# chapter 3
# affected environment

FINAL SCOPING REPORT

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# 3. AFFECTED ENVIRONMENT

This chapter provides an overview of the environment of the Port of Ngqura and the Coega IDZ in which the PhytoAmandla Biofuel Processing Plant 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.

## 3.1 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 city of Port Elizabeth in the Eastern Cape Province. The IDZ falls within the boundaries of the Nelson Mandela Bay Municipality (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 PhytoAmandla Biofuel Processing Plant is situated within Zone 5 of the Coega IDZ, which has a preferred land use for Base Metallurgy (see Figure 3-1). The development footprint for the proposed processing plant and associated infrastructure are all located within the property boundary of the IDZ with the pipelines spanning into the designated Port of Ngqura (Zone 8) where the proposed OTGC tank farm will be located.


**Figure 3-1 Demarcated zones within the Coega IDZ**

## 3.2 BIOPHYSICAL ENVIRONMENT

### 3.2.1 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)[1]. Rainfall occurs as a result of convective summer rain and due to the passage of frontal troughs during winter (SRK, 2007)[2]. 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.

### 3.2.2 Air Quality

The ambient air quality in the Coega area is categorised as relatively good (CES, 2000[3]; SRK, 2007; Zunckel *et al*., 2010[4]). 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.

[1] Coetzee, P.S., Kerley, G.I.H., Campbell, E.E., de Ruyck, A., Wooldridge, T., Boshoff, A. and Bate, G. (1996). Zinc smelter environmental impact assessment: Flora and fauna baseline study for the Coega precinct. SAB Institute for Coastal Research, Port Elizabeth.

[2] SRK Consulting Engineers and Scientists (2007). Final Environmental Impact Assessment and Draft Environmental Management Programme: Proposed Chlor-Alkali Plant within the Coega Industrial Development Zone. Report prepared for Strait Chemicals (Pty) Ltd, Port Elizabeth.

[3] Coastal & Environmental Services (CES), (2000). Coega Rezoning EIA: Environmental Impact Assessment for the Rezoning of the Core Development Area from Agriculture to Special Purposes, Environmental Impact Report. Report prepared by Coastal & Environmental Services, Grahamstown for the Coega Development Corporation, Port Elizabeth. January 2000.

[4] Zunckel, M., Raghunandan, A. and Pillay B. (2010). Kalagadi Manganese Smelter in the Coega Industrial Development Zone: Air Quality Impact Assessment, uMoya-NILU, Durban. Report prepared for CES, Grahamstown.

Other industries such as cable manufacturing and motor assemblies have a relatively small impact on air quality. Naturally sparsely vegetated and denuded areas are common in the Coega area as well as denuded areas associated with the construction in the IDZ. The moderate to strong winds that occur with a high frequency easily entrain sand and dust from these areas. As a result, windblown dust, particularly in winter, will impact on air quality in the area. Due to the efficient atmospheric dispersion potential along the coast and the absence of major air pollution sources the air quality in the Coega IDZ is relatively good and generally complies with ambient air quality standards. Exceedances of the ambient $PM_{10}$ standard have been recorded.

The Coega IDZ is situated on the Cape south coast where a high frequency of strong westerly to southwesterly winds occurs (more than 50% of all winds). These are also the strongest winds. The annual average wind speed at the airport is 5.9 m/s. As a result dispersion of air pollutants is generally efficient and towards the east under prevailing westerly winds. At times however dispersion can be poor when the atmospheric conditions are stable and wind speeds are low. These conditions are most likely to occur at night and in the winter.

### 3.2.3 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 and 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)[5]. 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[6]; CES, 2008[7]). The extensive cover offered by the surface calcrete and superficial drift within the IDZ results in low levels of bedrock exposure (Almond, 2010).

[5] Almond, J. E. (2010). Palaeontological heritage assessment of the Coega IDZ, Eastern Cape Province, Natura Viva cc, Cape Town.

[6] Terreco (2006). Coega Eskom Electrical Infrastructure Integration EIA Geological/Geotechnical Assessment. Report prepared for Eyethu Engineers, Pietermaritzburg.

[7] Coastal & Environmental Services (CES), (2008). Kalagadi Manganese Smelter in the Coega Industrial Development Zone: Scoping Report. Report prepared by Coastal & Environmental Services, Grahamstown for Kalagadi Manganese, Rivonia, South Africa. November 2008.

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[8], 2008; SRK, 2007), and is part of the main southern fault system which crosses South Africa from east to west (CDC, 2011, *pers. comm.*).

### 3.2.4 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[9]). 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)[10].

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.

[8] Coastal & Environmental Services (CES), (2001). The Subsequent Environmental Impact Report for the Proposed Port of Ngura. Report prepared by Coastal & Environmental Services, Grahamstown for the Coega Development Corporation, Port Elizabeth. September 2001.

[9] Scherman, P. (2010). Proposed Kalagadi Manganese Smelter in the Coega Industrial Development Zone: Hydrological and Surface Water Assessment, Scherman Colloty and Associates, Grahamstown. Report prepared for CES, Grahamstown.

[10] Maclear, L. G. A. (2004). Coega Water Quality Monitoring Trend Analysis of Fluoride Concentrations in Surface Water and Groundwater: 2000-2003. Proceedings of the 2004 Water Institute of Southern Africa (WISA) Biennial Conference, Cape Town, South Africa.

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).

### 3.2.5 Vegetation

The vegetation found in the area falls within the Thicket Biome (Low and Rebelo, 1996[11]; Mucina and Rutherford, 2006[12]) or Valley Bushveld (Acocks, 1988)[13].

***a) Thicket Biome***

Thicket (also known as Valley Bushveld) is a dense, often to the degree of being impenetrable, bushland. It consists of a mixture of spinescent shrubs, low trees, vines and succulents. Structurally it is dominated by evergreen and semi-evergreen sclerophyllous shrubs and succulents, and has a low to mid-high (2-8 m) closed or near-closed canopy (Everard 1985[14], 1987[15], 1991[16]). Arid forms generally have a sparse field layer of consisting of succulents, dwarf shrubs and geophytes, while the more mesic forms usually have an herbaceous field layer of forbs and grasses. Floristically, Thicket is relatively

[11] Low, B., Rebelo, A.G. 1996. Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs and Tourism, Pretoria,

[12] Mucina, L. and Rutherford, M.C. (eds.) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

[13] Acocks, J.P.H. 1988. Veld types of South Africa. Memoirs of the Botanical Survey of South Africa No. 57, Botanical Research Institute, Pretoria,

[14] Everard, D.A. 1985. The Conservation Status of Some Unique Plant Communities in the Eastern Cape. MSc, Rhodes, Grahamstown.

[15] Everard, D.A. 1987. A classification of the subtropical transitional thicket in the eastern Cape, based on syntaxonomic and structural attributes. South African Journal of Botany 53, 329-340.

[16] Everard, D.A. 1991. Is Subtropical Thicket The "Missing Biome" of South Africa. In: Zacharias PJK, Stuart-Hill GC, Midgley J (eds) Proceedings of the First Valley Bushveld/Subtropical Thicket symposium. Grassland Society of Southern Africa, Howick.

rich in species and has a high α-diversity (same species occur in the same plot) but is low in β-diversity (same species occur from plot to plot). It is transitional in terms of phytochorological components and includes species with Tongaland-Pondoland, Afromontane, Karoo-Namib and occasionally Cape affinity (White 1983[17]; Everard 1987, 1991; Low and Rebelo 1996).

Thicket occurs at altitudes between 30 m and 800 m. Altitudinal variation correlates closely with rainfall totals. The dissected topography of the Eastern Cape (epicentre of the Thicket Biome) provides a variety of microenvironments through alternation of slope steepness and, in particular, aspect. Water is the most critical factor. Steep rainfall gradients with local rain shadow effects, especially in the inland valleys, are typical of Thicket landscapes. Temperature exerts less of an effect. Frost is significant inland and in hollows.

The Eastern Cape is characterised by an unreliable, relatively low annual rainfall. The dry climate and high temperatures are ecologically more suited to deep-rooted shrubs and xerophytes (succulent plants or plants with small leaves) (Aucamp and Tainton 1984)[18]. Thickets are evergreen, and this often misleads observers into thinking that there is sufficient water to maintain the vegetation in a lush state. Extensive livestock production constitutes the main farming enterprise in Thicket. Conditions are generally too arid for cultivated pastures and only the most hardy of grasses will survive. The trees and shrubs present in Thicket constitute an extremely important source of browse and the development of this component of the vegetation is likely to be important should the post-closure landuse be livestock (Aucamp and Tainton 1984).

Acocks (1988) coined the term *Valley Bushveld* for what we now call *Thicket*, as it predominantly occurred in the hot river valleys. He recognised differences in the vegetation and grouped Valley Bushveld into five types of which Sundays River Scrub occurs on the study site. This type generally has lower succulence and is a tall thicket. The two orders proposed by Cowling (1984)[19] were based on ecological and taxonomic evidence: Succulent Thicket and Kaffrarian Thicket. These were split into four types by Everard (1987): Mesic Succulent Thicket (MST), Mesic Kaffrarian Thicket (MKT), Xeric Succulent Thicket (XST) and Xeric Kaffrarian Thicket (XKT). The Thicket on the study site is **Mesic Succulent Thicket** according to this classification (Everard 1987). Vlok and Euston-Brown (2002)[20] more recently classified Thicket in more detail. Their first differentiation has been Dune Thicket and Mainland Thicket. Mainland Thicket (which occurs on the study site) is separated into ten different Thicket types of which **Sundays Thicket** occurs on the study site. Sundays Thicket is characterised by *Aloe africana* and *Euphorbia ledienii*. Sundays Thicket consists of three different types: Plateau Thicket, Valley Thicket and Arid Thicket of which Sundays Valley Thicket occurs at the study site. Valley Thickets may be divided into Solid Thickets and Mosaic Thicket. Both of these occur at the study site.

Vegetation of the valleys between the flat-topped ridges contains Solid Thicket that is characterised by the two indicator species for Sundays Thicket: *Aloe africana* and *Euphorbia ledienii*. In this solid thicket there is also an abundance of *Azima tetracantha*, *Capparis sepiaria*, *Cotyledon velutina*, *Crassula cordata*, *Crassula ovata*, *Ehretia rigida*, *Euclea undulata*, *Gymnosporia polyacantha*, *Maerua cafra*, *Plectranthus madagascariensis*, *Putterlickia pyracantha*, *Rhoicissus tridentata*, *Rhus longispina*, *Rhus pterota*, *Sansevieria aethiopica*, *Sansevieria hyacinthoides*, *Sarcostemma viminale* and *Schotia afra* (Vlok and Euston-Brown 2002). These species are all found in abundance at the study site. Typical species (indicators) that are present but not abundant are *Crassula perfoliata*, *Crassula rogersii* and *Kalanchoe rotundifolia*.

[17] White 1983. The Vegetation of Africa. A descriptive memoir to accompany the Unesco/AETFAT/UNSO vegetation map of Africa. UNESCO.

[18] Aucamp, A.J., Tainton, N.M. 1984. Veld management in the valley bushveld of the Eastern Cape. Government Printer, Pretoria.

[19] Cowling, R.M. 1984. A syntaxonomic and synecological study in the Humansdorp region of the Fynbos Biome. Bothalia 15, 175-227.

[20] Vlok, J.H., Euston-Brown, D. 2002. Subtropical Thicket Ecosystem Planning (STEP) project: biological survey report (Plants and Birds). Terrestrial Ecology Research Unit, Port Elizabeth.

The pipeline will traverse Thicket that is either in good condition or infested with exotics or degraded, eroded and with low levels of cover.

### 3.2.6 Fauna

#### *a) 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)[21]. 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.*).

#### *b) 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)[22].

#### *c) 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).

#### *d) 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)[23]. Currently amphibians are of increasing scientific concern as global reports of declining amphibian populations continue to appear (Phillips, 1994)[24]. Although there is no consensus on a single cause for this phenomenon there is general agreement that the declines in many areas

[21] Barnes KN (ed) (1998). The important bird areas of southern Africa. BirdLife South Africa, Johannesburg.

[22] Branch W.R. (1999). Save our species: Threatened small adders. Africa Environment and Wildlife 7(4): 36-37.

[23] Frost, D., 1985. Amphibian species of the World. Association of Systematic Collections, Kansas

[24] Phillips, K., 1994. Tracking the vanishing frogs. Penguin Books, New York, 244

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).

***e) 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)[25] 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.

### 3.2.7 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)[26]. 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)[27].

[25] Swanepoel, P., 1988. Diversity and distribution of mammals in the Eastern Cape. Rhodes University, Grahamstown

[26] Transnet National Ports Authority (2010). Request for Proposal: Funding, Construction and Operation of a Liquid Bulk Handling and Storage Facility at the Port of Ngqura, including Pipeline Connections, Loading Arms and Piperack Structures to Handle Cargo Across the Liquid Bulk Berth. Transnet National Ports Authority, Parktown, Johannesburg.

[27] National Ports Authority of South Africa (2011). Port of Ngqura Fact Sheet [on-line], http://www.transnetnationalportsauthority.net/documents/pdf/Ngqura%20fact%20sheet.pdf. National Ports Authority of South Africa, South Africa. Accessed, 10 October 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)[28]. 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).

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)[29]. 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)[30]. 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 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 Impact Assessement (HIA) 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.

With regards to palaeontology, the Coega IDZ is underlain by sedimentary rocks that range in age from c. 470 million years ago to the 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

[28] Dicken, M. (2010). The Ichthyofauna in the Port of Ngqura, South Africa, African Journal of Marine Science, 32(3):491-499.

[29] Tulsi, K. and Phelp, D. (2009). Monitoring and Maintenance of Breakwaters which Protect Port Entrances. Proceedings of the 28th Southern African Transport Conference, Pretoria, South Africa.

[30] Prestedge, Retief, Dresner, Wijnberg Consulting Port and Coastal Engineers (PRDW) (2011). Port of Ngqura Sand Bypass Scheme [on-line], http://za.prdw.com/sites/default/files/NGQURA%20PORT%20Sand%20Bypass%20System%20Rev%202%202011-06-30.pdf, South Africa.

dense vegetation. Man-made excavations such as road and railway cuttings, stormwater drainage channels, reservoirs and quarries, of which there are a considerable number here, often provide the best opportunities to examine and sample fresh, potentially fossiliferous bedrock.

The archaeological component (Binneman, 2010)[31] 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 top soil 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.

## 3.4 SOCIO-ECONOMIC

### 3.4.1 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 StatSA (Census 2001), the statistics reflect a large black population, with low incomes and high levels of unemployment.

According to the NMBM Integrated Development Plan, 2008 (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 (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 (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 (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

[31] Binneman, J. (2010). A Phase 1 Archaeological Impact Assessment of the Greater Coega Industrial Development Zone (IDZ), near Port Elizabeth, Nelson Mandela Bay Municipality, Eastern Cape Province, Eastern Cape Heritage Consultants, Jeffreys Bay.

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.

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 and, thereby, increasing employment opportunities.

### 3.4.2 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.

### 3.4.3 CDC industrial relations policy, philosophy and principles

The industrial relations policy and philosophy of the CDC, to which PhytoAmandla and all other projects, developments, service providers, contractors and employees who participate in the Coega IDZ are required to adopt and subscribe to by accepting the CDC Zone Labour Agreement, are enshrined in the following principles:

- Compliance with all applicable legislation that governs labour relations in the Republic of South Africa;
- Compliance with all applicable industry agreements and legislation, as defined;
- Compliance with labour agreements that are negotiated between contractor employer associations and organised labour, in respect of the IDZ and projects within the IDZ;
- Compliance with the concept of fair labour practices as developed by the judgements and rulings of the CCMA, Labour Courts and the Labour Appeal Court in the Republic of South Africa;
- Application of standard wage rates for all local and core employees;
- Fair and equitable terms and conditions of employment that are, as far as possible and practicable, uniform and standardised across the IDZ, through the mechanism of Zone Labour Agreement and individual Project Labour Agreements;
- Compliance with all project procedures, rules and regulations that are prescribed, introduced or implemented by the CDC or its duly authorised representative;
- Promotion of labour stability, harmony and productivity at every possible opportunity;
- Maximisation of local content in projects, developments, services, contracting and construction contracts and activities;
- Development and empowerment of small, medium and micro enterprises in the local communities, particularly those from a previously disadvantaged background;

- Skills training, development and transfer, both through the training initiatives and services of nominated training providers. On-the-job training and upgrading of skills and capacity will be provided by contractors;
- Dedication and commitment to world-class performance and professionalism in the execution of any and all activities associated with the IDZ;
- Mutual respect between all parties and individuals engaged in any employment relationship;
- Honesty, integrity and transparency in all aspects and activities related to the IDZ.

## 3.5 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.

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.

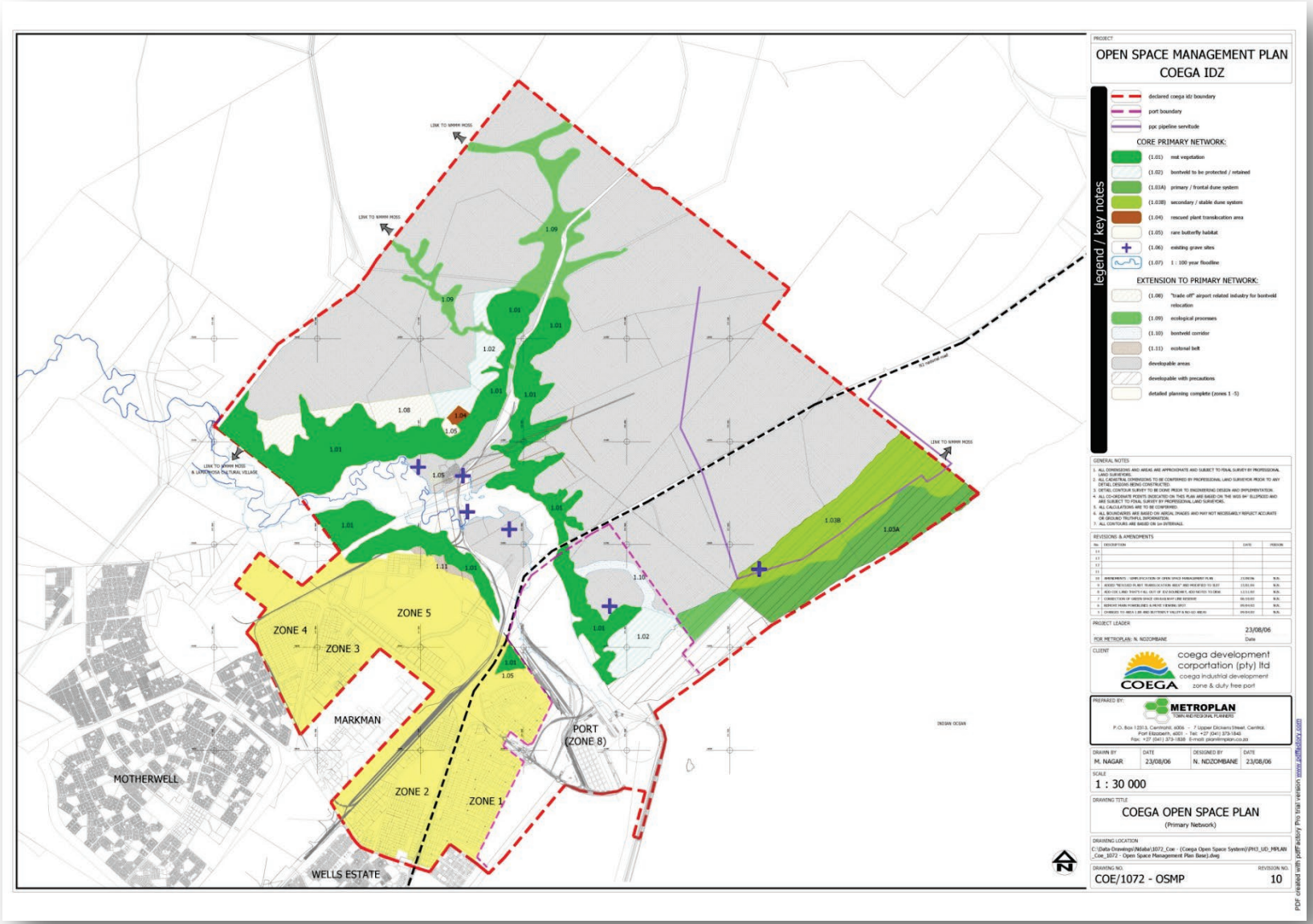


**Figure 3-2 Coega IDZ latest version of the Open Space System (revision 10)**