and progressively place the sand at the site of rehabilitation. Excavators have an extendable arm with a digging bucket, grasper or auger attachment. The digging bucket can move large quantities of sand in a short space of time and the grasper can be used to collect and spread large quantities of brush. It is possible to use an excavator to trim the slope of the dune to the required angle from either the crest or toe of the dune;
- Tractor – Loader – Backender: may be used to perform all of the above tasks, and
- Bobcat – May be used in narrow spaces for example to remove sand build-up from walkways and near buildings.

When earth-moving equipment is used precautions will be taken so as not to disturb existing areas of vegetation. All vehicles and equipment used on site will be operated by appropriately trained and/or licensed individuals in compliance with all safety measures as laid out in the Occupational Health & Safety Act (OHSA). Vehicles and machinery will be kept in good working order and will not be serviced and refuelled on site (see section 11 for further detail surrounding the conditions of use for heavy equipment).

### 6.1.8 Timing and reconstruction

Dune reconstruction should ideally be timed in accordance with favourable weather patterns and where necessary, carried out in stages to enable planting to commence almost immediately following re-profiling to minimise risk of erosion and the loss of sand through aeolian movement. If the reconstruction is completed too far in advance of planting, the likelihood of significant sand loss is likely to be high. The loss of sand due to poor synchronisation between re-profiling and planting will necessitate further dune reconstruction. The timing of dune reconstruction work will therefore take into account climatic conditions, planting season, the availability of planting materials, staffing and equipment availability.

## 6.2 Dune stabilization

Stabilisation of sand will in most cases be undertaken following dune reformation (rebuilding and reshaping). This will assist against wind erosion as well to allow vegetation to establish. Common techniques used to stabilise the dune surface include the use of plant material such as wind nets, hedgerows, mulch, brush matting, irrigation, and the placement of kelp. These approaches are also useful in improving moisture and salinity conditions for vegetation. Pioneer species may also be planted in conjunction with the use of plant material stabilisers, but will only be done if the moisture and salinity conditions are favourable.

### 6.2.1 Mulch/Woodchip

In areas where exposure to wind is minimal, surface stability can be obtained by using mulch. Mulch assists with retention of soil moisture and provides protection for seedlings from the harsh conditions associated with coastal environments. Suitable materials for mulch include grass cuttings, leaves, wood chips, straw and sawdust. Chipped waste from pruning and clearing operations will be considered as long as the material is not contaminated with undesirable seeds. Mulches have the advantage of being (1) cheap, (2) readily available, (3) easier to handle and transport than brush and does not offer any value from a thievery perspective. However, mulches are not effective on exposed areas with strong winds. Under these circumstances brush is preferred. Mulch used for dune rehabilitation should be coarse and heavy to lessen the likelihood of it blowing away when dried out. Mulch will not be harvested from surrounding areas of indigenous vegetation.

### 6.2.2 Wind netting

Wind netting may be used to trap sand at a pre-determined site. If erected at right angles to the predominant winds they function effectively as win-breaks, leading to the deposition of sand on the lee side of the wind nets. The trapping of sand through this method is useful in slowing down the movement of sand and ultimately the stabilisation of the system.

### 6.2.3 Brush matting

Brush matting involves placing a layer of branches over the bare sand surface. As the wind passes over this layer, wind velocities are reduced, allowing the sand surface to remain intact. Windblown sand drops through and is trapped beneath the brush. Brush matting is labour intensive as it requires the cutting, transporting and spreading of brush. It is also a technique which is restricted to areas where brush is available and does not bear seeds. However, the advantages outweigh the disadvantages, as outlined below:

- Dune vegetation establishes well and grows easily through brush matting. The sand-trapping qualities of brush matting are useful for burying seed that can be planted over the brushed area. It is incorporated into the soil profile as windblown sand is trapped and deposited on top of the seeds;
- Brush matting withstands strong winds while keeping the sand surface stable;
- With competent supervision, the brush can be obtained and spread by relatively unskilled staff;
- Seed or seedlings can be planted and fertiliser applied either before or after the brush is laid. Brush matting provides shelter for the developing seedlings, and
- As the brush eventually decays it adds organic matter to the sand, improving its nutrient status and moisture-holding capacity.

During the rehabilitation of the dunes:

- Coastal vegetation will not be used as brush except when rehabilitation coincides with the clearing of areas for development or the construction of fire breaks;
- Care will be taken to avoid introducing seed from plants that are not locally endemic or indigenous;
- The butt end of the branch will face the prevailing wind direction;
- When laid the brush should cover at least 60-80% of the sand surface;
- If brush availability is limited, it will be laid in rows 2-3 meters apart beginning at the base of the dune nearest to the mobile sand source, and
- Brushwood will not be used if it presents a fire hazard, especially to nearby infrastructure.

### 6.2.4 Irrigation

Irrigation systems will only be used in certain circumstances (see section 6.4.4)

### 6.2.5 Kelp

Kelp is important for the integrity of coastal dunes as it has the ability to trap sand, raise beach profiles and encourages the establishment of pioneer plants. It also provides nutrients for dune vegetation during the decomposition process. Beach cast kelp, otherwise known as kelp 'wrack' also provides a physical barrier for dune systems from wave action, particularly during the second-high tide of a storm event which has generated high seas.

Excessive removal of kelp from beaches can have significant implications for the integrity of beach and dune ecology. The CCT has in place a Beach Cleaning Protocol (Annexure B) which informs the operational management and removal of kelp from Cape Town's beaches. This policy aims to strike a delicate balance between leaving kelp on beaches due to the environmental and indirect social benefits, whilst minimising the negative social impacts associated with kelp, that being odour, flies and obstruction. Outside of kelp cleansing zones (Annexure C), beach cast kelp will be left in its natural configuration along Cape Town's beaches as opposed to physically placing kelp on dune systems. The natural distribution of kelp on beaches plays an important role in elevating beach profiles. Elevated beach profiles in turn mitigate exposure of dunes to coastal erosion.

## 6.3 Protective fencing

The main purpose of fencing is to prevent damage to the dunes from pedestrian and vehicular traffic when rehabilitation and maintenance is in progress. Physical delineation of the site is critical as it defines the area where the public must not enter.

Various types of fencing may be used, for example wooden posts, recycled plastic fencing, danger tape etc. Fencing may be temporary or permanent depending on the progress of dune rehabilitation and the pressures that may exist around rehabilitated dunes. At no time however will fences be constructed if they limit or restrict public access to the beach. Further, at no time will concrete footings be used to secure poles for fences.

### 6.3.1 Fence type and construction

- The fence type and construction will be dictated by local site characteristics and the availability of materials;
- Fences will be of simple construction, and easy to maintain and remove;

- Hazard tape may be used to as a temporary intervention in emergency situations, and
- Provided there are no ongoing pressures that may lead to the degradation of rehabilitated dunes, fences will be removed upon completion of rehabilitation

### 6.3.2 Fence position

- The seaward or frontal fence will be located near the toe of the foredune, above high-water levels;
- Fences will be roughly parallel to the dune toe;
- At remote sites with limited pressures, fences are unlikely to be used;
- The location of fences in hind dunes will vary according to constraints imposed by the landform, existing vegetation and the presence of developments such as car parks and roads, and
- All such areas will have signage, informing people of both restricted access and the need for rehabilitation through access control.

## 6.4 Re-vegetation of dunes

### 6.4.1. General planting principles

The most effective long-term method for dune stabilisation is through the planting of vegetation. Vegetation is the least expensive, most durable, most aesthetically appealing and only self-maintaining technique available. Vegetation on coastal dunes binds the sand as well as reduces wind velocity. Re-vegetation of dunes must be carried out as swiftly as possible following the reconstruction of the dune. The use of nursery-raised seedlings, in situ cuttings and seeding are the most common methods of establishing vegetation on the dunes. However, established plants from the immediate vicinity, rescued during the course of other operations, may also be used on occasion. The following conditions will be applicable when using vegetation to stabilise dune systems:

- Planting will occur as soon the dune is profiled and sand movement is stabilized;
- Locally indigenous species will be used which is consistent to the local vegetation characteristics (Annexure D);
- Successional planting will be established where possible and appropriate;
- All plants will be inspected to ensure that they are free from pests and diseases;
- All measures will be put in place to create a protected and sheltered environment for newly planted vegetation;
- The combination of high temperatures, low soil moisture and strong winds are the major causes behind poor establishment of dune vegetation. The timing of planting will be such that these conditions are avoided. Planting will take place within Cape Town's growing season, mainly between May and August;
- All necessary preparations (i.e. the addition of mulch or fertilizer) will be made to ensure the establishment of newly planted vegetation;
- Where necessary irrigation systems may be installed and used during Cape Town's dry season (summer months), and

- When seed mix is used all preparations (i.e. the installation of wind breaks and mulch) will be undertaken to ensure that seeds are given the best available chance of germinating.

### 6.4.2 Plants and seed mulch sourced from nurseries

In order for re-vegetation projects to be successful, the planting of tough, well-hardened native dune plants is essential. Plants can be raised in nurseries and when ready, planted on the dunes requiring re-vegetation. Alternatively seed mulch may also be used in cases where dense vegetation cover is required. The nurseries from which the plants and seed mix are sourced will need to meet various requirements:

- They should have a suitable supply of indigenous dune species native to the Western Cape;
- They should take precaution to ensure that plants and seeds are free from diseases by maintaining a disease free environment and treating disease/pest outbreaks;
- They should ensure that the components of the potting mix are free of disease-causing pathogens, and
- Follow-up monitoring will ensure that any alien plant species accidentally incorporated into the mix are timeously eradicated.

### 6.4.3 Compost and fertilizer

Plant tissues (e.g. leaves and stems) make up a significant proportion of the total nutrient pool of the otherwise nutrient poor coastal dune soils. Therefore, in areas where vegetation has been damaged or removed it will be necessary to use fertiliser or compost in order to increase the nutrient level to that which will allow for successful plant growth. While indigenous dune plants are often well adapted to surviving in nutrient poor soils, fertilisers and compost are useful when it comes to facilitating the growth of young plants. Fertilizing and composting also minimizes the time required to achieve stability against wind erosion. The following points will be taken into consideration when applying compost or fertilizer:

- Organic matter generated by garden refuse may be used as compost;
- Care will be exercised when using fertilizer products near sensitive areas (e.g. wetlands) in order to avoid contamination of these areas;
- Organic fertilizers should be used where possible and fertilizer should be applied in a uniform manner after planting;
- Eco-labelled and green certified products should be used e.g. FSC, Energy Star, Fair Trade etc;
- Fertilizers will not be applied to establish natural vegetation on the undisturbed coastal dunes;
- Fertilizing beyond initial planting is unnecessary and will not be conducted;
- Fertilizer should not be applied before heavy rain as it may be leached from the soil before uptake of plants;
- Fertilizers should be spread by hand ensuring that each area receives the appropriate amount;
- fertilizers containing phosphorus will be used cautiously, as phosphorous levels can build-up in the sand and encourage weed invasion;
- The nitrogen component of fertilizers tends to be very soluble and heavy rainfall can cause leaching from the relatively shallow root zone of young dune plants. This risk may be reduced by splitting up the fertilizer application and applying it when weather conditions are suitable, and

- Fertilizer containers should be properly sealed and stored in a safe place in between uses.

### 6.4.4 Irrigation systems

Irrigation may be required to assist with watering plants in the early stages of dune rehabilitation in order to evade moisture stress which is often responsible for the poor survival of seedlings. Typically, this is required in Cape Town during the hot and dry summer months. There is far greater flexibility with regard to the time of planting if seedlings can be watered during the critical establishment period. The following guidelines will be applicable in the use of irrigation systems:

- During periods of drought use of water for irrigation will be limited in accordance with the CCT's own water use restrictions;
- Correct irrigation sequences need to be applied; excessive irrigation will induce root rot as well as cause roots to grow too close to the surface. As a consequence, the dune may become less stable;
- All seeded or planted vegetated areas shall be irrigated at regular intervals. This should be monitored by the relevant beach for the duration of the rehabilitation period;
- All vegetated areas should receive 100% irrigation coverage;
- Care should be taken not to damage the soil structure or stability by use of excessive force of water;
- Water used for irrigation should be free from pollutants that would harm the plants;
- Plants with similar water requirements should be grouped together e.g. plants with low, moderate or high water needs;
- Weeds and by extrapolation alien plants should be removed as these compete with indigenous vegetation for water;
- Water loss through evaporation will be reduced by watering in the early morning or late afternoon, and
- The irrigation system and pressure must be regularly inspected to identify leaks.

## 6.5 Managing Access

### 6.5.1 Boardwalks

The purpose of these structures is to guide peoples' movement over dunes in an elevated manner to avoid trampling of vegetation and the subsequent formation of dune blow-outs. Boardwalks may be constructed using wood or recycled plastic; the latter being preferable as it requires less maintenance and has a longer lifespan. The following factors will be taken into account when constructing boardwalks within sensitive dune areas:

- Boardwalks will be repaired and maintained regularly;
- Existing access routes will be used where possible without the addition of unnecessary infrastructure;
- Unnecessary access routes will be de-commissioned and rehabilitated, with other improved access routes?

- Boardwalks will be positioned in a manner that does not detract from the aesthetic appeal of the coastal environment, and
- No concrete foundations will be used to support boardwalks; main support poles will instead be sunk to a depth that provides stability.

### 6.5.2 Signage

Informative signage will be installed to inform the public of any rehabilitation processes (and the importance of such processes) taking place and the purpose of any new structures which may have been erected.

# Monitoring of the rehabilitation and maintenance process

As in any rehabilitation project, maintenance is a crucial aspect in achieving successful results. Maintenance of dune vegetation, dune profiles and ancillary infrastructure such as raised boardwalks for the duration of the dunes lifespan is essential for optimising the functionality and effectiveness of these systems. Dune vegetation requires intensive maintenance for a number of weeks following planting and must be inspected on a regular basis. Collaborative platforms will be utilised to facilitate communication between departments within the CCT, as well as between the CCT and any service providers that may be utilised for rehabilitation and maintenance of dune systems.

## 7.1 CCT Coastal Monitoring Programme

Monitoring will also form an important component of the CCT's dune and beach management programme. This will primarily be undertaken through the CCT's Coastal Monitoring Programme (Figure 3) and will include the following methods:

- Fixed point photography
- Aerial/drone imagery
- Beach and dune profile analysis

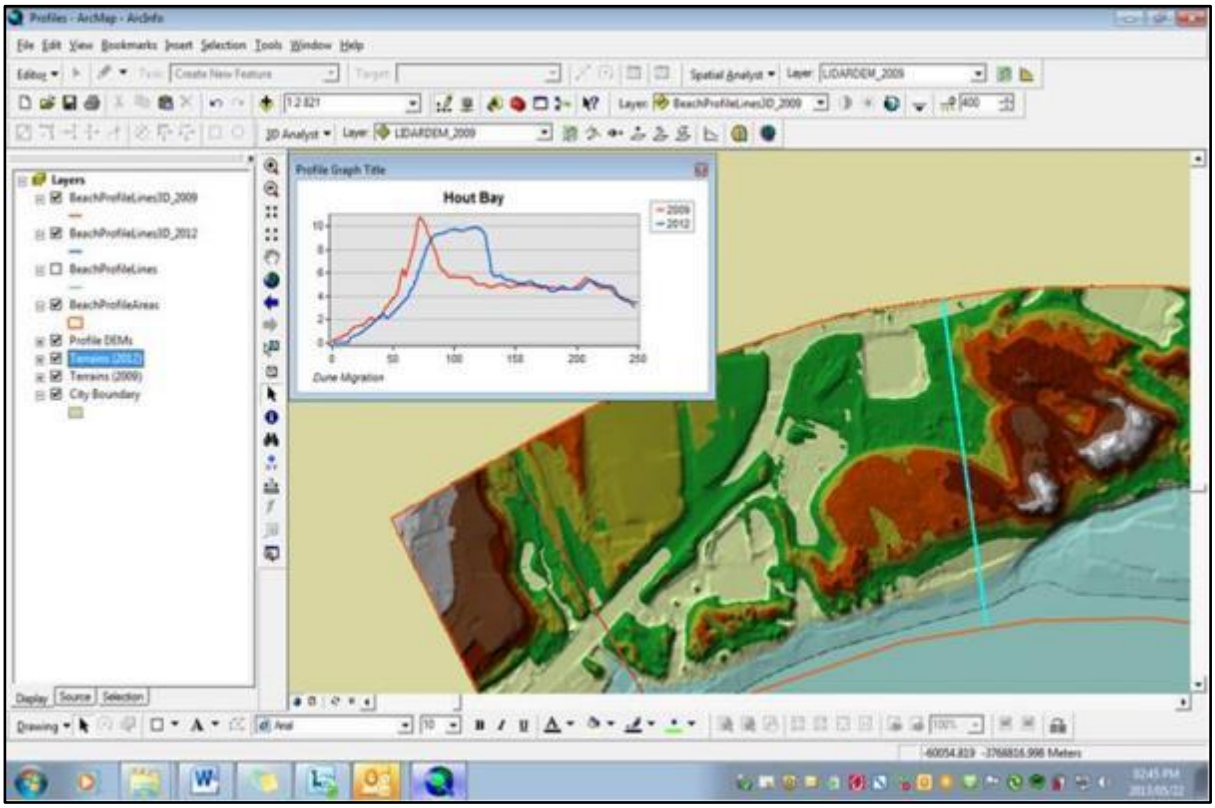


Figure 6: Screen grab of the CCT's coastal monitoring programme tracking change in dune profiles over time.

An additional component here is operational monitoring. This includes weekly measurements, daily inspections or irrigation systems, determination of sand accretion on public infrastructure etc. These operational monitoring requirements will be established and built into operational management plans for distinct coastal nodes. The intent of which is to provide guidance to operational level staff on the management and maintenance of coastal infrastructure and the retention of institutional memory to address staff turnover and the loss of knowledge.

The data generated by the CCT's coastal monitoring programme will provide the feedback required to determine maintenance requirements and will help to measure the effectiveness of the CCT's rehabilitation and maintenance efforts.

## 7.2 Search and rescue of nesting sea shore birds

The access route and area of operations will be inspected prior to activities commencing to ensure that there are no nesting birds e.g. plovers, oyster catchers on site. No nests or roosts will be moved or relocated. Areas in which nests are found will be cordoned off and avoided.

## 7.3 Alien plant clearing

An important aspect in establishing indigenous vegetation on dune cordons is the removal of alien vegetation. Alien invasive vegetation is problematic in many regards, namely: they often require more water than indigenous plants and therefore the local plants in the area are often left with an unsatisfactory water supply, they can act as fuel for veld fires and they are a major threat to biodiversity in catchment areas. There are also benefits to alien species. This benefit arises out of the ability of hardy species such as Rooikrans (*Acacia cyclops*) to stabilise sand dunes through their root systems in harsh environments and thereby prevent wind erosion and the migration of dunes onto infrastructure. This is particularly relevant in Cape Town with its strong and persistent winds. In respect of this, the removal of alien vegetation must be undertaken within a successional plan i.e. the removal of alien invasives cannot be removed without phasing in indigenous vegetation or any other means to stabilize the dune system; and through a series of consistent follow-up operations to ensure that alien plants do not re-coppice; or re-establish following dormancy of their seed bed. To do so would compound the problem of wind-blow sand within Cape Town. Some common undesirable species are identified below:

- *Acacia cyclops* (Rooikrans)
- *Acacia elata* (Pepper tree wattle)
- *Acacia implexa* (Screw pod wattle)
- *Acacia mearnsii* (Black wattle)
- *Acacia melanoxylon* (Blackwood)
- *Acacia longifolia* (Long-leafed wattle)
- *Acacia podalyriifolia* (Pearl acacia)
- *Acacia saligna* (Port Jackson)
- *Acacia stricta* (Hop wattle)
- *Acacia paradoxa* (Kangaroo wattle)
- *Acridostheres tristis* (Common Myna)
- *Ailanthus altissima* (Tree of heaven)
- *Anredera cordifolia* (Madeira vine)
- *Billardiera heterophylla* (Blue bell creeper)
- *Bryophyllum delagoense* (Chandelier plant)
- *Cardiospermum grandiflorum* (Balloon vine)
- *Campuloclinium macrocephalum* (Pom weed)
- *Centranthus ruber* (Devil's beard)
- *Cortaderia selloana* (Pampas grass)
- *Eucalyptus conferruminata* (Spider gum)
- *Genista monspessulana* (French broom)
- *Hakea drupacea* (Sweet hakea)
- *Hakeasericea* (Silky hakea)
- *Iris pseudacorus* (Yellow flag iris)
- *Leptospermum laevigatum* (Australian myrtle)
- *Lythrum salicaria* (Purple loosestrife)
- *Melaleuca hypericifolia* (Red flowering tea tree)
- Nymphaea Mexicana (Yellow water lily)
- *Parkiaspeciose* (Stinkbean)

- *Pennisetum setaceum* (Fountain grass)
- *Pereskia aculeata* (Barbados gooseberry)
- *Pinuspinaster* (Cluster pine)
- *Pittosporum undulatum* (Australian cheesewood, sweet pittosporum)
- *Polistes dominula* (European paper wasp)
- *Rivina Humilis* (Rivinia bloodberry)
- *Spartium junceum* (Spanish broom)
- *Verbesina encelioides* (Wild sunflower)

### 7.4 Herbicides

Use of herbicides in the removal of alien invasives will be avoided. The CCT will instead focus on labour intensive removal of alien invasives when clearing operations are required. Any application of herbicides for the removal of invasive species will be undertaken strictly in accordance with Departmental Affairs *Revised and Updated Policy on the Use of Herbicides and Mycoherbicides for the Control of Alien Vegetation* (2012). Due regard will also be given to the potential for dune destabilisation that may result from alien removal as per section 7.3.

## Beach re-profiling

Beaches are highly dynamic spaces. Within Cape Town, beach profiles generally tend to be raised on the west coast due to prevailing south easterly and relatively calm seas in the summer whilst in winter beach profiles tend to drop due to exposure to higher seas and subsequent erosion. The opposite is true for Cape Town's False Bay coastline.
Beaches are highly dynamic spaces. Within Cape Town, beach profiles generally tend to be raised on the west coast due to prevailing south easterly and relatively calm seas in the summer whilst in winter beach profiles tend to drop due to exposure to higher seas and subsequent erosion. The opposite is true for Cape Town's False Bay coastline. The dynamic nature of Cape Town's beaches in conjunction with heavily altered and 'fixed' coastlines necessitates that beach levels are managed. Beach revetments, built to protect coastal infrastructure, were built with the intention to facilitate the efficient management of sand levels on the seaward side of beach walls and revetments.

### 8.1 Purpose

The intention of beach which is to prevent beach levels from building up to such an extent that sand does not 'spill over' and smother public infrastructure such as roads, walkways and parking facilities. Lowering of upper beach levels also enables greater areas of the beach to become wet during high tides thus limiting the potential for aeolian transport of sand.

The CCT, and the various councils prior to the CCT's formation in 2000, have for many decades (as far back as the 1960's), mechanically flattened beach profiles through mechanical scraping to a pre-determined level and the re-distribution of sand to a more even profile within the intertidal zone. Beaches requiring re-profiling include the following:

- Fish Hoek
- Muizenberg
- Strand

- Gordon's Bay
- Hout Bay

This method and process, and considering the highly altered environment in which these beaches occur, has no impact on beach ecology, and is beneficial from a public access perspective in that coastal infrastructure remains accessible and open at all times. Further, such an approach is more cost effective as opposed to removing sand from CCT infrastructure after the fact where such sand often becomes contaminated by litter and taken to land-fills. This sand, as a consequence, is lost to the system. The following operational protocols will be complied with when re-profiling the listed beaches:

- Re-profiling will not take place during windy or unfavourable conditions;
- Re-profiling will be undertaken at low tide to facilitate redistribution of sand below the HWM;
- Re-profiling will not be undertaken during peak periods of beach use;
- Excesses sand will be levelled out within the intertidal zone, and
- Re-profiling will take place on an 'if and when required' basis determined by the CCT's coastal branch.

# Estuary Mouth Maintenance Management Plans

The CCT has documented the various maintenance and management interventions that are required in the following seven estuary / river outlets in it's so called "Maintenance Management Plans (MMPs):

- Diep
- Silvermine
- Disa
- Lourens
- Sir Lowry's Pass
- Eerste
- Zandvlei

## 9.1 Purpose

The purpose of these MMP's, is to guide the CCT's maintenance activities, which mainly cover typical stormwater management activities, within sensitive estuarine environments and to identify suitable mitigation measures that will minimize negative environmental impacts of these activities. The MMPs also make provision for maintenance interventions which departments such as ERM, W&S, Parks, Sport, Recreation & Amenities, and Electricity may also need to undertake on municipal infrastructure within the estuarine area.

While these MMPs contain internal working guidelines and outline best practise for a range of municipal interventions, they also serve to preserve the City's institutional memory. The MMPs were authorised in terms of an amendment of the City's existing Environmental Authorisation of the Stormwater Maintenance and Management Programme in terms of the National Environmental Management Act (Act No. 107 of 1998) (EIA Ref No. 16/3/1/3/1/A7/4/2031/12).

The Estuary MMPs include a delineation of the estuary extent; a summary of available information on conservation importance, health status and sensitivity of each estuary; a description of the required maintenance activities. An identification of the presence of Heritage Resources was also undertaken within each estuarine area. It should be noted that the coastal zone, river mouths / estuaries and coastal zones may have fossils and/or remnants of previous settlements / communities. Site visits to each of the seven estuaries were undertaken during which a variety of maintenance activities were discussed with CCT officials and estuarine ecologists. These MMPs were compiled based on information supplied by CCT officials, observations made during the site visits, available information in the scientific literature and other reports (e.g. estuary management plans), and the consultant's previous experience and specialist knowledge. Finally, the MMPs should be read together with the Environmental Management Programme and Technical Assessment Report (GIBB, 2014) which were compiled as part of the original Basic Assessment Report and EIA application for the authorisation for maintenance and management interventions in the City's surface stormwater systems. Chapter 13 of that EMPr deals specifically with estuaries and river mouths.

MMPs for the Zandvlei and Rietvlei have been completed as a separate process as part of the City's reserve management plans. All Estuary MMPs are available upon request.

# General site maintenance

A good housekeeping and a clean site policy will be applied by the CCT during dune and beach management interventions. The site maintenance guidelines below will apply to any maintenance and rehabilitation in respect of dunes and beaches.

## 10.1 Access routes

Machinery used to access areas requiring work will be undertaken through formal access routes. If no formal access routes are available, access to the site will be undertaken in a sensitive manner, or thorough already disturbed areas. Upon completion of work, access routes will be rehabilitated. The movement of any personnel or equipment outside of the designated working areas as it relates to dune rehabilitation and maintenance will not be permitted.

## 10.2 No go areas

Prior to commencing work, 'no go areas' will be determined and demarcated at project sites for areas that are ecologically sensitive and are at risk of being damaged during rehabilitation and maintenance work. Officials from the CCT's coastal branch will be on site during planned maintenance activities to ensure that these areas are not impacted upon.

## 10.3 Storage of equipment

No storage areas will be established on the beach or within sensitive dune areas. All equipment and tools that are used will be removed at the end of each working day. Equipment that may need to be stored for whatever reason (including breakdowns and overnight storage due to lengthy operations) will be stored in pre-determined and secured sites.

## 10.4 Public safety, compliance and ECOs

It is the CCT's responsibility to make sure that the public is kept safe from planned maintenance and rehabilitation operations. This is especially the case considering that these operations will be taking place on the beaches and dune systems, which are designated as areas of public open space. The CCT will post Environmental Control Officers (ECOs) on the ground during maintenance operations to advise and caution beach users. The ECOs will also ensure that operations for undertaking dune and beach rehabilitation will be undertaken in strict accordance with this MMP.

## 10.5 Pollution and foreign substances

Operations conducted towards dune and beach management will require the use of machinery and equipment. Thus there is the potential risk of pollution in the form of leakages. The following sections determine measures that will be put in place to mitigate against spills:

### 10.5.1 Fuel and fuel spills

No re-fuelling of machinery will take place on the beach. All re-fuelling will take place at the designated equipment storage site. A drip tray for each item of equipment will be provided and used during operation and re-fuelling. If leakage of oil or fuel does take place on site and any area is contaminated, the effected sub-straight will be removed from site immediately and disposed of waste at a registered landfill.
All non-road going vehicles (i.e. heavy tracked machinery) will be re-fuelled at the designated site by means of mobile re-fuelling equipment. The surface under the refuelling area shall be protected against spills prior to any re-fuelling activities. Appropriate absorbent material (SpillSorb or similar product) shall be readily available on site to absorb, break down or encapsulate a minor fuel or oil spillage. The CCT will make provision for a minimum of 200l of fuel or oil spillage.

### 10.5.2 Generators

In the event that generators are required, the following conditions will apply:

- Generators will have catch receptacles (drip trays) for leaks and for when re-fueling takes place;
- Generators are to be placed so as not to disturb or cause a nuisance to people or fauna. This is not only applicable to noise, but also exhaust fumes.

### 10.5.3 Foreign substances

No foreign substances (i.e. landfill) will be taken onto the beach and used in the process of re-profiling. In the event that additional sand is required either for raising the beach profile or for dune maintenance and rehabilitation processes, such sand will be sourced according to the specifications detailed in section 6.1.1. and 6.1.5.

### 10.5.4 Oil spills

SpillSorb will be on site at all times to mop up and remove spills from vehicle machinery.

# Stakeholder Notification and Reporting Process

## 11.1 Stakeholder notification

A week prior to commencement of activities in respect of this management plan, the CCT will erect signage indicating the City's intent to commence with activities as it relates to dune rehabilitation. Information to be displayed on the sign will include the following:

- Nature of the work to be undertaken;
- Expected commencement and completion date, and
- Contact numbers for further information.

## 11.2 Post-reporting and compliance monitoring

Following from the completion of work undertaken, a compliance monitoring report will be completed by the Coastal Management branch. All compliance reports will be archived and will be made available to DEA&DP should they be required for audit purposes. The compliance monitoring report as per Annexure E will detail the following:

- Date of commencement and completion of work;
- Materials used, estimated quantities of sand removed and replaced;
- Whether there was any non-compliance with the MMP, and
- Any additional information.

The following table provides a list of CCT officials, their departments and contact numbers, as relevant to dune and beach management as provided for in this MMP:

Table 1: City of Cape Town Contacts

| NAME | DEPARTMENT | DESIGNATION | E-MAIL | TEL |
|---|---|---|---|---|
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# Conclusion

Littoral active zones are constantly being reshaped by the sea and the wind. Within the context of urban environments this requires ongoing maintenance of dune and beach systems. Regular inspections of dune and beach conditions and management interventions must be carried to ensure that coastal systems remain functional and intact, and in a manner which improves the socio-economic values of Cape Town's coastline.

# Priority locations for dune and beach maintenance and rehabilitation

| Area | GPS[5] | Issue | Intervention[6] | Status |
|---|---|---|---|---|
| Van Riebeeckstrand | 18° 26' 28.792" E 33° 42' 20.525" S | Encroachment by pvt sector into vegetated dune systems. | Rehabilitation through removal of garden species, structures and planting of indigenous dune vegetation. | As and when required |
| Melkbosstrand | 18° 26' 39.609" E 33° 43' 3.939" S | Encroachment by pvt sector into vegetated dune systems. | Rehabilitation through removal of garden species, structures and planting of indigenous dune vegetation. | As and when required |
| Big Bay | 18° 27' 24.961" E 33° 47' 35.757" S | Artificial dune cordon receding due to erosion. | Requires managed realignment of vegetated dune and beach re-profiling. | To be undertaken |
| Table View and Dolphin Beach | 18° 28' 27.717" E 33° 49' 7.749" S | Deteriorating dune systems compounding wind-blown sand problems and failing infrastructure abutting these systems. | Requires re-profiling, re-planting and ongoing maintenance. | To be undertaken. |
| Table Bay Nature Reserve | 18° 29' 5.384" E 33° 50' 20.693" S | Alien invasive infestation. | Removal of alien vegetation. | Ongoing |
| Sunset Beach | 18° 29' 21.849" E 33° 51' 19.464" S | Encroachment by pvt sector into vegetated dune systems. | Rehabilitation through removal of garden species and structures and planting of indigenous dune vegetation. | As and when required |
| Milnerton area | 18° 28' 53.205" E 33° 53' 36.833" S | Artificial dune system being exposed to coastal erosion. | Requires managed realignment of vegetated dune and beach re-profiling. | To be undertaken |
| Hout Bay | 18° 21' 12.737" E 33° 53' 36.833" S | Deteriorating dune systems compounding wind-blown sand problems leading to smothered infrastructure. The Hout Bay dunes form what was originally a sediment by-pass system to Sandy Bay. Build-up of sand against public infrastructure as a result of raised beach profiles. | Wide-scale rehabilitation and maintenance of Hout Bay dune and beach areas. Beach re-profiling. | To be undertaken |
| Kommetjie | 18° 20' 13.699" E 34° 7' 48.026" S | Dune encroachment into private properties and public infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | As and when required. |
| Glencairn | 18° 25' 52.997" E 34° 9' 34.108" S | Deteriorating dune vegetation and subsequent mobilisation of sand smothering infrastructure such as road and rail network. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |

[5] These coordinates provide an indication of the general area.
[6] This table refers only to those interventions that are the responsibility of the CCT, which includes undertaking rehabilitation on behalf of private landowners.

| | | | | |
|---|---|---|---|---|
| Fish Hoek | 18° 26' 5.71" E<br>34° 8' 9.124" S | Deteriorating dune vegetation and subsequent mobilisation of sand smothering adjacent chalets and infrastructure. Build-up of beach area leading to 'over spilling' of sand onto adjacent public infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling of the beach area. | Ongoing |
| Sunrise Beach | 18° 28' 52.048" E<br>34° 6' 14.314" S | Deteriorating dune vegetation and subsequent mobilisation of sand smothering adjacent infrastructure such as parking facilities. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |
| Strandfontein | 18° 33' 28.819" E<br>34° 5' 11.626" S | Mobile dune systems due to strong and persistent South Easterlies – smothering coastal infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |
| Blue Waters | 18° 34' 47.921" E<br>34° 4' 52." S | Mobile dune systems due to strong and persistent South Easterlies – smoothing coastal infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |
| Mnandi/Kapteinsklip | 18° 37' 20.179" E<br>34° 4' 28.032" S | Mobile dune systems due to strong and persistent South Easterlies – smothering coastal infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |
| Monwabisi | 18° 41' 18.007" E<br>34° 4' 19.842" S | Mobile dune systems due to strong and persistent South Easterlies – smothering coastal infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |
| Macassar | 18° 45' 1.002" E<br>34° 4' 37.096" S | Mobile dune systems due to strong and persistent South Easterlies – smothering coastal infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |
| Strand | 18° 48' 59.698" E<br>34° 6' 15.175" S | Mobile dune systems due to strong and persistent South Easterlies – smothering coastal infrastructure. Build-up of beach area leading to 'over spilling' of sand onto adjacent public infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and beach re-profiling. | Ongoing. |
| Fleur Park /Hendon Park | 18° 51' 45.223" E<br>34° 9' 14.043" S | Mobile dune systems due to strong and persistent South Easterlies – smothering coastal infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |
| Gordon's Bay | 18° 52' 4.254" E<br>34° 9' 30.422" S | Elevated beach profiles and over-spilling of sand onto public infrastructure. | Beach re-profiling. | Ongoing |
| Koggelbaai | 18° 50' 52.972" E<br>34° 13' 55.028" S | Mobile dune systems due to strong and persistent South Easterlies – smothering coastal infrastructure. | Dune rehabilitation and maintenance requiring stabilisation, re-vegetation and re-profiling. | Ongoing |

# ANNEXURE E: Indigenous dune plant species to the Cape Town area

| Species | Common name |
|---|---|
| *Afrolimon perigrinum* | Strandroos |
| *Albuca maxima* | Soldier-in-the-box |
| *Amellus asteroides* | |
| *Annesorhiza macrocarpa* | Wilde-anyswortel |
| *Anthospermum aethiopicum* | Jakkalstert |
| *Arctotheca calendula* | Cape weed |
| *Arctotheca populifolia* | Sea pumpkin |
| *Aspalathus hispida* | Witertjiebos |
| *Asparagus asparagoides* | Breëblaarklimop |
| *Asparagus capensis* | Katdoring |
| *Asparagus fasciculatus* | Asparagus Fern |
| *Asparagus rubicundus* | Swarthaakdoring |
| *Babiana tubulosa* | Witbobbejaantjie |
| *Capnophyllum africanum* | |
| *Carpobrotus edulis* | Hottentot fig |
| *Cassine peragua* | Bastersaffraan |
| *Chrysanthemoides incana* | Grysbietou |
| *Chrysanthemoides monilifera* | Brother berry |
| *Chrysanthemoides monilifera* | Brother berry |
| *Chrysocoma cf. coma-aurea* | Golden heads |
| *Chionanthus foveolatus* | Fine-leaved ironwood |
| *Cineraria geifolia* | Cineraria |
| *Cissampelos capensis* | Davidjies |
| *Cladoraphis cyperoides* | Steekriet |
| *Cliffortia obcordata* | |
| *Clutia daphnoides* | Vaalbossie |
| *Cotula turbinata* | Batchelor buttons |
| *Cotyledon orbiculata* | Pig's ear |
| *Crassula cf. glomerata* | Brakvygie |
| *Crassula dichotoma* | Geelcrassula |
| *Crassula subulata* | |

| | |
|---|---|
| *Crassula tomentosa* | |
| *Cynanchum africanum* | Monkey rope |
| *Cyphia cf. crenata* | Kleinbokkies |
| *Cysticapnos vesicaria* | Klappertjie |
| *Dasispermum suffruticosum* | Duineseldery |
| *Didelta carnosa* | Kusslaaibos |
| *Didymodoxa capensis* | |
| *Dimorphotheca pluvialis* | Ox-eye daisy |
| *Drosanthemum marinum* | Krakervy |
| *Ehrharta cf. calycina* | Common ehrharta |
| *Ehrharta villosa* | Pypgras |
| *Eriocephalus racemosus* | Kapkoppie |
| *Euclea racemosa* | Bush guarri |
| *Euphorbia burmannii* | Steenbokmelkbos |
| *Euphorbia caput-medusae* | Medusa's head |
| *Euphorbia caput-medusae* | Medusa's head |
| *Euphorbia mauritanica* | Beesmelkbos |
| *Exomis microphylla* | Brakbossie |
| *Felicia tenella* | Astertjie |
| *Ferraria crispa* | Spinnekopblom |
| *Ficinia ramosissima* | |
| *Galium tomentosum* | Kleefgras |
| *Gazania pectinata* | Kaapserooigousblom |
| *Gladiolus cunonius* | Suikerkannetjie |
| *Grielum grandiflorum* | Platdoring |
| *Haemanthus cf. coccineus* | April fool |
| *Hebenstretia cordata* | Kusslakblom |
| *Hebenstretia repens* | Witslakblom |
| *Helichrysum cf. revolutum* | Kooigoed |
| *Helichrysum cochleariforme* | Gold-and-silver |
| *Helichrysum crispum* | Hottentotskooigoed |
| *Helichrysum niveum* | Sewejaartjie |
| *Helichrysum patulum* | Hottentot's bedding |
| *Helichrysum retortum* | Kuskooigoed |
| *Helichrysum revolutum* | Kooigoed |

| | |
|---|---|
| *Heliophila africana* | Bloubekkie |
| *Hemimeris sabulosa* | Sandgeelgesiggie |
| *Hermannia pinnata* | Kwasblaarkruippoproos |
| *Indigofera heterophylla* | Coral flower |
| *Ischyrolepis eleocharis* | Katstert |
| *Isolepis antarctica* | Sedges |
| *Jordaaniella dubia* | Helderkruipvygie |
| *Kedrostis nana* | Bryony |
| *Lessertia tomentosa* | Sutherlandia |
| *Lycium cf. ferocissimum* | Slangbessie |
| *Lyperia lychnidea* | Soettraanblommetjie |
| *Lyperia tristis* | Traanblommetjie |
| *Manulea thyrsiflora* | Woolly manulea |
| *Manulea tomentosa* | Duinevingertjies |
| *Mesembryanthemum crystallinum* | Ice plant |
| *Metalasia muricata* | Blombos |
| *Microloma sagittatum* | Bokhoring |
| *Moraea fugax* | Hottentotsbrood |
| *Morella cordifolia* | Candle berry |
| *Muraltia (Nylandtia) spinosa* | Skilpadbessie |
| *Nemesia affinis* | Weeskindertjie(s) |
| *Nylandtia spinosa* | Skilpadbessie |
| *Olea exasperata* | Slanghout |
| *Oncosiphon suffruticosum* | Stinkkruidbossie |
| *Ornithoglossum viride* | Eendjies |
| *Osyris compressa* | Pruimbas |
| *Otholobium bracteolatum* | Skaapbostee |
| *Othonna coronopifolia* | Sandbobbejaankool |
| *Othonna filicaulis* | Bobbejaankoolklimop |
| *Oxalis pes-caprae* | Sorrel |
| *Passerina cf. paleacea* | Gonnabos |
| *Passerina ericoides* | Kusgonnabas |
| *Passerina corymbosa* | Gonnabas |
| *Pelargonium capitatum* | Rose-scented pelargonium |
| *Pelargonium gibbosum* | Dikbeenmalva |

| | |
|---|---|
| *Pelargonium gibbosum* | Dikbeenmalva |
| *Pentaschistis pallida* | Haasgras |
| *Pharnaceum lanatum* | Wolhaarsneeuwvygie |
| *Phylica ericoides* | hardebos |
| *Phragmites australis* | Fluitjiesriet |
| *Psoralea repens* | Duine-ertjie |
| *Pterocelastrus tricuspidatus* | Cherrywood |
| *Putterlickia pyracantha* | Basterpendoring |
| *Restio (Ischyrolepis) eleocharis* | Duinekatstert |
| *Rhus crenata* | (dune) Crow-berry |
| *Rhus glauca* | Blue kuni-bush |
| *Rhus laevigata* | Dune taaibos |
| *Rhus lucida* | Wild currant |
| *Robsonodendron maritimum* | Duinesybas |
| *Roepera flexuosum* | Spekbossie |
| *Roepera morgsana* | Slaaibos |
| *Ruschia indecora* | |
| *Ruschia macowanii* | Bosvygie |
| *Salvia africana-lutea* | Wild sage |
| *Senecio cf. arenarius* | Hongerblom |
| *Senecio elegans* | Wild cineraria |
| *Senecio littoreus* | Hongerblom |
| *Senecio maritimus* | Strandhongerblom |
| *Seriphium (Stoebe) plumosum* | Slangbos |
| *Sideroxylon inerme* | White milkwood |
| *Silene crassifolia* | Crassifolia flower |
| *Silene undulata* | Wild tobacco |
| *Solanum africanum* | Melkellie |
| *Tetragonia decumbens* | Kinkelbossie |
| *Tetragonia fruticosa* | Kinkelbos(sie) |
| *Thamnochortus spicigerus* | Duineriet |
| *Thesium aggregatum* | Roothugs |
| *Thinopyrum distichum* | Coastal wheat grass |
| *Trachyandra cf. divaricata* | Duinekool |
| *Trachyandra cf. revoluta* | Cape Spinach |

| | |
|---|---|
| *Trachyandra ciliata* | Wildeblomkool |
| *Trachyandra divaricata* | Duinekool |
| *Trichogyne repens* | Witnaaldebossie |
| *Viscum capense* | Mistletoe |
| *Wahlenbergia androsacea* | Hare-bell |
| *Zaluzianskya villosa* | Drumsticks |
| *Zantedeschia aethiopica* | Arum lily |

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