CHAPTER 3:
DESCRIPTION OF THE AFFECTED ENVIRONMENT

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3.1 Background

This chapter provides an overview of the environment of the Port of Ngqura and the Coega IDZ in which this OTGC Bulk Liquid Storage and Handling Facility project is proposed. The receiving environment is understood to include biophysical, socio-economic and heritage aspects which could be affected by the proposed development or which in turn might impact on the proposed development. The majority of information used in this chapter was sourced from studies conducted by the Coega Development Corporation (CDC) and recent EIAs conducted in the Coega area.

3.2 Site Location

The Coega IDZ is situated along the southern coast of South Africa at the mouth of the Coega River, between the Sundays River in the East and the Swartkops River in the West, approximately 15 km north-east of the town of Port Elizabeth in the Eastern Cape Province. The IDZ falls within the boundaries of the NMBM which includes the former municipalities of Port Elizabeth, Uitenhage and Dispatch. The IDZ has been divided into a total of 14 zones, each of which has its own preferred land use relative to its specific zoning. The proposed site for the OTGC Bulk Liquid Storage and Handling Facility project is situated within Zone 8 of the Coega IDZ, which forms the southern-most extent of the IDZ (Refer to Figure 3.1: Page 3-3). The development footprint for the proposed tank farm and associated infrastructure are all located within the property boundary of the IDZ and within the designated Port of Ngqura, and will be managed by TNPA as the registered landowner. TNPA are in support of the proposed development as it forms part of their business strategy to improve growth and infrastructure within the petroleum industry.

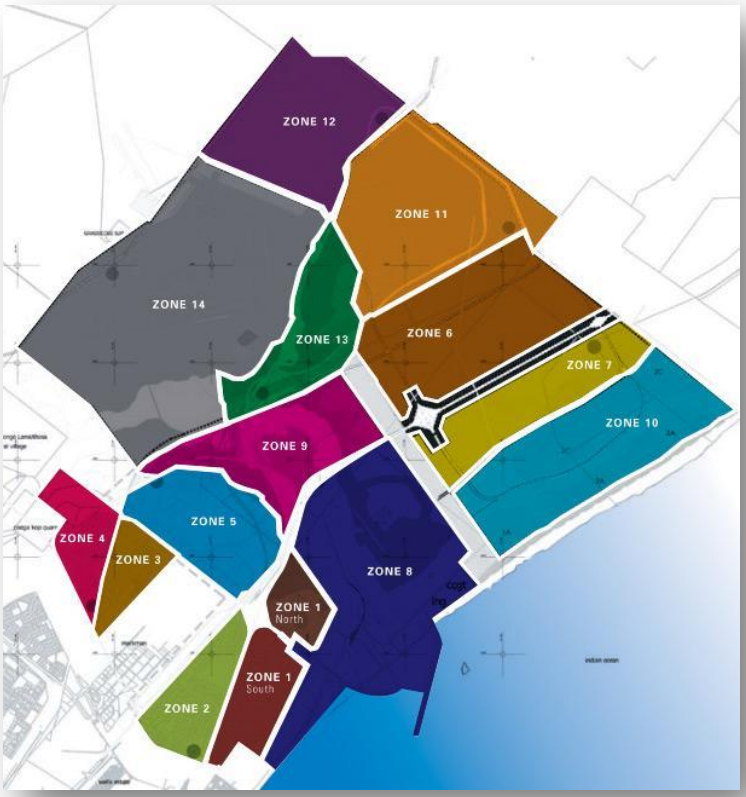

Figure 3.1: Demarcated zones within the Coega IDZ

3.3 Biophysical Environment

3.3.1 Climate

The Coega IDZ is located in a transition zone situated between the temperate southern coastal belt and the subtropical eastern coast, and subsequently experiences warm summers and temperate winters. Rainfall is distributed throughout the year with peaks in autumn (May to June) and spring (August to September), and an annual average rainfall of approximately 400 mm (Coetzee *et al*., 1996). Rainfall occurs as a result of convective summer rain and due to the passage of frontal troughs during winter (SRK, 2007). The study area experiences gradient winds for the majority of the year with the wind direction varying between West to west-south-westerly (14% of the time) and Easterly (15% of the time). Wind speed and duration increases during the summer months (October to February) with 55% of wind with a speed of 3.3 m/s originating from the west and west-south-westerly direction. Temperature in the study area ranges from an annual average maximum of 24˚ Celsius to an average minimum of 15˚ Celsius.

3.3.2 Air Quality

The ambient air quality in the Coega area is categorised as relatively good (CES, 2000; SRK, 2007; Zunckel *et al*., 2010). The CDC has commissioned and established an air quality monitoring programme in the Coega IDZ (SRK, 2007, Zunckel *et al*., 2010). The following information is summarised based on the research carried out by SRK (2007) and Zunckel *et al*. (2010) in order to describe the current ambient air quality in the Coega IDZ. Three stations, located at the Saltworks, Amsterdamplein, and Motherwell, have been established to monitor nitrous oxides, sulphur dioxide, and standard meteorological variables such as temperature, relative humidity, wind speed and wind direction. In addition, the monitoring station at Motherwell measures ozone and particulate matter less than 10 microns, whereas the remaining two stations measure the total suspended particulates. The nitrogen dioxide, sulphur dioxide and particulate matter levels generally fluctuate during windy conditions; however the maximum 24-hour averages are within the limits of the National Ambient Air Quality Guidelines.

Zunckel *et al*. (2010) note that the current source of air pollution in the Coega IDZ is Algoa Bricks, which is located along the western periphery of the IDZ and is currently being decommissioned (CDC, 2011, *pers. comm*.). The main emissions from this fairly small brick works development include SO_2, particulate matter and fluoride. The earthworks and construction at the Port of Ngqura, as well as the emissions from traffic on the nearby N2 and Old Grahamstown Road are also considered as air pollution sources in the Coega IDZ. Furthermore, it is understood that the Markman Industrial Area is likely to influence the air quality in the Coega IDZ. The Markman Industrial Area is located on the south-western border of the Coega IDZ. This industrial area contains an abattoir, two tanneries, and a foundry, which generate pollutants in the form of SO_2, particulate matter and odour. In addition, sparse vegetation cover and largely uncovered areas, particularly within the construction areas, are widespread within the Coega IDZ. Consequently, localised dust pollution is very likely, especially as a result of the moderate to strong winds that occur within the area.

3.3.3 Landscape and Geology

The IDZ area has been previously disturbed and has been degraded as a result of agricultural activities which took place on the land prior to the establishment of the Coega IDZ. The vegetative cover has been transformed from its original pristine state, resulting in a disturbed environment. In addition, the presence of infrastructural components, particularly in the form of overhead electrical reticulation infrastructure also contributes to the disturbed character of the site.

Listed below are two major landscape types that are distinguishable in the proposed project zone of ecological disturbance and visual influence:

- the raised coastal plain, and
- the sandy coastline and coastal dunes.

The raised coastal plain is a zone comprising the main inland area of the IDZ is located 50 to 70 m above mean sea level.

The sandy coastline and coastal dunes is an area which includes the lower reaches of the Coega River, the Port of Ngqura and the immediate shoreline along the Algoa Bay area. The dunes along the coastline and at the lower reaches of the Coega River can be divided into vegetated (fixed) dunes and mobile dunes respectively and rise up to an elevation of 50 to 60 m on the eastern side of the port. These dunes lead to the raised coastal plain as described above, and form a visual barrier, separating the coastline from the elevated inland area of the Coega IDZ and the N2 highway.

The Coega IDZ is underlain by a wide range of sedimentary rocks of the Palaeozoic Table Mountain Group, the Mesozoic Uitenhage Group and the Caenozoic Algoa Group (Almond, 2010). More specific, the geology of the Coega IDZ is characterised by coastal limestone overlain by windblown calcareous sands. Unconsolidated sand, alluvium and fluvial sediments dominate the Coega River floodplain, whilst coastal limestone occurs in the regions landward of the N2 national road (Terreco, 2006; CES, 2008). The extensive cover offered by the surface calcrete and superficial drift within the IDZ results in low levels of bedrock exposure (Almond, 2010).

The soils within the Coega IDZ are classified as deep, red, lime-rich, sandy clay loams (SRK, 2007; CES, 2008). Research indicates that the Coega IDZ is underlain by the Salnova, Alexandria, Kirkwood and Sundays River Formations, which consist of estuarine gravel, sandstone, mudstone and limestone (SRK, 2007; CES, 2008).

According to Almond (2010), the Kirkwood and Sundays Formations underlie the majority of the IDZ at depth; however they largely occur at or near the surface along the Coega River Valley and Brakrivier margins. The limestone-rich estuarine and coastal marine sediments of the Alexandria Formation overlie a large part of the IDZ, with an average thickness ranging from 7 m to 10 m. The Kirkwood Formation mainly consists of reddish-brown mudrocks with some greenish-grey sandstones, whilst the Sundays River Formation mainly consists of grey to greenish-grey mudrocks and some sandstones. The Salnova Formation contains a wide range of sandy and conglomeratic beach deposits, and it also outcrops at different points along the coastline stretching from the Marine Growers abalone farm towards Mellville in the north-east (Almond, 2010).

Research indicates that the Coega fault is a major structural feature in the area. It extends from the Groendal Dam near Uitenhage towards the coast in an easterly direction (CES,

2001, 2008; SRK, 2007), and is part of the main southern fault system which crosses South Africa from east to west (CDC, 2011, *pers. comm*.).

3.3.4 Surface Water and Groundwater

The Coega River covers a catchment area of 550 km^2 and is the most significant surface water body in the Coega IDZ (SRK, 2007; Scherman, 2010). Research indicates that the Coega River is classified as moderately modified within its upper reaches and critically modified in its lower reaches (SRK, 2007). The Coega IDZ is underlain by sand, calcrete, and gravel deposits, which is further underlain by a layer of clays. This limits infiltration in the area, resulting in increased run-off conditions subsequent to rainfall (SRK, 2007; Scherman, 2010).

In terms of groundwater, SRK (2010) indicate that the Coega IDZ is underlain by four separate aquifers, which include a shallow primary alluvial aquifer, an intergranular aquifer system of the Alexandria Formation, an aquiclude which contains mudstones of the Kirkwood Formation (Uitenhage Group), and a deep secondary artesian aquifer of the Table Mountain Group. The aquiclude is understood to generate limited amounts of poor quality water (Maclear, 2004).

Specifically, the artesian aquifer lines the southern portion of the Coega IDZ, and is understood to have formed as a result of the sandstones and quartzites of the Table Mountain Group (SRK, 2007). Furthermore, a series of Cretaceous formations, which extend approximately 1200 m in thickness, generally confine the aquifer itself (Maclear, 2004; SRK, 2007). It is considered as one of the few artesian systems in South Africa, and is therefore regarded as important (SRK, 2007; Scherman, 2010). In the past, this aquifer experienced over-exploitation, which resulted in a reduction of artesian yields. Scherman (2010) refers to the groundwater within this system as excellent, with a requirement for hardening as a result of the corrosive and acidic characteristics of the aquifer.

With regards to shallow groundwater within the Coega IDZ, these levels generally occur within 3 m to 5 m below the surface, which is defined as just as above the interface of the permeable sands and underlying impermeable clays (SRK, 2007). The groundwater flows in the same direction as the surface water drainage, which is towards the southeast of the Coega IDZ. It is understood that groundwater levels do not fluctuate significantly as a result of reduced infiltration of rainfall. However, these levels are expected to rise and fall between 3 m and 4 m during substantial rainfall. Sodium and chloride are predominant in the shallow groundwater within the Coega IDZ, together with the natural occurrence of traces of magnesium, potassium, iron, phosphorous, manganese, and aluminium. These trace metal concentrations are believed to occur as a result of the natural soil-water interactions, as opposed to industrial influence (SRK, 2007).

According to Scherman (2010), monitoring of the surface water and groundwater of the Coega River groundwater and surface water system has taken place since 2000. The CDC initiated such a monitoring programme in order to monitor and determine the baseline soil and water quality conditions prior to the development of the Coega IDZ (Maclear, 2004; Scherman, 2010). Between 2000 and 2001, the baseline monitoring programme consisted of eight groundwater monitoring boreholes, four mini-piezometers, and six surface water monitoring sites (Scherman, 2010). In March 2008, several monitoring sites were established and located in the vicinity of a proposed Manganese Smelter, along the Coega River (Scherman, 2010). Some of the groundwater and surface water monitoring sites were located at the Coega Brick, Post Office, and Swartkoppe Farm (Scherman, 2010). It is understood that groundwater monitoring takes place six times a year at seven borehole sites and the surface water monitoring takes place six times a year at nine surface water points (Scherman, 2010). The groundwater and surface water sites are analysed for several physical parameters (such as pH, turbidity, conductivity, hardness, dissolved oxygen, colour, and total dissolved solids), and typical chemical and organic parameters (Scherman, 2010).

3.3.5 Vegetation

On a regional scale, the study area is located within the Subtropical Thicket Biome, known for its role in separating northern (summer rainfall) and southern (winter rainfall) floral regions. The Terrestrial Ecology Research Unit (TERU) estimates this biome to include in excess of 1558 plant species of which 322 are endemic (Vlok & Euston-Brown, 2002). This biome extends from Mossel Bay in the West to Buffalo City in the East and reaches inland for roughly 100 to 200 km from the coast. On a local scale, two vegetation types are identified in the study area:

Coastal and inland vegetation type: Vegetation along the coastal band includes Algoa Dune Thicket and Colchester Strandveld, while inland vegetation consists of Grassy Ridge Bontveld, Sunday Valley Thicket, Motherwell Karroid Thicket and Sundays Doringveld Thicket. Of these vegetation types Colchester Strandveld and Motherwell Karroid Thicket are classified as endangered while all the other mentioned vegetation types are classified as vulnerable. Inland vegetation in an undisturbed state tends to form dense thickets in low-lying areas and valleys, while flat and ridged areas are characterised by grassland, fynbos and/or Karroid species interspersed with clumps of thicket species (Eyethu Engineers, 2006). Grassridge Bontveld is a vegetation type that is found on plateaus of the Coega IDZ, and it is understood to contain a high conservation status (SRK, 2007).

Dune vegetation type: Dune vegetation can be classed into three units common to the Eastern Cape coast, namely; Foredunes and Hummocks, Dune Woodlands and Dune Grasslands. Dune vegetation tends to be highly invaded by Rooikrans (*Acacia cyclops*) with some pockets of indigenous vegetation remaining (Eyethu Engineers, 2006). The

CDC is bound by the Record of Decision that was granted to them to remove all alien vegetation from the dunes to allow for the indigenous vegetation to regenerate.

3.3.6 Fauna

Birds - The coastal birds and seabirds of Algoa Bay rely on the scattered special habitats provided by estuaries and river mouths, rocky shores, dunefields, reefs and the offshore islands. These varied habitats contribute to the diverse range of avifauna in the Coega IDZ, in which over 150 species are common (SRK, 2007). The Algoa Bay Island Nature Reserve consists of the Bird and St Croix (St Croix, Jahleel, Seal and Brenton Island) Island groups, each of which has been declared an Important Bird Area as they are inhabited by threatened and endangered species (Barnes, 1998). The islands support globally significant populations of Cape gannets (*Morus capensis*), African Penguins (*Spheniscus demersus*) and Roseate Terns (*Sterna dougallii*). The largest gannet colony in the world is at Bird Island, the largest African Penguin colony in southern Africa is at St Croix, and the only confirmed sites where Roseate Terns breed in South Africa are at Bird and St Croix Islands, with a further possible breeding site being Jahleel Island. Damara Terns have been observed within the dune area in the IDZ since 1995 and a maximum of five breeding pairs are currently in the dunes (CDC, 2011, *pers. comm*.). In addition, Flamingos, chestnutbanded plovers and Caspian terns breed on the salt pans (CDC, 2011, *pers. comm*.).

Reptiles - The reptile fauna of the Coega area is particularly diverse, with 56 species of lizards, chameleons, snakes, tortoises and sea turtles represented. Most of these species occur in the Succulent Thicket and riverine habitats, whilst fewer species are noted in the coastal dunes and estuarine habitats (SRK, 2007). Of these 56 species, 22 species are either Red Data taxa, listed under the Convention on the Illegal Trade in Endangered Species (CITES), or are endemic to the area or peripheral to the usual range of the species (CES, 2001). These include eight lizards, two monitors, one gecko, one chameleon, three snakes, three tortoises and the four globally endangered sea turtle species. The species with the most restricted range is the Albany dwarf adder (*Bitis albanica*) (Branch, 1999).

Invertebrates - Information on the invertebrate fauna, apart from butterflies, is scarce. One endemic grasshopper and three butterflies of interest have been recorded from the Coega area. The grasshopper, *Acrotylos hirtus*, is endemic to the dunefields of Algoa Bay. Three Lycaenid butterflies (coppers and blues) have been identified as rare or have very restricted distributions in the Coega area. These are *Aloeides clarki* and *Peocilimitis pyroeis* (small coppers) and *Lepidochrysops bacchus* (a small blue).

Amphibians - Amphibians are an important and often neglected component of terrestrial vertebrate faunas. They are well represented in sub-Saharan Africa, from which approximately 600 species have been recorded (Frost, 1985). Currently amphibians are

of increasing scientific concern as global reports of declining amphibian populations continue to appear (Phillips, 1994). Although there is no consensus on a single cause for this phenomenon there is general agreement that the declines in many areas even in pristine protected parks are significant and do not represent simple cyclic events. Frogs have been aptly called bio-indicator species, whose abundance and diversity is a poignant reflection of the general health and well-being of aquatic ecosystems. They are important components of wetland systems, particularly ephemeral systems from which fish are either excluded or of minor importance. In these habitats, they are dominant predators of invertebrates, many of which may impact significantly on humans (e.g. as vectors of disease).

Research indicates that the Eastern Cape contains a rich amphibian population, which is estimated at almost a third of the known species in South Africa (CES, 2001). However, the amphibian population in the Coega area is not well known, and is limited to the specimens kept in museums (CES, 2001). Previous studies estimate a total of 17 amphibian species recorded in the Coega IDZ (CES, 2001; SRK, 2006). However, four species, namely the Natal puddle frog, the bullfrog, the yellow striped reed frog, and the bubbling kassina, are listed as peripheral, with none of them being threatened internationally (SRK, 2006).

Terrestrial mammals - Only two mammal species are endemic to the wider Coega area: Duthie's golden mole (*Chlorotalpa duthiae*) and the pygmy hairy-footed gerbil (*Gerbillurus paeba exilis*), which occur in dune thicket (CES, 2001). Both of these species are protected in terms of the conditions attached to the Rezoning EIA and the Port of Ngqura EIA. The remaining 13 Red Data listed mammal species are widespread species not restricted to the Coega area. Despite the emphasis placed on large mammals in the conservation literature they make up less than 15 percent of the total mammal diversity in South Africa. The majority of mammals are small or medium-sized, with rodents being the most successful of all living mammals. Swanepoel (1988) noted that of 292 terrestrial mammal species in southern Africa, 128 (44%) were recorded from the Eastern Cape. Although these figures are now out of date they do demonstrate the mammalian diversity of the Province. Few of the large and medium-sized mammal fauna that previously occurred in the region now occur naturally in the wild. Most are locally extinct or occur in small, fragmented populations usually in forest reserves or in protected areas. Species that have been extirpated within historical times in the Eastern Cape include the cheetah, hunting dog, hippopotamus, lion, red hartebeest and warthog. Most have been extensively re-introduced into provincial and private game reserves, whilst the latter has escaped from many reserves and threatens to become a problem animal in some areas. Among the medium- to large-sized mammals, buffalo are restricted to reserves, whilst reedbuck, brown hyena, spotted hyena, leopard and serval are extremely rare in the wild.

3.3.7 Marine Environment: Port of Ngqura

Algoa Bay is the largest of a series of eastward-facing bays along the South Coast of South Africa. The Bird Island group of islands demarcates the eastern boundary of Algoa Bay, with Jahleel, St Croix and Brenton islands situated in the shallower central area. The mouth of the bay ranges between 60 and 70 km in width, whilst the depth is generally less than 70 m.

Construction of the Port of Ngqura commenced in 2003 (TNPA, 2010). The Port of Ngqura is the third deepwater port in South Africa, together with Saldanha Bay and Richards Bay along the West and East Coasts respectively (NPA, 2011).

The inner harbour consists of 1.8 km of concrete quay walls and a section of undeveloped sandy coastline stretching 500 m (Dicken, 2010). Phase 1 of the port construction consists of five berths (two container berths, one liquid bulk berth, and two multi-purpose or break-bulk berths) (TNPA, 2010). It is anticipated that Berth B100, will be initially utilized as the liquid bulk berth for the proposed project, with a possible relocation to the planned A-series berths once it has been constructed. As highlighted in the previous chapters, the construction of the A-series berths will form part of a separate EIA; however the impacts associated with the potential relocation to the A-berths will be assessed as part of this EIA. The water depth of Berth B100 is approximately 18 m, whilst the berth itself is 300 m long and contains a pier that is 100 m wide (TNPA, 2010).

The entrance channel of the Port of Ngqura is approximately 18 m deep (NPA, 2011) and 420 m wide (Dicken, 2010). The main outer breakwater at the Port of Ngqura covers a length of approximately 2.75 km, which is classed as the longest in South Africa (Tulsi and Phelp, 2009). The secondary breakwater covers a length of approximately 1.3 km (NPA, 2011). Both breakwaters were constructed with rubble mound and are lined with concrete dolosse for protection (Dicken, 2010). The main outer breakwater consists of approximately 21 000 dolosse, which each weigh 30 tons (Tulsi and Phelp, 2009).

A sand by-pass scheme has been established to curb the effects of the protruding port on the littoral drift along the coastline (Prestedge, Retief, Dresner, Wijnberg Consulting Port and Coastal Engineers, (PRDW), 2011). The sand by-pass scheme was designed and implemented to control beach accretion along the updrift side of the Port of Ngqura, to prevent sedimentation in the harbour entrance, to prevent erosion along the downdrift side of the port, and to encourage continuous sediment transport along the coast (PRDW, 2011). Sand that collects along the updrift section of the port is re-distributed on the downdrift side, approximately 3.4 km from the sand trap itself (PRDW, 2011).

In terms of salinity, the ephemeral nature of the Coega River, as well as its dependency on rainfall events, causes the Port of Ngqura to be principally marine (Dicken, 2010).

3.3.8 Physical Oceanography of Algoa Bay

The Agulhas Current, flowing south-westward with its core offshore of the continental shelf edge, forms the major open ocean influence (Schumann, 1998). Speeds in excess of 2 m/s are common, and the structure extends well below 2000 m depth. The continental shelf width increases with distance south-westwards and concurrently the Agulhas Current also moves farther offshore.

The volume of sediment transported northward and eastward by longshore drift around Algoa Bay past the Coega River mouth is estimated at 150 000 – 200 000 m^3/yr (Illenberger, 1997 in CSIR, 2007). In a previous study relating to the proposed extension of the container berth at the Port of Ngqura, currents were measured by deploying an S4 instrument near the head of the breakwater in a water depth of 17.5 m (CSIR, 2007). It was established that these measured currents were predominantly wind-driven, as they responded rapidly to wind conditions (CSIR, 2007).

The Port of Ngqura obstructs the alongshore flow somewhat and results in a zone to the NE of the eastern breakwater that is at times quiescent or a zone of persistent re-circulation. A similar quiescent or recirculation zone exists to the SW of the Port of Ngqura (CSIR, 2007).

3.3.9 Marine Sediments

The palaeo-valley of the Coega River is filled with discontinuous gravel, sand, silt, and clay layers (CES, 2001). Fine-grained sand (0.125 to 0.250 mm) is dispersed throughout the bay in shallow water. In general, coarse-grained sediments predominate in the deep water (Bremner, 1991).

3.3.10 Marine Biota

Ecological communities in the Port of Ngqura

Klages *et al.* (2006) indicate that sediment macrofauna in the Port of Ngqura was relatively impoverished in 2006. These macrofauna were apparently not taxonomically distinct from the biological community in sediments adjacent to the port. Photographic transect surveys across the full intertidal zone of the harbour structures in March 2006 indicated that they supported brown mussel *Perna perna* and rock oyster *Striostrea margaritacea,* as well as attached epiphytic and filamentous algae, barnacles (*Tetraclita, Chthamalus*) (Klages *et al.,* 2006). These species can be considered as being typical of the region. In cursory observations made in July 2006, the mussels ranged up to 50 mm to 60 mm indicating ages between 12 and 18 months (Dye and Dyantyi, 2002 in CSIR,

2007). It appears that, as a minimum, the development of biofouling communities can be rapid in this particular location (CSIR, 2007).

Subtidal zone

The subtidal sea floor adjacent to the Port of Ngqura is dominated by low relief emergent rock reefs interspersed by various grades of sands (CSIR, 2007). Mud, silt and clay sediments generally do not occur in this area, probably due to high shear stresses at the seafloor associated with waves. Although not well known, the available research/observation literature indicates that the major primary producers are phytoplankton and a fine macroalgal turf growing on the shallower emergent reef surfaces. The Coega River is considered an important contributor of nutrients to the shallow subtidal zone as elevated phytoplankton biomasses have been recorded adjacent to the river mouth. The sand areas support a benthic macrofauna distribution expected for a nearshore depth gradient, i.e. suspension feeders dominate the shallow areas, predators and scavengers are most common at intermediate depths and deposit feeders dominate in the deeper areas. Biomass fluctuates with lowest levels in the nearshore and highest levels at the deeper locations. The benthic macrofauna include all of the major groups expected to be found in RSA inner continental shelf unconsolidated sediments. Crustaceans and polychaetes comprise the numerical dominants followed by molluscs and echinoderms. Subsidiary taxa such as sipunculids have also been recorded in the area (CSIR, 2007).

Surfzone communities

A distinctive feature of the surfzone along the eastern sector of Algoa Bay is the regular occurrence of visible accumulations of the diatom *Anaulus australis*. *Anaulus* accumulations occur near Coega, although not in the extreme concentrations of millions of cells per millilitre found farther east (du Preez, 1996). *Anaulus* accounts for over 95% of the plant production (Campbell & Bate, 1988), and is the basic food source on which the rest of the food web in the surfzone and adjacent beach is based. The macrofauna consists of a large number of animals, although the number of species is relatively low. The food web is centred in the surfzone and comprises the benthic community living in the sand and a pelagic community present in the water column. Generally, molluscs dominate the finer-grained beach sands of Algoa Bay, with biomass largely attributed to sand mussels and plough snails. Benthic organisms include the filter feeding sand mussels *Donax serra* and *D. sordidus*, scavenging snails of the genus *Bullia* and the three-spotted swimming crab *Ovalipes trimaculatus. Donax* sandmussels are key organisms in the foodweb and are preyed on by a variety of organisms, including Kelp Gull (*Larus dominicanus*), African Black Oystercatcher (*Haematopus moquini*), Sanderling (*Calidris alba*), crabs, sandsharks, rays, bony fish and humans (Wooldridge *et al.,* 1997).

Pelagic communities

Pelagic communities comprise the plants and animals inhabiting the open water column. Close to 130 species of diatoms, dinoflagellates and silicoflagellates were recorded in the Algoa Bay area (Klages & Bornman, 2005a).

Benthos

Benthic communities live on or burrow into the soft sediments of the seafloor. The Ngqura Port marine biomonitoring programme (Newman, 2001, Klages & Bornman, 2003, 2005a, 2005b; Klages *et al.*, 2006) results showed a remarkable diversity, topping 156 in the number of species. Approximately 35 % of the species were rare. Most (48 %) were arthropods (mainly crustaceans of the orders Amphipoda and Isopoda), although errant polychaete annelids were also well represented (27 %), as were ophiuroid echinoderms (6.5 %). The remaining species included cnidarians, platyhelminths, nematodes, nemerteans, sipunculids, sedentary polychaetes, molluscs, other echinoderms and protochordates. The number of individuals per unit area sampled was high. For instance, amphipods and polychaetes reached 2830 in January 2003 and 7040 individuals in September 2004, respectively, per m^2 of seafloor. Results of the biomonitoring programme provided a strong signal that the benthic infauna was impacted in terms of species richness and community structure by port development. Observed changes in infaunal community structure were consistent with an environment that in 2004 had experienced high turbidity and the release of dredging fines from the dredge spoil dump site near Brenton Island.

Fish

A study was carried out by a team of scientific anglers (Dicken, 2010; 2011) to investigate the fish populations in the Port of Ngqura over a 12 month period. Within this period, an excess of 4500 fish specimens representing 47 species were caught and released (Dicken, 2011). These species included the Cape stumpnose, pufferfish, kob, elf and garrick, as well as subtropical kingfish (Dicken, 2011), and queen mackerel (*Scomberomorus plurilineatus)* which were never previously recorded from any recreational shore or boat-based fisheries in the Eastern Cape (Dicken, 2010).

According to Dicken (2010), the Port of Ngqura offers a hard substrata habitat, which contrasts the soft sediment habitat associated with the adjoining sandy beaches. Based on this contrast, the Port of Ngqura has the potential of altering the abundance, distribution and diversity of fish species in the marine environment. Owing to the various infrastructure within the port, three distinct habitats were identified during this study such as the Dolosse, Quay Wall, and the Sandy Shore. The Dolosse provided a habitat within which the highest number species were recorded in comparison to the Quay Wall and Sandy Shore (Dicken, 2010).

The study also highlighted the unexpected abundance and diversity of shark species in the Port itself (Dicken, 2011). These species included bronze whalers, hammerheads, various cat sharks, dusky sharks (*Carcharhinus obscures)* and gully sharks. The dusky and gully sharks were determined to be the most common species as a result of the sheltered environment the port creates, as well as the abundance of fish prey. The study concluded that the Port of Ngqura is considered as a productive environment, which provides a nursery for some species of fish owing to the sheltered environment created by the breakwaters (Dicken, 2011).

Birds and marine mammals

All South African coastal seabirds are protected under the Seabirds and Seals Protection Act (46 of 1973), and the Islands of the Cross are classed as Important Bird Areas (Barnes, 1998). About 28 of the 104 seabird species recorded off South Africa occur frequently in the north-western sector of Algoa Bay. The rest are vagrant or rare. Four of the 15 South African resident seabird species, as well as two herons, breed on the Islands of the Cross while for several more they are important roost sites (Klages & Whittington, 2006).

Most seabirds in the area feed in the top metres of the water column, and largely on epipelagic fish. Anchovy *Engraulis japonicus* and Sardine *Sardinops sagax* are the most important prey species, Horse Mackerel *Trachurus trachurus*, Saury *Scomberesox saurus* and Redeye.

Roundherring *Etrumeus whiteheadi* play a lesser role. Many migrants readily take offal provided by fishing boats. Zooplankton and micronekton are important prey constituents for the smaller species, such as prions, storm petrels and terns (Smale *et al.,* 1994). The African Penguin and the Roseate Tern are arguably of the highest conservation concern. The African Penguin is classified as Vulnerable to Extinction because its population decreased in a dramatic and sustained fashion during the 20th century and continues to do so after the turn of the millennium (Underhill *et al.,* 2006). As a non-volant visual hunter the African Penguin is particularly vulnerable to increases in water turbidity from construction activities. Roseate Tern numbers have been depressed by sealers and guano scrapers for a very long time and the species appear to battle to recover from this severe impact (Tree & Klages, 2003). The breeding population is just 250 pairs, making it South Africa's second rarest breeding seabird after Leach's Storm Petrel.

The marine mammal fauna of South Africa comprises in excess of 30 whale, dolphin and seal species. Nine species (4 whales, 4 dolphins, 1 seal) are relatively common in the area, albeit some only seasonally (CSIR, 2001). The two largest cetaceans are present in winter and spring only, when Southern Right Whales give birth and nurse their young in shallow waters, and when Humpback Whales migrate through to their more tropical nursery areas. Humpback Dolphins (nationally a Critically Endangered species) and Bottlenose Dolphins use the surfzone extensively as a feeding ground. Common and Risso's Dolphins are usually encountered somewhat further offshore. The Cape Fur Seal has a wide at-sea distribution (Smale *et al*., 1994).

Two broad foraging guilds are recognisable in the assemblage, based on where marine mammals pursue their prey: inshore and reefs, or epipelagic. As is the case with seabirds, Anchovy and Sardine are the most important prey species for the open-water species of cetaceans, whereas a wide variety of perciform reef fish (such as *Sparidae*, *Lutjanidae*, *Mugilidae*) form the common prey of the inshore feeders.

3.4 Heritage Resources

A heritage study covering the entire IDZ (excluding Zone 8) was commissioned by the CDC in 2009 and 2010. This heritage study was compiled by Dr. John Almond and Dr. Johann Binneman who provided the paleontological input and archaeological component, respectively. Ms. Jenny Bennie provided the Built Environment section of the heritage study for the Coega IDZ. This heritage study is intended to provide a basis for project-specific EIAs in the IDZ and to provide heritage information that can be included proactively in the early planning for the location and implementation of projects in the IDZ. A summary of the draft results of the studies is provided below.

The area contained in the Coega IDZ has variable significance in terms of heritage resources, with evidence of Stone and Iron Age sites. The broader Eastern Cape region has historic significance due to its frontier location acting as an interface between hunter-gatherers, pastoralists and European settlers, thus it is expected that the proposed project within Zone 8 of the IDZ contained some degree of historical/cultural activity in the past. Further to this, it is understood that Zone 8 of the IDZ contains a grave yard, which may pose as significant heritage sites.

With regards to palaeontology, the Coega IDZ is underlain by sedimentary rocks that range in age from c. 470 million years ago to present and are assigned to ten rock successions within the Palaeozoic Table Mountain Group, the Mesozoic Uitenhage Group and the Caenozoic Algoa Group. Most of these rock units contain fossil heritage of some sort but in most cases this is very limited. The notable exceptions are three marine successions, i.e. the Sundays River Formation, the Alexandria Formation, and coastal Salnova Formation. Important but rare fossils of dinosaurs and plants are also known from the Early Cretaceous Kirkwood Formation, but so far only outside the IDZ area. Levels of bedrock exposure within the Coega IDZ are generally very low due to extensive cover by superficial drift (e.g. soil, alluvium, in situ weathering products) as well as by surface calcrete (pedogenic limestone) and dense vegetation. Man-made excavations such as road and railway cuttings, stormwater drainage channels, reservoirs and quarries, of which there are a considerable number, often provide the best opportunities to examine and sample fresh, potentially fossiliferous bedrock.

The archaeological component (Binneman, 2010) of the IDZ heritage study reports that archaeological sites and materials have been recorded throughout the Coega IDZ. Shell middens, Later and Middle Stone Age stone tools have been found along the coast and adjacent sand dunes. Occasional Earlier, Middle and Later Stone Age stone tools were found in all of the inland zones. In general these stone tools were in secondary context and not associated with any other remains. Although the stone tools appear to be of low cultural sensitivity, other archaeological sites/materials may be exposed when the vegetation and topsoil are removed (for example human remains). Binneman (2010) notes that although the IDZ area was occupied extensively in the past (judging from the large quantity of flaked stone randomly scattered throughout the area), it would appear

that the area is relatively poor in large and important archaeological sites. However, many sites/materials and human remains may be covered by soil and vegetation.

A heritage impact assessment will be carried out for the proposed project as described in Chapter 6 of this report.

3.5 Socio-Economic

3.5.1 Demographics and human development

NMBM is situated in the Eastern Cape Province, the second largest province in South Africa, covering approximately 169 580 square kilometres, or 13.9% of South Africa's total land area. With more than six million people, the Eastern Cape has the third largest provincial population. According to the Stats SA Census (2001), the statistics reflect a large black population, with low incomes and high levels of unemployment.

According to the NMBM Integrated Development Plan (IDP) (2008), Nelson Mandela Bay has a population of about 1.1 million people, and covers an area of 1 950 square kilometres. Port Elizabeth is South Africa's second oldest city and is also the commercial capital of the Eastern Cape. Uitenhage and Despatch also form a part of the NMBM. Altogether, 52 percent of the NMBM population are female and 37 percent are below the age of 20, highlighting the importance of education, job creation and youth programmes. Decades of distorted development in the city have manifested in highly skewed distribution of income and wealth. The unemployment rate among the economically active sector of the community is approximately 28 percent (NMBM IDP, 2008). Although the unemployment rate in Nelson Mandela Bay has shown a steady decline since 1994, it remains higher than the national average for South Africa. The NMBM continues to provide relief to impoverished households through its Assistance to the Poor Scheme, increasing its monthly contribution for water and electricity from 6 kl to 8 kl and from 50 kWh to 75 kWh respectively in 2007 (NMBM IDP, 2008). Approximately 93 111 households receive free basic water, sanitation and refuse removal services, while 94 823 households receive free electricity every month. Job creation is a priority, given the need to increase the prosperity of the community and ensure a more equitable distribution of wealth among residents. Consequently the Municipality has invited all local stakeholders and social partners to make a contribution to the economic growth and development of the area.

Nelson Mandela Bay is the economic powerhouse of the Eastern Cape Province, and has experienced a 20 percent increase in Gross Geographic Product (GGP) over the last five years (NMBM IDP, 2008). It is the hub of automotive manufacturing in South Africa, which accounts for 50 percent of local manufacturing. The motivation behind the Coega IDZ development, regarded as a keystone development in the Eastern Cape, came from the National Governments Growth, Employment and Redistribution (GEAR) strategy. It is the

largest single infrastructure development project undertaken in South Africa since 1994. When fully functional, the port is expected to become a significant catalyst to the economic growth of Nelson Mandela Bay and the region. Current and future investments are expected to create more jobs and stimulate the economy. The economy of the Eastern Cape has grown faster than the national economy over the past few years.

According to the Eastern Cape Development Corporation (ECDC), the manufacturing sector increased by 21 percent in real terms from 1998 to 2001, compared to 9 percent for South Africa as a whole. The Eastern Cape Province manufacturing sector is well integrated into the world economy. Nearly half of the 120 large enterprises are part of international corporations, and over 50 percent of the large enterprises are exporting more than 25 percent of their output (CDC, 2004).

It is clear from the discussion above that unemployment in the Eastern Cape Province is high and it is therefore highly likely that this would be one of the main issues that would be raised during public participation. In addition, considering that the IDZ is earmarked to increase the manufacturing sector and is one of the main contributors to the GGP, the proposed project is relevant in the context of supporting much needed growth in the manufacturing sector thereby increasing employment opportunities.

3.5.2 Initiatives to promote economic development

In order to reverse the above trends and stimulate and support socio-economic development, a number of initiatives are currently underway in the NMBM and surrounding areas. Key amongst these are the establishment of the Coega IDZ and the development of the Port of Ngqura, support services for the development of small-medium and micro-enterprises (SMMEs), and corporate social investment programmes. In addition, the expansion of the Addo Elephant National Park and the growth of the ecotourism sector in the Eastern Cape are being promoted for conservation value as well as for the contribution that tourism and conservation initiatives can make to employment creation.

3.6 Coega Open Space Management Plan

An open space management plan (OSMP) has been developed for the Coega IDZ, and formally approved by the national Department of Environmental Affairs (DEA) as part of the conditions of environmental authorisation granted for the IDZ. The OSMP incorporates areas of highest ecological value within the IDZ (e.g. areas of Mesic Succulent Thicket and Bontveld vegetation). This plan has been updated several times over the past 8 years, and the current version is Revision 10 as shown in Figure 3.2 (Page 3-19).

The intention of creating open spaces within the IDZ is to protect cultural and ecologically sensitive areas while stimulating passive and active recreation in the IDZ. Accordingly, the objective of the OSMP is to create an effective management system for open spaces in the IDZ and to provide specific management guidelines, based on sound ecological principles, for the management of ecological and cultural resources present within the IDZ.

The key implication of the OSMP is the routing of the pipelines and the siting of the tank farm. These should not be located in any of the identified open spaces. It is practical however, to locate these structures just outside the OSMP, which will ensure optimal use of land, while also ensuring the protection of cultural and ecologically sensitive areas. Furthermore, due to the fact that the pipelines will be constructed on concrete sleepers above-ground, it will facilitate the unhindered movement of small fauna and limit environmental disturbance by avoiding large-scale clearing, excavating and trenching associated with underground pipelines.

Figure 3.2: Coega Open Space Management Plan