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VEGETATION AND WETLAND STATUS QUO ASSESSMENT

for the proposed Nyanza Light Metals (Pty) Ltd. TiO_2 Pilot Plant, within the RBIDZ Phase 1F, Richards Bay, KwaZulu-Natal.

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ABBREVIATIONS AND ACRONYMS	
BIA	Biodiversity Impact Assessment
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CREW	Custodians of Rare and Endangered Wildflowers
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Ecological Importance and Sensitivity
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ESMP	uMhlathuze Environmental Services Management Plan
FAR	Floor Area Ratio
GA	General Authorisation (GN 509)
GIS	Geographical Information Systems
GPS	Global Positioning System
HGM	Hydro-Geomorphic (unit)
HSS	Highveld Steel Slag
IUCN	International Union for Conservation of Nature and Natural Resource
KCDM	King Cetshwayo District Municipality
KZN	KwaZulu-Natal
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NFA	National Forests Act (Act 84 of 1998)
NFEPA	National Freshwater Ecosystems Priority Areas
NWA	National Water Act (Act 36 of 1998)
NWCS	National Wetland Classification System
PES	Present Ecological State
PNCO	Provincial Nature Conservation Ordinance
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System
RBIDZ	Richards Bay Industrial Development Zone
RHDHV	Royal Haskoning DHV
SANBI	South African National Biodiversity Institute
SEA	EKZNW Strategic Environmental Assessment
SIBIS	Integrated Biodiversity Information System
SWSAs	Strategic Water Source Areas
SWSA-gw	Strategic Water Source Areas for ground water
SWSA-sw	Strategic Water Source Areas for surface water
TOPS	NEMBA Threatened or Protected Species
VEGMAP	Vegetation Map of Southern Africa
WMA	Water Management Area
WSAs	Water Source Areas
WULA	Water Use License Application
WWF-SA	World Wide Fund for Nature – South Africa

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EXECUTIVE SUMMARY

Exigent Engineering CC has been appointed by Hatch on behalf of Nyanza Light Metals (Pty) Ltd. to conduct a status quo vegetation and wetland assessment for the environmental authorisation processes for the proposed Nyanza TiO_2 Pilot Plant in Richards Bay, in the King Cetshwayo District Municipality, KwaZulu-Natal.

The Scope of Work for this specialist study includes a vegetation and wetland assessment for an area within the Richards Bay Industrial Development Zone: Phase 1F in Alton, where Nyanza proposes to construct a commercial scale plant which will produce rutile TiO_2 pigment products, with the key objective to produce saleable TiO_2 pigment. Based on market research by Nyanza, the aim of the project is to target the paints and plastics market in Africa and the Middle East. The key objective of the pilot plant development work is to produce, at pilot scale, a hydrolysate from the HSS using the Anglo-American Corporation process that can be further processed into TiO_2 pigment using conventional sulphate TiO_2 process technology and equipment.

The extent of the Nyanza TiO_2 Pilot Plant is approximately 0,90 hectares, however based on the GN 509 of 2016 of the National Water Act, all activities within 500 m of a wetland should be assessed. Therefore, this study's investigation extends to a larger study area (98,93 ha) which includes the required 500 m area surrounding the Nyanza TiO_2 Pilot Plant.

The RBIDZ Phase 1F Estate, inclusive of this study area, has been investigated by numerous specialists from 2003. Consistently it's been documented that the RBIDZ: Phase 1F estate has been severely impacted by anthropogenic activities such as industry development, artificial concrete lined stormwater canals, historic plantations, foot paths, littering and most importantly, habitat fragmentation. Only a few degraded vegetation communities remain recognisable in the form of coastal forest, coastal grasslands and hygrophilous sedge wetlands. The Nyanza pilot plant development is proposed in the coastal grasslands and hygrophilous sedge wetland communities

Specifically, approximately 0,1 hectare of the western corner of the proposed Nyanza pilot plant development site extends into the Wetland Unit B. Based on the negotiations between the various Stakeholders and Competent Authorities, infilling of this wetland is deemed ***generally unacceptable*** however, its loss has been calculated and incorporated into the rehabilitation of the wetlands on Erven 16673 and 16674 and therefore ***approved*** and deemed ***acceptable.***

However, as the proposed Nyanza pilot plant development lies within the RBIDZ: Phase 1F Estate, they will be bound by mitigations recommended in the Wetland Rehabilitation Plan (RHDHV, 2016). In line with this Wetland Mitigation Plan, it is recommended that a portion of the 40% FAR of the full Nyanza area be 'spent' on conservation of the portion of wetland in the western corner of the pilot plant area. The combined surface area recommended for conservation within the Nyanza pilot plant development site then calculates to 0,16 ha, which forms 17,78 % of the 0,9 ha development site.

However, when constructing within and in close proximately to these sensitive environments, specific management measures should be implemented. These include:

- Limit construction during the dry season, if possible.
- Demarcation of the wetland prior to start of construction.
- No placement of soil inside the demarcated wetland or buffer area.
- Immediate rehabilitation after completion of construction activities.
- Removal of alien species within the construction area.
- Specific care should be taken to limit erosion after rehabilitation efforts.
- Edge effects of activities, e.g. erosion and alien/ weed control need to be strictly managed.
- Prevent excavated material from entering water resources.
- All spills should be immediately cleaned up and treated accordingly.
- No dumping of construction waste material should be allowed.
- Incorporate adequate erosion management measures to limit erosion and associated sedimentation of the water resource.

A license from the DWS is required to carry out any activity involving modifications to wetlands. As the proposed upgrade will impact wetlands, approval in terms of the NWA will be required.

Nymphaea nouchali was identified within Wetland Unit B which extends into the western corner of the Nyanza pilot plant development site. A permit will be required from EKZNW for the removal of these KZN Nature Conservation Ordinance individuals prior to the proposed impact on the wetland. No Red Data or protected species in terms of other legislation were observed within the development site. However, these species may not have been observed due to the season of the assessment. It is therefore recommended that a search and rescue operation be undertaken within the Nyanza development site prior to construction within the flowering season of the various species. Permits must be obtained for removal of any of these species from the EKZNW and DAFF.

1. INTRODUCTION

Exigent Engineering CC has been appointed by Hatch on behalf of Nyanza Light Metals (Pty) Ltd. (hereafter Nyanza) to conduct a specialist vegetation and wetland status quo assessment for the proposed Nyanza TiO_2 Pilot Plant within the Richards Bay Industrial Development Zone (RBIDZ): Phase 1F in Alton, Richards Bay, in the King Cetshwayo District Municipality (KCDM), KwaZulu-Natal (KZN).

Nyanza proposes to construct a commercial scale plant which will produce rutile TiO_2 pigment products, with the key objective to produce saleable TiO_2 pigment. Based on market research by Nyanza, the aim of the project is to target the paints and plastics market in Africa and the Middle East.

The business case is strengthened by gaining a competitive advantage in the form of lower manufacturing cost using a low-cost feedstock. This low-cost feedstock is slag stockpiled at the erstwhile Highveld Steel & Vanadium plant, with a TiO_2 content of about 30%. This material is referred to as "HSS", i.e. Highveld Steel Slag. The key objective of the pilot plant development work is to produce, at pilot scale, a hydrolysate from the HSS using the Anglo-American Corporation process (Anglo process) that can be further processed into TiO_2 pigment using conventional sulphate TiO_2 process technology and equipment.

This Vegetation and Wetland assessment report therefore considers and reports on the environmental impacts the proposed Nyanza TiO2 Pilot Plant may have and will form part of the submissions to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) and a Water Use License Application (WULA) to the Department of Water and Sanitation (DWS).

2. SCOPE OF WORK

The Scope of Work for this specialist study includes a vegetation and wetland status quo assessment. Based on the GN 509 of 2016 of the National Water Act (NWA), all activities within 500 m of a wetland should be assessed. Therefore, the proposed activity extends to a larger study area (98,93 ha) which includes a 500 m area surrounding the Nyanza TiO_2 Pilot Plant (Figure 2-1).

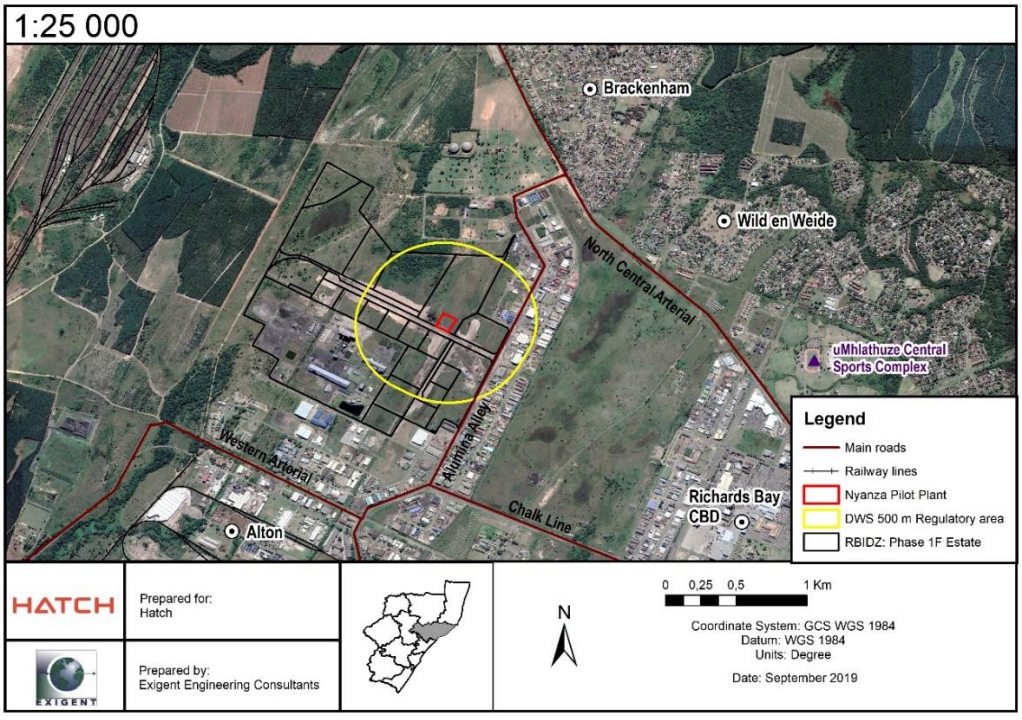

Figure 2-1. Locality map indicating the extent of the study area.

2.1. Vegetation assessment

Specifically addressing the vegetation assessment, the following needs to be included:

1. Description of the vegetation present, the relevant and important characteristics and components thereof, including ecological functioning, which may be affected by the proposed project, or which may affect the proposed project during establishment, construction, operation and maintenance/decommissioning.
2. The identification of species of conservation importance, including Red Data/CITES and TOPS species potentially affected by the proposed project.
3. The identification and recording (with GPS co-ordinates) significant study areas that should be conserved, their indication on a suitable map, and motivation why they should be conserved.
4. The identification of the likely risks and impacts (negative and/or positive, including cumulative impacts if relevant) and their significance, which the proposed project may have on the vegetation assemblages and *vice versa* during study area establishment, construction, operation and maintenance and/or decommissioning.
5. The recommendation of mitigation measures for enhancing positive impacts and avoiding or mitigating negative impacts and risks (to be implemented during the design, construction, operation and/or decommissioning phases), for inclusion in an Environmental Management Programme.
6. The identification of permit requirements as related to the removal and/or destruction of vegetation and specific plant species.
7. Discuss any other sensitivities and important issues from the specialist perspective that are not identified in the terms of reference.

2.2. Wetland assessment

Specifically, using existing information for the study area, substantiated by a ground-truthing exercise, the wetland assessment must address the following primary elements:

1. Ascertain the status of the wetland system through identification and delineation of wetland habitats within the site and within 500 m from the Nyanza TiO_2 Pilot Plant, as per the DWA 2008 "*Updated manual for the identification and delineation of wetlands and riparian areas"*.
2. Confirmation and where required, determination of all wetland boundaries (viz. the edge of the temporary wetness zone in each case) based on site specific conditions.
3. Propose ecological buffers as stipulated by both National (DWS) and Provincial (EKZNW) legislation whilst acknowledging previous specialist recommendations.
4. All wetlands lost or impacted on during the construction and/or operational phases of the development will be geographically referenced in an inventory.
5. Specifically focusing on functional assessment using the WET-Health Level Rapid Assessment to confirm the current Present Ecological State (PES) of the wetland system.
6. Ascertain the Ecological Importance and Sensitivity (EIS) (WET-EIS tool) of the wetland systems.
7. Status quo assessment of the importance of the wetland in providing ecosystem goods and services according to the WET-Eco-services assessment tool; outlining important characteristics and components thereof, which may influence the proposed development during construction and operation.
8. Recommend suitable mitigation measures to minimise predicted impacts associated.
9. The identification of permit requirements as related to the infilling or destruction of wetlands.
10. From the Exigent specialist perspective, to discuss any other sensitivities and significant issues that are not identified in these terms of reference.

3. RELEVANT LEGISLATION

3.1. Biodiversity legislation

3.1.1. Constitution of the Republic of South Africa Act (Act 108 of 1996)

The Constitution of the Republic of South Africa Act (Act No. 108 of 1996) places a duty on the State and citizens to protect the environment. Section 24 provides that:

"*Everyone has the right –*

(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.
iii) secure ecologically sustainable development and use of natural resources while promoting
iv) justifiable economic and social development".

3.1.2. National Environmental Management Act (Act 107 of 1998)

The principles underpinning environmental management contained in the National Environmental Management Act (Act 107 of 1998) (NEMA) must be considered by any organ of state in the exercise of any power that may impact on the environment. Section 2 (4a) states that sustainable development requires the consideration of all relevant factors including the following:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimized and remedied.
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimized and remedied.
- That the development, use and exploitation of renewable resources and the ecosystems of which they are a part do not exceed the level beyond which their integrity is jeopardized.
- That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimized and remedied.

3.1.3. National Forest Act (Act 54 of 1998)

Government Gazette No 26731 of August 2004, and any later revisions as released, provide a list of tree species protected under the National Forests Act. In terms of the National Forests Act, indigenous trees within a natural forest or protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold except under licence granted by the Department of Agriculture, Forestry and Fisheries (DAFF), or a delegated authority. Applications for such activities should be made to the responsible official in each province.

3.1.4. National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) addresses, amongst others:

- Biodiversity planning and monitoring.
- Protection of threatened or protected ecosystems.
- Protection of threatened or protected species (TOPS).
- The control of alien species, invasive species and genetically modified organisms.

Species that are classified as threatened and/or protected are listed in Government Gazette 151 of February 2007 and the regulations are included in Government Gazette 152 of February 2007, with the most recent amendment in Government Notice 576 of July 2011.

Threatened ecosystems in need of protection are listed Government Notice 1002 of December 2011. The National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Lists, 2016 (No 864) was published on 29 July 2016 in GN 40166.

3.1.5. KZN Nature Conservation Ordinance (15 of 1974)

The KZN Nature Conservation Ordinance relates to nature conservation and concerns in the province. The ordinance lists the protected and specially protected plants in the province and prohibits the picking, sale, export or removal of protected plants. The ordinance also lists invader weeds, which must be controlled on study area and may not be sold or donated.

Schedule 12 is a list of protected indigenous species which requires a permit prior to being exported from or imported into the Province.

3.2. Wetland legislation

3.2.1. National Water Act (Act 36 of 1998)

The National Water Act (NWA) (Act 36 of 1998) identifies 11 consumptive and non-consumptive water uses which must be authorized under a tiered authorization system. Section 27 of the NWA specifies that the following factors regarding water use authorization must be taken into consideration:

- The efficient and beneficial use of water in the public interest;
- The socio-economic impact of the decision whether to issue a licence;
- Alignment with the catchment management strategy;
- The impact of the water use, resource directed measures; and
- Investments made by the applicant in respect of the water use in question.

The NWA provides the legal framework for the effective and sustainable management of our water resources. In line with the international trend of integrated water resource management, the NWA aims to manage rivers, dams, wetlands, surrounding land, groundwater, as well as human activities that influence them, in an integrated way. It provides for the protection, use, development, conservation, management and control of water resources. The NWA further clearly defines a watercourse and resource quality characteristics. According to section 21 (c) and (i) water uses almost any activity in any catchment has the potential to change the resource quality characteristics (flow regime, water quality, habitat and biota) and would require some form of authorization in terms of these water uses. Government Notice 509 serves as a notice of the promulgation of the availability of a General Authorisation of Section 21 (c) or (i) water uses in terms of the NWA. The Notice replaces the need for a Water Use Licence Application in terms of the NWA should the water user be within the limits of the Notice. The Notice lists a series of mitigation requirements for developments as well as other items which have to be taken into consideration by the water user. Along with these requirements a risk matrix is required to be undertaken, which proves to the DWS that the proposed development will have a low impact on the receiving environment.

Based on the description of the activities that will be required for this proposed project, a Section 21 (c) and (i) water use authorisation must be applied for from DWS as the south western corner of the development site lies within wetlands and wetlands are located within 500 m of the Nyanza Pilot Plant.

3.2.2. Additional wetland legislation

Locally, the South African Constitution, various Acts and two international treaties allow for the protection of wetlands and rivers. Additional to the aforementioned legislation, these wetland systems are also protected from destruction or pollution by the following:

- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998.
- The Ramsar Convention, 1971 including the Wetland Conservation Programme (DEAT) and the National Wetland Rehabilitation Initiative (DEAT, 2000).

- Conservation of Agricultural Resources Act (Act 43 of 1983).
- Minerals and Petroleum Resources Development Act (Act 28 of 2002).

The Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983) and the National Environmental Management: Biodiversity Act (NEMBA) (Act 10 of 2004) also applies to this project. CARA and NEMBA has categorised many invasive plants together with associated obligations of the landowner.

3.3. Provincial legislation and policy for buffers

Currently, there are no accepted wetland buffer distances provided by the provincial authorities. A standard 30 m buffer has been applied to wetlands in the province, disregarding site-specific conditions. The Ezemvelo KZN Wildlife Biodiversity Impact Assessment Guideline (2013) have however compiled criteria for determining the width of wetland buffers based on the biophysical factors and the interactions between them. Other policies that are relevant include:

- Provincial Nature Conservation Ordinance (PNCO) – Protected Flora;
- KZN Biodiversity Conservation Plan; and
- KZN Vegetation Map (2011).

Meyer and Breetzke (2013) proposed a minimum of 30 m buffer for all wetlands within RBIDZ Phase 1F. However, the buffer relevant to the study area will be revised and determined using a combination of the EKZNW biodiversity guidelines and the preliminary guidelines for the determination of buffer zones for rivers, wetlands and estuaries by Macfarlane *et al*. (2014). The buffer model sheet for the results of the study area can be provided upon request.

4. ASSUMPTIONS AND LIMITATIONS

- The GPS Oregon 600 which was used is at best accurate to within five meters.
- The wetland boundary mapped in this specialist report represent the approximate boundary on a gradient between saturated and terrestrial soil as determined by a specialist experienced in the delineation technique.
- In order to obtain a comprehensive understanding of the dynamics of the study area, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and replication. However, due to time constraints, such long-term studies are not always feasible, and conclusions will be based on one field survey conducted on 9 July and 2 September 2019.
- The site visits took place outside of the preferred sampling period (November-April) for the province (EKZNW, 2013). As a result, very few plant species were in flower during the time of sampling which limits plant identification and results in an underestimate of the species diversity and presence of protected species.

5. DESCRIPTION OF RECEIVING ENVIRONMENT

5.1. Locality

Nyanza TiO_2 Pilot Plant is proposed within the RBIDZ: Phase 1F Estate. It is a purpose built and secure industrial estate, in Alton North, the Industrial area of the City of uMhlathuze Local Municipality. within the King Cetshwayo District Municipality, KwaZulu-Natal province (Figure 2-1). The RBIDZ: Phase 1F Estate comprises of approximately 191 hectares of zoned industrial land of which one third is occupied by the Tata Steel industrial complex. It is located within the quarter degree grid cell 2832 CA and quaternary catchment W12F. The proposed Nyanza Pilot Plant site is currently vacant and is zoned as "*general industrial*". with the geographical coordinates of the centre point at 28°44'28.56"S and 32°01'52.52"E.

5.2. Land use and surrounding area

RBIDZ Phase 1F is bordered by mixed-use industrial developments and vacant land. The RBIDZ are in the process of installing various services (water, sewer and stormwater infrastructure, electrical services, telecommunication and roads), with many of these already installed. Within RBIDZ Phase 1F property, Eskom power lines run parallel to the northern border of Tata Steel. Three concrete lined artificial drainage canals are present in Alton. Two of these intersect in the RBIDZ Phase 1F Estate (Figure 5-1). One of these artificial drainage canals is situated on the eastern boundary of the proposed pilot plant site. This eastern canal drains towards a natural wetland system in Alton south, leading to the Bhizolo canal.

a)

b)

c)

d)

Figure 5-1. Services within RBIDZ Phase 1F where a) represents the ClearVu fence with electrical security and access roads with street lightning, b) the Eskom power lines north of Tata Steel, c) installed fire hydrants and d) the artificial drainage channel adjacent to the Nyanza Pilot Plant site.

5.3. Biophysical description

5.3.1. Climate

The climate of the study area can be described as summer rainfall towards the interior but comprise generally of a weak rainfall seasonality, especially closer to the coast. The study area experiences relatively high precipitation reaching mean annual precipitation values of approximately 1200 mm in coastal localities, decreasing to the interior. High humidity and temperature are experienced during summer months with the mean maximum being 35.3 °Celsius and a mean winter temperature of 5.5 °Celsius. No incidence of frost is recorded within the study area (Mucina & Rutherford, 2006).

5.3.2. Geology and geography

The study area is generally characterised as a relatively flat landscape. It comprises of 18 000 years old quaternary sediments of marine origin mainly with yellowish and argillaceous redistributed sands of the Berea and Muzi Formations (Maputaland Group). The soils are nutritiously very poor and well leached, except in the interdune depressions were organic-rich soils are often present (Mucina & Rutherford, 2006). The main land types "Ha" and "Hb" present on site may include the Constantia, Shepstone and Vilafontes soil forms while the less distributed "Db" land type on site is associated with a wide variety of geological units such as the basement granites, Natal Group sandstones, Dwyka tillites, Ecca shales and sandstones, mudstones, shale and/or sandstones of the Escourt, Emakwezini, Nyoka, Ntabene and Clarens Formations, siltsrone/sandstone of the Zululand Group and some Cenozoic deposits. The "Db" broad soil pattern is generally situated in low gradient slopes and are therefore prone to inundation/flooding. "Db" landtype unit is characterised by duplex soils with non–red B horizons (Council for Geoscience, 2012).

The site is underlain by the KwaMbonambi Formation which forms part of the Maputaland Group. The older Port Durnford Formation consists of mainly carbonaceous mudstone and claystones. The KwaMbonambi Formation consists of a variety of grey, orange and red sands. Peat occurs on the seaward, wetter margins of this formation (Roberts *et al*., 2006). According to Grundling & Grobler (2005), peat accumulates mostly along the eastern and southern coastline and the eastern parts of the central plateau in wetter areas of the country. They are very rare and unique wetland types of Southern Africa that provide an important ecosystem habitat due to the diversity that they support, their size, distribution and threats (Grundling & Grobler, 2005). No peat soils were detected during the site visit.

5.3.3. Hydrology

The National Freshwater Ecosystems Priority Areas (NFEPA) used Water Source Areas (WSAs) to create a database that present various water and water related layers, including wetland delineation and vegetation data, catchment data, area of high groundwater recharge and water management areas using the criterion of the production of relatively large volumes of runoff which sustain lowland areas downstream. This work was then taken further in a study by the World Wide Fund for Nature – South Africa (WWF-SA) and the Council for Scientific and Industrial Research (CSIR) who identified 21 Strategic WSAs for surface water (SWSA-sw) which covered 8% of South Africa and supplied 50% of the mean annual runoff. More recently, the Water Research Commission funded a study which identified water source areas for both ground and surface water resources (BGIS SANBI 2017). Strategic Water Source Areas (SWSAs) are now defined as areas of land that either:

(a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or

(b) have high groundwater recharge and where the groundwater forms a nationally important resource; or

(c) areas that meet both criteria (a) and (b). They include transboundary Water Source Areas that extend into Lesotho and Swaziland.

Based on the BGIS SANBI SWSAs database (2017) the study area is strategically important at the national level for water and economic security for South Africa as it lies in both the Zululand Coast surface water and the Richards Bay ground water-fed estuary SWSA.

Surface Water

The study area falls within the Pongola to Mtamvuna Water Management Area (WMA) (As Gazetted on 16 September 2016). This WMA includes major rivers such as the Pongola, Mhlathuze, Mkuze, Thukela, Mvoti and Umgeni Rivers amongst various others. It lies within the quaternary catchment W12F. The major water resources of the uMhlathuze Catchment is uMhlathuze and Nseleni rivers, Goedertrouw dam and several irrigation dams and impoundments, several lakes and pans (such as Lake Cubhu, Mzingazi Lake, Nhlabane Lake and Nsezi Lake), riparian areas along most of the riverine habitat, hillslope seepages, valley bottom wetland systems and Mhlathuze River Floodplain and Estuary. The most important wetland systems within the Umhlathuze Catchment are

Mzingazi, Qhubu and Nhlabane Lake (as it supplies water to Richards Bay and surroundings), Mhlatuze Floodplain, Mhlatuze Estuary and its associated valley bottom wetland feeding into it, and Mountainous seeps in the upper reaches of Mhlatuze River (DWA, 2014).

The Nsezi River is located west of Alton Industrial area and the Bizolo perennial river to the south of Alton. National spatial data further identifies several non-perennial pans in the area. Three major stormwater drainage channels are located in Alton, two of which traverse RBIDZ: Phase 1F Estate. The Nyanza pilot plant development site is proposed west of the central drainage line (Figure 5-2).

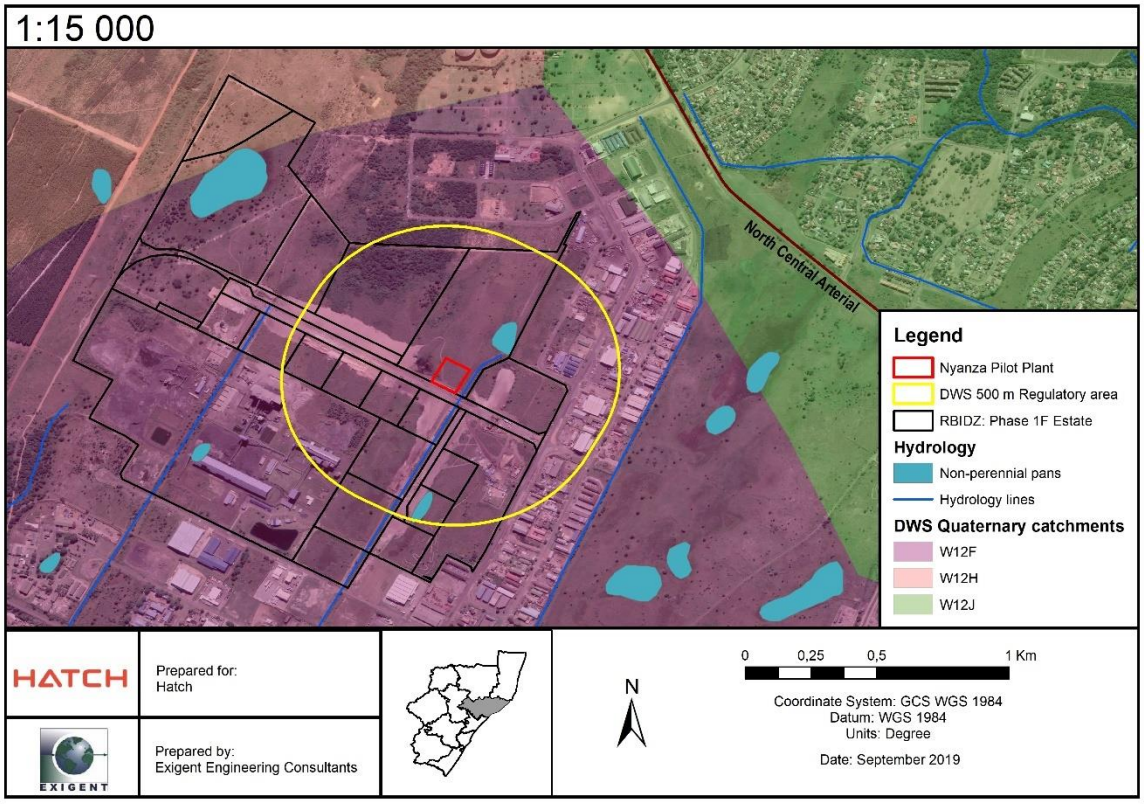

Figure 5-2. Hydrology of the study area

Resource Class, Resource Quality Objectives (RQO) and Reserve Determination

The water resources within this catchment has been awarded a PES rating of C (Moderately modified) and an EIS rating of Moderate. The river associated with the W12F quaternary catchment area is the Mhlathuze River with the catchment infrastructure the Mhlathuze Lagoon (DWA, 2014).

The aquatic resources are under threat from current land use practices and over-utilisation of water resources. Existing water resources should be protected through water conservation measures such as removal of alien invasive species, rehabilitation of wetlands, limiting groundwater abstraction to the set sustainable yield and minimizing the pollution of water resources (DWA, 2014).

Groundwater

The groundwater recharge of South Africa has been mapped and distributed as part of the National Freshwater Ecosystems Priority Areas (NFEPA) in 2011. This data aimed to provide the sub-quaternary catchments where the groundwater recharge was three-times higher than the average recharge ratio. Areas of high groundwater recharge are not necessarily classified as FEPAs, however they can be perceived as the 'recharge hotspots' of a region. It is critical to maintain the natural habitat in these areas of high groundwater recharge as to protect the functioning

of the groundwater dependent ecosystems. Areas of groundwater recharge values higher than 300 indicate high groundwater recharge areas. In KwaZulu-Natal, there are no areas of high groundwater recharge. The study area has a groundwater recharge ratio of 170 to the west, 171 in the central section, which include the Nyanza Pilot Plant, and 165 in the eastern section of the study area (Figure 6-3).

The aquifer classification map of South Africa has indicated that the study area has been identified as a minor aquifer system. The water source in this area is surface water. According to the groundwater quality map of South Africa the electrical conductivity of the groundwater in the area ranges between 150 to 370 mS/m (millisiemens per metre).

5.3.4. General description of the vegetation of the area

The study area is located within the Indian Ocean Coastal Belt Biome, located within the Maputaland Coastal Belt vegetation type (Mucina & Rutherford, 2006). According to the National vegetation data (BGIS SANBI, 2018) and Ezemvelo KZN Wildlife (EKZNW, 2011), the study area is mainly located within the Maputaland Wooded Grassland. Both databases identify the forest patch on the northern boundary of the study area and a small patch east of the Nyanza development site. EKZNW classifies it as Maputaland Moist Coastal Lowland Forest, while the national vegetation database classifies it as northern coastal forest. EKZNW further recognises Subtropical Freshwater Wetlands within the study area, impeding on the south western boundary of the Nyanza development site (Figure 5-3 and Figure 5-4).

According to the Ecosystem Threat Status of National Biodiversity Assessment (SANBI 2011) the study area is located within a critically endangered ecotype due to the presence of the NEMBA listed Kwambonambi hygrophilous grasslands. EKZNW (2011) classifies the Maputaland Wooded Grassland and the Maputaland Moist Coastal Lowland Forest as endangered and the Subtropical Freshwater Wetlands as vulnerable (Figure 5-5). A summary of the conservation status can be found in Table 5-1.

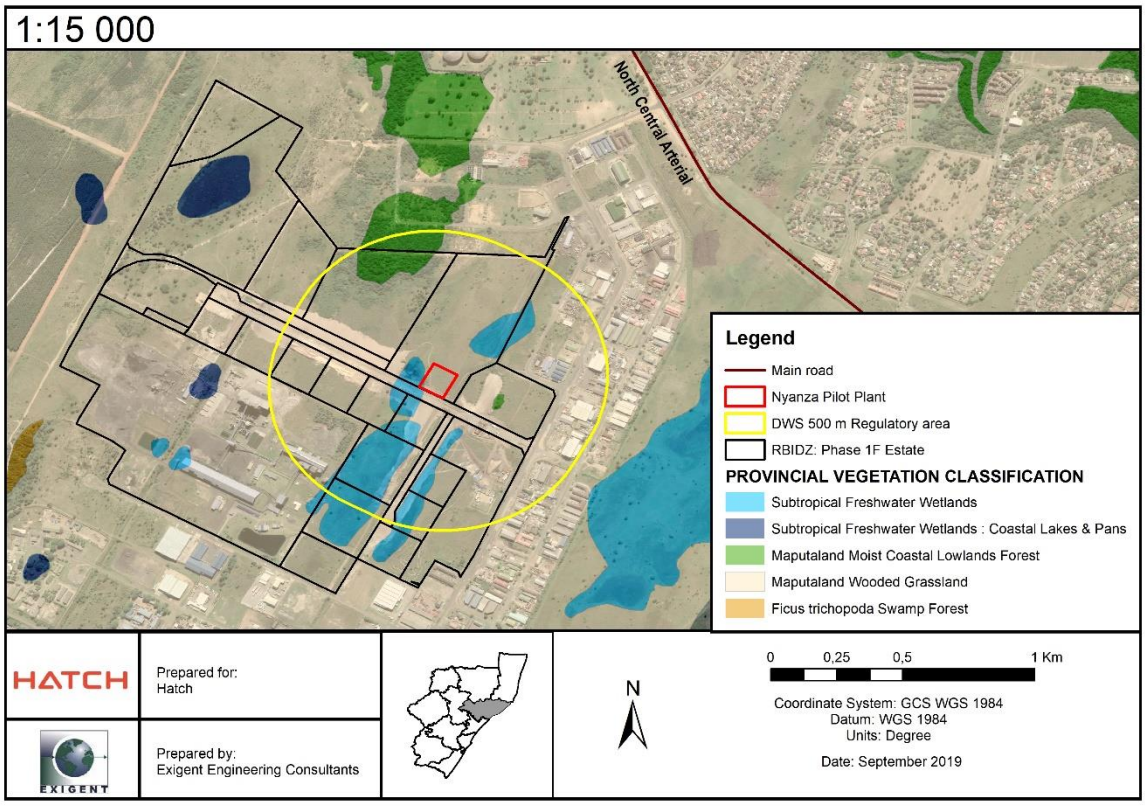

Figure 5-3. Provincial vegetation map of the study area (EKZNW, 2011).

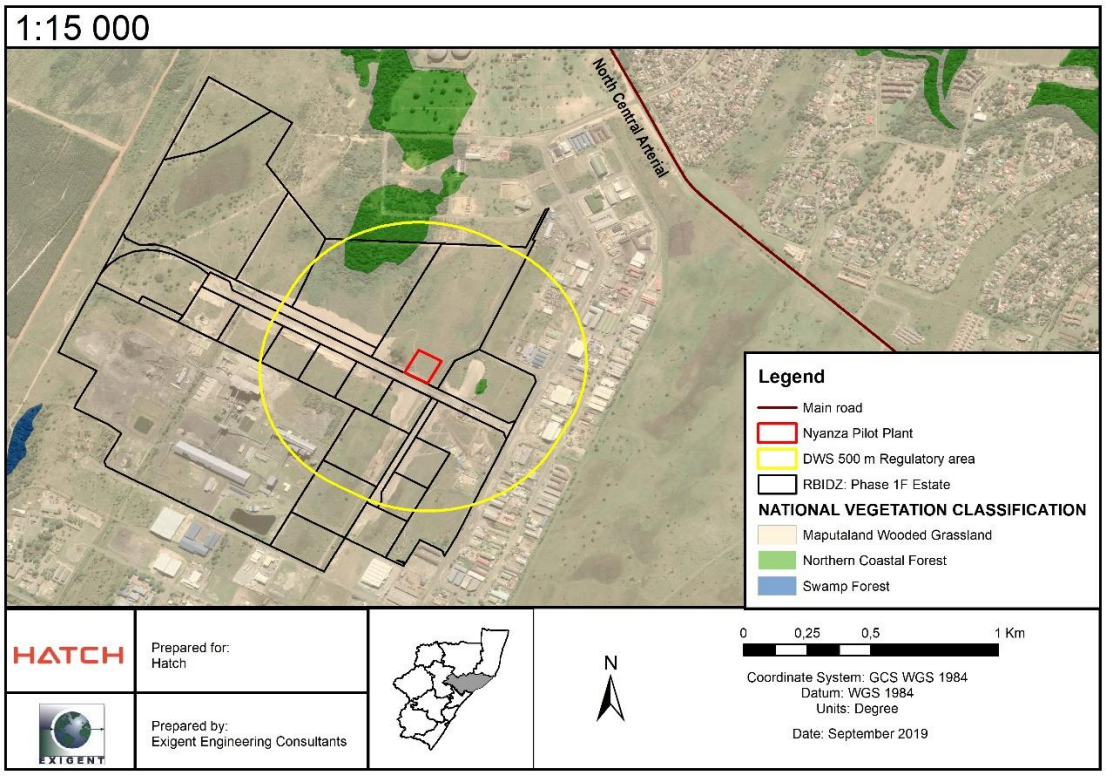

Figure 5-4. National vegetation map of the study area (BGIS, SANBI, 2018).

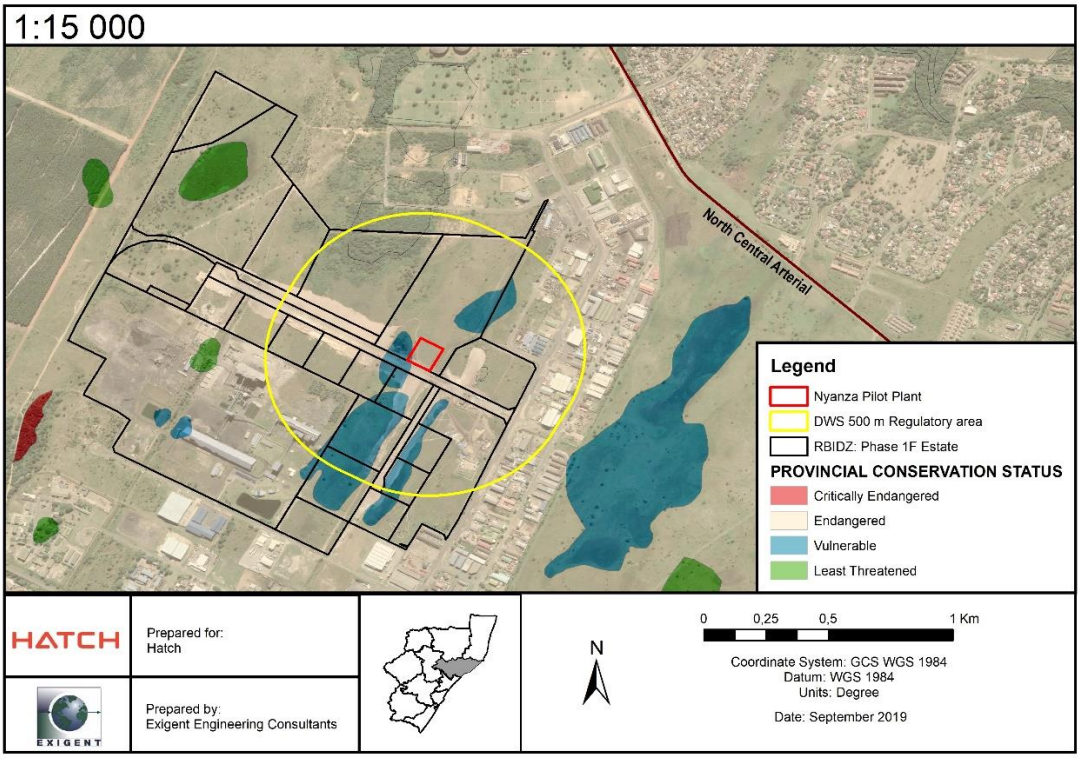

Figure 5-5. Provincial Conservation status (EKZNW, 2011).

Table 5-1. Key vegetation types found in the study area (Mucina and Rutherford, 2006; NSBA, 2011 and EKZNW, 2011).

Vegetation type	Status		
	Mucina and Rutherford (2006)	NSBA* (2011)	EKZNW (2011)
Maputaland Wooded Grassland	Endangered	Critically endangered (Kwambonambi Hygrophilous Grassland)	Endangered
	Description:		
	Approximately 17% is being conserved in the Nature Reserves such as the iSimangaliso Wetland Park. Approximately 46% of this vegetation type has already been transformed by plantations and partly for cultivated land. 90% of the southernmost portion of this vegetation type is transformed by timber pulp plantations, cane fields and informal settlements. Alien plant infestations include scattered populations of *Chromolaena odorata* and *Lantana camara*.		
KwaZulu Natal Coastal Forest: Maputaland Coastal Lowland Forest	Endangered	Endangered	Endangered
	Description:		
	68% is conserved in Manguzi, iSimangaliso Wetland Park, Maphelana, Dukuduku, Sodwana, Richards Bay, Umlalazi, Enseleni, Amathigulu, Harold Johnson, Hawaan, Umhlanga Lagoon, Kenneth Stainbank, Impisini, Skyline, Frederika, Mpenjati Nature Reserves mostly under KZN Wildlife management. Current threats to this vegetation type include mine prospecting and conversion into small-scale agricultural lots. It is prone to invasion by species such as *Chromolaena odorata* and *Pereskia.*		
Freshwater wetlands: Sub-tropical freshwater wetlands	Vulnerable	Vulnerable	Vulnerable
	Description:		
	Approximately 40-50% is conserved in Nature Reserves such as iSimangaliso Wetland Park, Kruger National Park, Nduma Game Reserve, Thembe Elephant Park, as well as in Nhlabane, Nylsvley, Nkombo, Sileza and Richards Bay Nature Reserves. A further 10% is protected in private game reserves in Limpopo, Mpumulanga and KwaZulu-Natal Provinces. Only 4% is transformed by cultivation, urban sprawl and local grazing. Disturbance of this vegetation type leads to alien invasive species infestation such as *Chromolaena discolor*, *Lantana camara, Melia azedarach* and aquatic weeds such as *Eichhornia crassipes, Pistia stratiotes* and *Salvinia molesta*		

*National Spatial Biodiversity Assessment

The Maputaland Wooded Grassland vegetation type comprises of coastal sandy grasslands rich in geoxylic suffrutices, dwarf shrubs, small trees and a rich herbaceous flora in its origin state (Mucina & Rutherford, 2006). A degraded state of this vegetation type was observed in the majority of the study area. Table 5-2 lists the species representative from each stratum from the Maputaland Wooded Grassland.

Table 5-2. Dominant species representative from different stratums of the Maputaland Wooded Grassland vegetation type (Mucina & Rutherford, 2006).

Grasses	Grasses	Geoxylic suffrutices
Diheteropogon amplectens	*Sporobolus subulatus*	*Eugenia capensis*
Themeda triandra	**Shrubs**	*Parinari curatellifolia*
Urelytrum agropyroides	*Agathisanthemum bojeri*	*Salacia krausii*
Aristida stipitata subsp. *graciliflora*	*Helichrysum krausii*	**Trees**
Bewsia biflora	*Crotolaria monteiroi* var. *monteiroi*	*Achridocarpus natalitius* var. *linearifolius*
Cyperus obtusiflorus	**Herbs**	*Dichrostachys cinerea* subsp. *nyassana*
Cyperus tenax	*Cyrtanthus galpinii*	*Diospyros lycoides* subsp. *sericea*
Digitaria natalensis	*Chamaecrista plumosa*	*Hyphaene coriacea*
Eustachya paspaloides	**Geoxylic suffrutices**	*Terminalia sericea*
Setaria sphacelata	*Ancylobotrys petersiana*	*Syzygium cordatum*
Sporobolus fimbriatus	*Diospyros galpinii*	

Mucina & Rutherford (2006) describes Northern Coastal Forest as species rich, trees of tall to medium height and occuring on coastal plains and stabilised coastal dunes. The understoreys are also species rich and well-developed. However, site investigations revealed that the patches of coastal forest located within the study area is severely degraded with predominantly alien species understories. Typical species of this vegetation type is listed in Table 5-3 below.

Table 5-3. Dominant species representative from different stratums of the Northern Coastal Forest vegetation type (Mucina & Rutherford, 2006).

Grasses/Climbers	Trees	Trees
Grasses	*Albizia adianthifolia*	*Peddiea africana*
Cyperus albostriatus	*Drypetes reticulata*	*Rhus nebulosi*
Oplismenus hirtellus	*Mimusops caffra*	*Strychnos henningsii*
Woody climbers	*Psydrax obovata* subsp. *obovata*	*Acokanthera oblongifolia*
Acacia kraussiana	*Sideroxylon inerme*	*Callichilia orientalis*
Rhoicissus tomentosa	*Trichillia emetica*	*Deinbollia oblongifolia*
Dalbergia armata	*Vepris lanceolata*	*Dovyalis rhamnoides*
Monanthotaxis caffra	*Brachylaena discolor* subsp. *discolor*	*Euclea natalensis*
Uvaria caffra	*Buxus natalensis*	*Euclea racemosa*
Herbaceous climbers	*Cavacoa aurea*	*Scutia myrtina*
Gloriosa superba	*Englerophytum natalense*	*Strychnos decussata*
Shrubs	*Erythroxylum emarginatum*	*Tapura fischeri*
Carissa bispinosa subsp. *bispinosa*	*Egenia capensis*	*Teclea gerrardii*
Hyperacanthus amoenus	*Gymnosporia nemorosa*	*Turraea floribunda*
Putterlickia verrucosa	*Kraussia floribunda*	*Xylotheca kraussiana*
Chrysamthemoides monolifera susp. *rotundata*	**Herbs**	
Isoglossa woodii	*Achyrannthus aspera*	*Laportea peduncularis*
Dracaena aletriformis	*Asystasia gangetica*	*Microsorum scolopendria*
Strelitzia nicolai		

Subtropical freshwater wetlands characteristically support low beds dominated by reeds, sedges and rushes and comprise of waterlogged meadows dominated by grasses. It is found typically along edges of seasonal pools in Aeolian depressions as well as fringing alluvial backwater pans or artificial dams. Typical Freshwater wetland species are listed in Table 5-4. Several wetlands were confirmed within the study area. These wetland areas have been assessed in detail as part of this scope of work and are discussed further in Section 0.

Table 5-4. Dominant species representative from different stratums of the Subtropical freshwater wetlands (Mucina & Rutherford, 2006).

Marshes		
Grasses	**Grasses**	**Herbs**
Chloris virgate	*Eriochloa meyeriana*	*Ethulia conyzoides*
Cyanodon dactylon	*Fimbristylis bisumbellata*	*Glinus lotoides*
Cyperus articulates	*Fuirena ecklonii*	*Hydrocotyle ranuculoides*
Dactyloctenium aegyptium	*Oxycarym cubense*	*Ludwigia adscendens* subsp. *diffusa*
Diplachne fusca	*Phasphalidum obtusifolium*	*Ludwigia leptocarpa*
Echinochloa pyramidalis	*Phaspalum commersonii*	*Ludwigia octovalvis*
Fimbristylisobtusifolia	*Pycreus pelophilus*	*Ludwigia palustris*
Hemarthria altissima	*Pycreus polystachyos*	*Neptunia oleracea*
Imperata cylindrical	*Scleria poiformis*	*Persicaria attenuate* subsp. *africana*
Ischaemum arcuatum	*Sporobolus consimilis*	*Persicaria hystricula*
Leersia hexandra	*Eragrostis chapelieri*	*Rorippa madagascariensis*
Pycreus mundii	**Herbs**	*Sium repandum*
Sporobolus nitens	*Pentodon pentandrus*	*Vahlia capensis*
Sporobolus smutsii	*Persicaria senegalensis*	*Eulophia angolensis*
Urochloa stolonifera	*Burmannia madagascariensis*	*Zeuxine africana*

Marshes		
Grasses	**Herbs**	
Bolboschoenus glaucus	*Centella coriacea*	*Salicornia pachystachya*
Courtoisia cyperoides	*Commelina diffusa*	*Buchnera longespicata*
Cyperus alopecuroides	*Convolvulus mauritanicus*	*Bergia salaria*
Cyperus pectinatus	*Desmodium dregeanum*	*Lagarosiphon crispus*
Digitaria natalensis	*Eclipta prostrata*	**Small Trees**
Echinochloa stragnina	*Epaltes gariepina*	*Hyphaene coriacea*
Eragrostis lappula	*Eriocaulo abyssinicum*	*Phoenix reclinata*
Lakes and ponds		
Grasses	**Herbs**	**Herbs**
Eleocharis dulcis	*Aponogeton rehmannii*	*Potamogeton schweinfurthii*
Herbs	*Ceratophyllum muricatum*	*Spirodela polyrhiza*
Azolla pinata subsp. *africana*	*Marsilea macrocarpa*	*Spirodela punctata*
Ceratophyllum demersum	*Najas marina* subsp. *delilei*	*Trapa natans* var. *bispinosa*
Lemna minor	*Najas pectinate*	*Utricularia gibba* subsp. *exolta*
Nymphaea nouchali var. *caerulea*	*Nymphoides indica* subsp. *occidentalis*	*Utricularia inflexa*
Pistia stratoides	*Nymphoides rautanenii*	*Utricularia subulata*
Wolffia arrniza	*Ottelia exserta*	*Crinum paludosum*
Aponogeton desertorum	*Potamogeton crispus*	
Aponogeton natalensis	*Potamogeton pectinatus*	
Reed and Sedge beds		
Grasses		
Cladium mariscus subsp. *jamaicense*	*Schoenoplectus corymbosus*	*Cyperus difformis*
Cyperus papyrus	*Schoenoplectus difformis*	*Cyperus digitatus*
Phragmites australis	*Typha capensis*	*Cyperus latifolius*
Phragmites mauritianus	*Cyperus fastigiatus*	*Cyperus sexangularis*
Fuirena ciliaris		

6. METHODOLODY

6.1. Desktop evaluation

Prior to conducting the physical study area visit and wetland delineation, an initial level 1 (desktop) survey was done using Google Earth's map timeline function to detect changes in visible vegetation gradients. Maps are available from 2004-2018. Possible wetlands and other sensitive features were identified, and GPS coordinates were noted to assist with the study area visit.

6.2. Literature review and database survey

Numerous wetland assessments and related wetland rehabilitation, management and offset plans have been conducted for the RBIDZ Phase 1F between 2003 and 2016, ranging from very comprehensive ecological descriptions of the biodiversity, to in-depth offset studies and rehabilitation and conservation management plans. A full list of resources is listed in Section 15, however a few of these reports provide baseline information and valuable insight to the study area and therefore require special acknowledgement:

- Breetzke, T. (2016). Richards Bay IDZ Phase 1F: Wetland Mitigation Plan. Report prepared by Royal Haskoning DHV (July 2016).
- Phamphe, R. (2015). Proposed Richards Bay Industrial Development Zone – Phase 1F – Installation of Bulk Infrastructure Services, Richards Bay, KwaZulu-Natal. Report prepared by Nemai Consulting C.C, report number 50039.
- Meyer, C. and Hierdien, E. (2013). Development of a Wetland Offset Management Plan for RBIDZ Phase 1F: Status Quo Report. Report prepared by Royal Haskoning DHV (March 2013).
- Meyer, C. and Breetzke, T. (2013). Development of a Wetland Offset Management Plan for RBIDZ Phase 1F: Status Quo and Feasibility Report. Report prepared by Royal Haskoning DHV (November 2013).

- SiVest (2010). Environmental Risk Assessment of Richards Bay IDZ 1A, 1B, 1C, 1D & 1F. Wetland Assessment Report prepared for Thorn-Ex cc. by SiVest Environmental Division.
- O'Connor and Associates (2003). Identification and prioritisation of Red Data Book species and other conservation-worthy species in KZ282. Report prepared for the uMhlathuze Municipality.

Furthermore, a database survey was conducted to assist with the study. Relevant resources included:

- uMhlathuze ESMP (2015);
- VEGMAP (2018);
- National Spatial Biodiversity Assessment (2011);
- Red Data Plant Lists; and
- Floral field guides and books.

6.2.1. Local databases

The aim of the uMhlathuze ESMP is to provide the municipality with a clear understanding of activities that need to be undertaken to protect and enhance the supply of environmental services in the area. Based on the final 2016/2017 uMhlathuze Spatial Development Framework (SDF), the two critical goals of the ESMP are:

- *'To define cohesive and functional spatial management units within the municipal area that need to be managed in order to optimise the delivery of environment services.'*
- *'To develop management plans for each management unit that identify the management activities required to secure environmental services supply.'*

The areas that provide environmental services to the City are spatially defined, and the following "Levels" of protection were determined:

Nature Reserves (Level 1): These are areas of high biodiversity and environmental significance that require a high level of legal protection. Included are unique habitats or areas that are considered important at International, National or Provincial level; estuaries, lakes, major wetlands, natural forests, coastal buffers and critically endangered habitats that are protected in terms of international or national legislation and/or treaties. It is recommended that these areas be proclaimed as nature reserves in terms of relevant legislation such as the National Environmental Management Protected Areas Act.

Conservation Zone (Level 2): Areas of biodiversity / environmental significance, which are not viable for proclamation as nature reserves, but that require some form of legal protection. Included are unique or regionally important natural habitats; wetland and forest areas that are protected in terms of national legislation; and all areas that fall within the 1:100-year flood line. No transformation of the natural assets or the development of land for purposes other than conservation should be permitted in this zone. Sustainable use of renewable resources is permitted.

Open Space Linkage Zone (Level 3): Included in the open space linkage zone are areas that provide a natural buffer for Level 1 and 2 Zones, areas that provide a natural link between Level 1 and 2 Zones and areas that supply, or ensure the supply of, significant environmental services. Transformation of natural assets and the development of land in these zones should only be permitted under controlled conditions.

Development Zone (Level 4): Includes all areas that are not included in Level 1, 2 and 3 zones. Areas in this zone are either already developed or transformed and contain land and natural assets that are not critical for environmental service supply. However, it is recognised that the development of these zones can impact on environmental services supply. As such, they should be developed in a manner that supports, or at least does not adversely impact on, the sustainability of environmental service supply in Level 1, 2 and 3 zones.

The full extent of the Nyanza Pilot plant lies within the Level 3: Open Space Linkage Zone, with the south western corner impeding into the related Level 2: Conservation zone. These two zones are associated with wetland units and their buffer zones present within the study area (Figure 6-1).

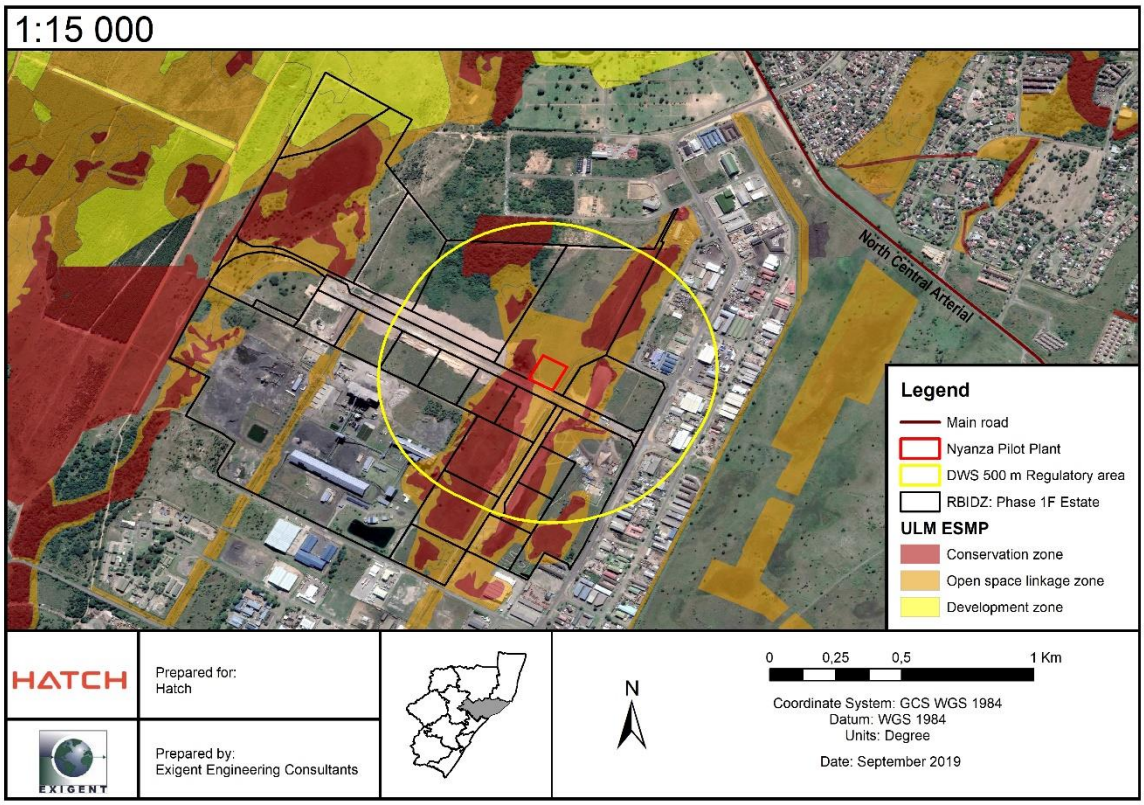

Figure 6-1. Municipal ESMP of the study area.

6.2.2. Provincial databases

The EKZNW Strategic Environmental Assessment (SEA) Database (2000) was used to model the distribution of a selection of 255 red data and endemic species. The species listed in Section 10 are those SEA species that have the potential to occur in the area.

The EKZNW Conservation Plan (C-Plan) was used in a GIS assessment of the study area. This database includes the layers of the following databases:

- National Land Cover 2000 (ver.1.2) edited for errors known to occur in provincial protected areas (January 2004);
- Provincial and national protected areas of the province (EKZNW);
- National Vegetation Map (BGIS SANBI, 2018);
- Forests of KZN (EKZNW, 2003);
- Wetlands of KZN (EKZNW, 2004);
- Biophysical data from Schulze, R.E. (1997);
- South African Atlas of Agrohydrology and Climatology. Water Research Commission, Pretoria; and
- Species distributions from Ezemvelo KZN Wildlife's Biodiversity database and supplemented by species specialist group records and inputs (EKZNW).

The first use of the conservation planning analysis in C-Plan is an **irreplaceability map** of the planning area. This map is divided into 2 x 2 km grid cells called 'planning units'. Each cell has associated with it an 'Irreplaceability Value' which is one reflection of the cell's importance with respect to the conservation of biodiversity. Irreplaceability reflects the planning units' ability to meet set 'targets' for selected biodiversity 'features' (EKZNW, 2004, Incomplete Draft). Where a planning unit has an irreplaceability value of 0, all biodiversity features recorded here are conserved

to the target amount within reserves in South Africa, and there is unlikely to be a biodiversity concern with the development within the study area. An irreplaceability value of 1 would imply there are various issues of biodiversity concern within the study area, which requires conservation and, therefore, development of the study area is not recommended.

Minset is a feature that is utilized within the C-Plan. This tool uses a minimum amount of study areas to optimize the achievement of conservation targets by placing numerous constraints on the users. It presents the most efficient solution to achieving conservation targets and other land use constraints (EKZNW, 2011).

The EKZNW Minset data classifies the major conservation areas into 4 main categories:

Critical Biodiversity Area (CBA) Mandatory: These are areas that have no other options than to meet their required biodiversity targets for both the biodiversity patterns and the ecological process features. This category is subdivided into two sets, depending on the irreplaceability of the area.

- CBA 1 Mandatory areas have an irreplaceability score that is equal to 1, meaning that the area is highly irreplaceable.
- CBA 2 Mandatory areas have an irreplaceability score that lies between 0.8 and is smaller than 1.

CBA Optimal: These areas are ideal areas to meet their biodiversity conservation targets whilst aiming to avoid high cost areas. This classification is allocated to areas with an irreplaceability score that lies between 0 and 0.8. This category as well as the CBA Mandatory Areas are determined by the National Threatened Ecosystems, the National and KZN Protected Area Expansion Strategy, the KZN threatened Ecosystems, Forests and macro-ecological corridors that are in areas that are under great environmental pressures.

Ecological Support Areas (ESA): Areas that are not essential for meeting biodiversity targets directly. However, they do play an important role in supporting and sustaining the ecological functioning of the CBAs. These areas are determined by the macro-ecological corridors.

Ecosystem Goods and Service Areas (EGSA): These are areas that are classified as natural/near natural vegetation which has the capability of delivering important ecosystem goods and services to the KZN province and the inhabitants of the land.

Based on EKZNW Minset data, the entire Nyanza Pilot Plant development site lies within a CBA 3: Optimal Areas (Figure 6-2). The CBA 3: Optimal areas are ideal to meet the biodiversity conservation targets whilst aiming to avoid high cost areas (EKZNW, 2011).

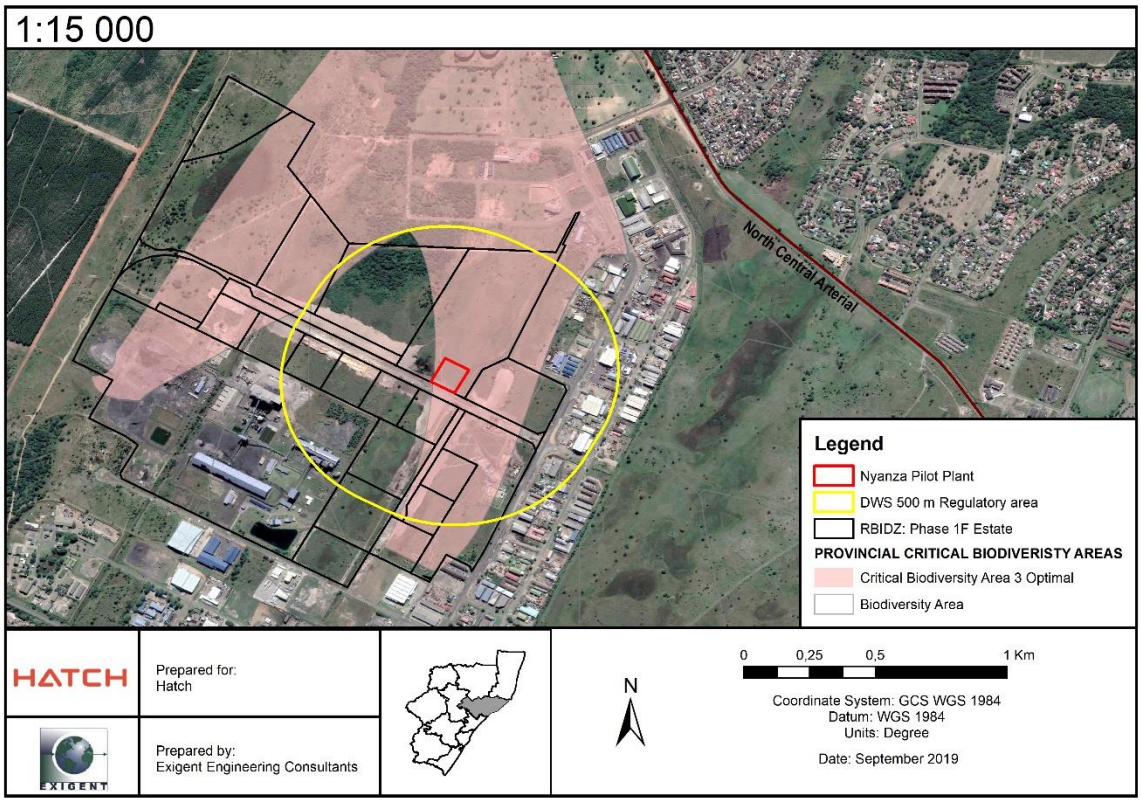

Figure 6-2. Critical Biodiversity Areas (EKZNW, 2011).

EKZNW Vegetation Type Map (2011)

The KZN Vegetation Type Map has undergone several changes since the publication of the Mucina and Rutherford (2006). Ezemvelo KZN Wildlife has, in collaboration with various government departments, NGOs, Working Groups and Forums e.g. KZN Wetland Forum, IAIA (members of the International Association for Impact Assessment), municipalities and parastatals, refined the KZN VT to develop an accurate representation of the pre-transformation extent of the vegetation types present. Because of the finer scale mapping and classification, the KZN VT map has in some cases identified new vegetation types and or subtypes within the vegetation types identified at national level. These changes have been peer reviewed and adopted by the National Vegetation Committee and has been incorporated into the revised SA Vegmap (BGIS SANBI, 2018).

6.2.3. National databases

The Integrated Biodiversity Information System (SIBIS) database from the South African National Biodiversity Institute (SANBI) contains information from several SANBI databases, namely:

- Acocks (plant species observations);
- Custodians of Rare and Endangered Wildflowers (CREW) (threatened plant species localities);
- DNA laboratories (plant and reptile DNA accessions);
- Garden Accessions (plant collection records);
- MSB (plant seed collection records);
- National Herbarium Pretoria (PRE) Computerised Information System (PRECIS) (taxonomy and herbarium specimens);
- Species Status (NEMBA-listed species);
- TSP (threatened plant species);

- National Freshwater Ecosystems Priority Areas (NFEPA) – (Nel *et al*., 2011). This mapping product highlights potential rivers and wetlands that should be earmarked for conservation on a national basis; and
- National Spatial Biodiversity Assessment.

The SIBIS database provides information of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List status, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix listing or NEMBA Threatened or Protected Species (TOPS) status of the study area, on an interactive map. The NFEPA database includes various water and water related layers, including wetland delineation and vegetation data, catchment data, area of high groundwater recharge and water management areas. Based on National Biodiversity Assessment classification, the entire study area falls within a NEMBA listed critically endangered ecosystem Kwambonambi Hygrophilous Grasslands.

The NFEPA database includes various water and water related layers, including wetland delineation and vegetation data, catchment data, area of high groundwater recharge and water management areas. Based on the NFEPA database, the study area lies within the Indian Ocean Coastal Belt Group 1 wetland vegetation type. Figure 6-3 further identifies Level 4 Hydrogeomorphic units (HGM) within the study area as a wetland flat, an unchannelled valley bottom wetland and a valleyhead seep wetland. These wetland units were located during the site visit and are described with additional systems in Section 0 of this report.

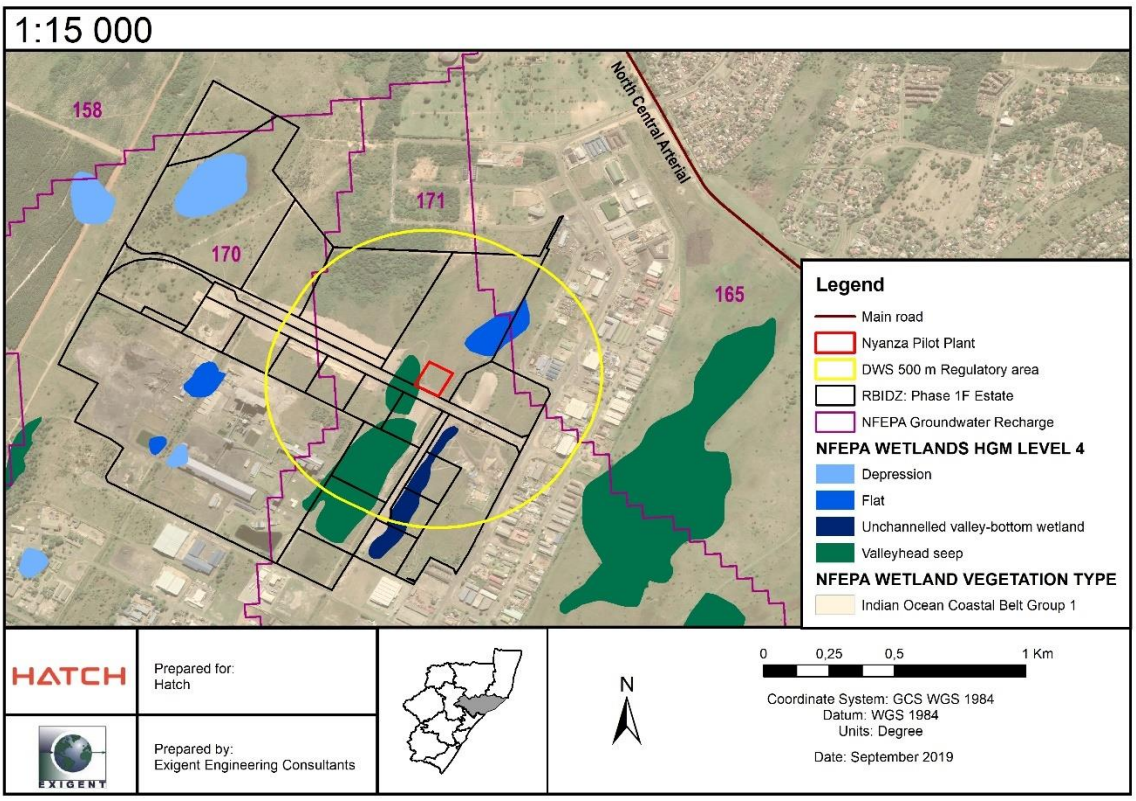

Figure 6-3. NFEPA map depicting water and water related features within the study area (Nel *et al*., 2011).

6.3. Vegetation assessment

The study area was stratified into relatively homogeneous vegetation/habitat units based on the morphology of the terrain and the growth-form of the vegetation. This was done with the help of 1:50 000 topographical maps and Google earth aerial photos of the study area and the actual vegetation surveys were conducted on 9 July and 2 September 2019. A species list was compiled during the site visits to ensure that representative species were captured.

6.3.1. Red data species/CITES assessment

The available habitat on the study area was compared to the habitat requirements of all Red Data flora species potentially occurring in the area. Based on this assessment, Red Data species with a probability of occurring on the study area were identified.

6.3.2. Protected tree species under the National Forest Act 1998 (Act 84 of 1998)

On 7 September 2014, Regulation 716 was gazetted under the National Forest Act, 1998 which stated that in terms of Section 15(1) of the National Forests Act, 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.

Schedule A of the Regulations list the various species which requires a license. The species occurring on the study area which requires a license has been described in Section 10.3.

6.4. Wetland assessment

The National Water Act (No 36 of 1998) defines a **wetland** as, "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil." This definition includes all naturally occurring wetlands and pans, but excludes rivers, lakes and artificial wetlands. The transition zone from the river or lake and the terrestrial ecosystem may be included in some cases.

Any area where water collects for long enough and often enough to influence the flora, fauna and soil, can be classified as a wetland. The main distinguishing features of wetlands are the presence of water at or near the surface, hydromorphic soil and vegetation adapted to saturated soils. These features can be used to determine if a wetland occurs on the study area or not (DWAF 2003).

It should be noted that riparian systems that are not permanently or periodically inundated are not considered true wetlands, i.e. those associated with drainage lines.

6.4.1. Wetland delineation

The wetlands were delineated based on the principles in the Department of Water Affairs (DWA) guideline document "*A practical field procedure for identification and delineation of wetlands and riparian areas, Edition 1 (September 2005),* in conjunction with the updated draft delineation guideline "*Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas"*. The criteria set out in the guidelines for assessment of presence of a wetland are as follows:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation; such as grey horizons, mottling streaks, hard pans, organic matter depositions, iron and manganese concretion resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes); and

- A high-water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

Due to the variable nature of South Africa's climate the direct presence of water is often an unreliable indicator of wetland conditions. Prolonged saturation of soil has a characteristic effect on soil morphology, affecting soil matrix chroma and mottling in particular.

The wetlands were delineated by making use of the following wetland indicators (DWAF, 2005):

Terrain unit indicator helps identifying those parts of the landscape where wetlands are most likely to occur. Wetlands occupy characteristic positions in the landscape and can occur on the following terrain units: crest, midslope, footslope and valley bottom (Figure 6-4).

The Soil Form indicator identifies the soil forms, as defined by the Soil Classification Working group (1991), which are associated with prolonged and frequent saturation.

Soil wetness indicator identifies the morphological signatures developed in the soil profile as a result of prolonged and frequent saturation. Notes were taken on soil chroma to a depth of 50 cm and this was related to hydrological conditions in terms of the criteria for distinguishing different soil saturation zones within a wetland (Kotze *et al*., 1994).

The vegetation indicator identifies hydrophytic vegetation associated with frequently saturated soils (Table 6-1).

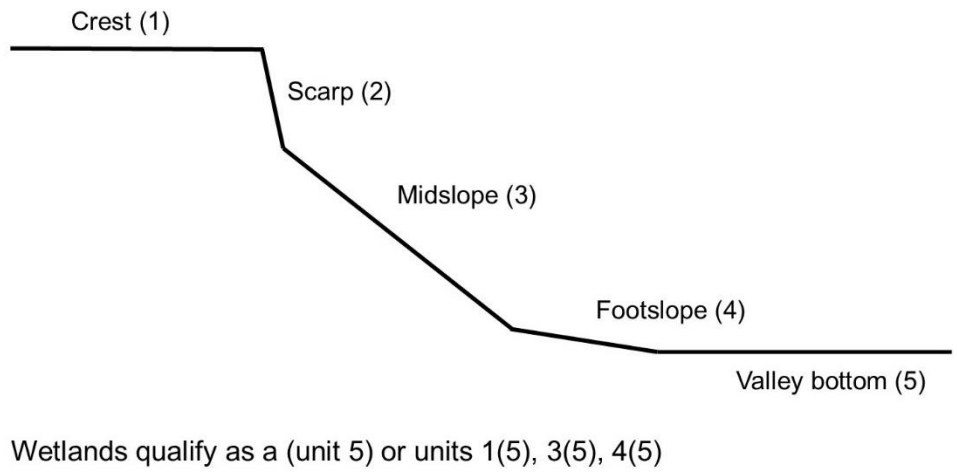

Figure 6-4. Terrain units.

Table 6-1. Criteria for distinguishing different soil saturation zones and hydric vegetation within a wetlands (from Kotze et al., 1994).

SOIL	DEGREE OF WETNESS		
	Temporary	Seasonal	Permanent / Semi-permanent
Soil depth 0-20cm	Matrix brown to greyish brown (chroma 0-3, usually 1 or 2). Few/no mottles. Non-sulphuric.	Matrix brownish grey to grey (chroma 0-2). Many mottles. Sometimes sulphuric.	Matrix grey (chroma 0-1). Few/no mottles. Often sulphuric.
Soil depth 20-40cm	Matrix greyish brown (chroma 0-2, usually 1). Few/many mottles.	Matrix brownish grey to grey (chroma 0-1). Many mottles.	Matrix grey (chroma 0-1). No/few mottles.

VEGETATION			
If herbaceous:	Predominantly grass species; mixture of species, which occur extensively in non-wetland areas, and hydrophytic plant species, which are restricted largely to wetland areas.	Hydrophytic sedge and grass species which are restricted to wetland areas, usually <1m tall.	Dominated by: (1) emergent plants, including reeds (*Phragmites* sp.), sedges and bulrushes (*Typha* sp.), usually >1m tall (marsh); or (2) floating or submerged aquatic plants.

Changes in the presence and frequency of mottling in the soils are the main methods of delineation. This is because mottles are usually not influenced by short term changes in the hydrology and vegetation of the wetland. The outer boundary of the wetland is defined as: "*the point where the indicators are no longer visible*" (DWA, 2005). Previously delineated wetland boundaries were verified using soil sampling and visual observation of plant species and moving away from the already proven wetland, further soil samples were taken until no wetland indicators were found. It should be noted that mottling was limited due to the inert nature of the regic sands of the study area.

6.4.2. Wetland classification system

Since the late 1960s, wetland classification systems have undergone a series of international and national revisions. These revisions allowed for the inclusion of additional wetland types, ecological and conservation rating metrics, together with a need for a system that would allude to the functional requirements of any given wetland (Ewart-Smith, J., Ollis. D., Day J. and Malan H., 2006). Wetland function is a consequence of biotic and abiotic factors, and wetland classification should strive to capture these aspects.

SANBI in collaboration with several specialists and stakeholders developed the newly revised and now accepted National Wetland Classification System (NWCS 2013). This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, including structural features at the finer or lower levels of classification (SANBI 2009).

Wetlands develop in response to elevated water tables, linked either to rivers, groundwater flows or seepage from aquifers (Parsons, 2004). These water levels or flows then interact with localised geology and soil forms, which then determine the form and function of the respective wetlands. Water is, thus, the common driving force in the formation of wetlands (DWAF, 2005). It is significant that the HGM approach has now been included in wetland classification as the HGM approach has been adopted throughout the water resources management realm with regards to the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) and WET-Health assessments for aquatic environments. These systems are then easily integrated using the HGM approach in line with the Eco-classification process of river and wetland reserve determinations used by the DWS.

Level 4 Wetland Classification

A classification system developed for the National Wetlands Inventory is based on the principles of the hydro-geomorphic (HGM) approach to wetland classification (Ewart-Smith *et al.,* 2006). This classification system was further developed and refined and a new classification system, the "Classification System for Wetlands and other Aquatic Ecosystem in South Africa" was published (Ollis, D., Snaddon, K., Job, N. and Mbona, N., 2013). The wetlands in the study area was classified in terms of functional units in line with a Level 4 category recognised in the classification system (Table 6-2, Ollis *et al.*, 2013).

Table 6-2. Level 4 wetland classification.

LEVEL			CLASSIFICATION	NOTES
Level 1			Inland system	
Level 2: Regional setting	SPATIAL FRAMEWORK	DWS Ecoregion (Kleinhans *et al.*, 2005)	Ecoregion 13: Natal Coastal Plain	
		Bioregion (NFEPA WetVeg Group)	Indian Ocean Coastal Group 1	

LEVEL	CLASSIFICATION	NOTES
Level 3: Landscape Setting	Plain	An extensive area of low relief. These areas are characterised by relatively level, gently undulating or uniformly sloping land with a very gentle gradient that is not located within a valley. The gradient is typically < 0.01 or 1:100 (Ollis et al., 2013).
Level 4: Hydrogeomorphic Unit	Depressions	A wetland or aquatic ecosystem with closed (or near-closed) elevation contours, which increases in depth from the perimeter to a central area of greatest depth and within which water typically accumulates (Ollis *et al*., 2013).
	Valley Bottom wetlands	Unchannelled valley bottom wetland: a valley-bottom wetland without a river channel running through it (Ollis *et al*., 2013).

6.5. Wetland condition (WET-Health)

6.5.1. PES and Ecological importance

Kotze *et al*., 2008 has highlighted the importance of estimating the functioning importance or ecosystem services of a wetland. These functions are impacted by the connectivity of the wetland to other ecosystems as well as the size thereof. In this study, several other sources of information were also considered, which included the National Freshwater Ecosystems Priority Areas project completed by the CSIR (CSIR, 2011), and regional and national biodiversity assessments, the latest being the National Biodiversity Assessment released by SANBI (Driver *et al*., 2012).

Wetland Condition is defined as a measure of the deviation of wetland structure and function from its natural reference condition (Macfarlane *et al.*, 2007). As the previous study was conducted in 2015 and wetlands had a negative projection of change for the next 5 years, this current study serves as the current status quo in terms of the hydrological, geo-morphological and vegetation integrity for the wetland units associated with the study area and an assessment of the current Present Ecological Status (PES) score (Macfarlane *et al*., 2007).Table 6-3 and

Table 6-4 below display the criteria of the assessment of the habitat integrity of the wetlands on site.

Table 6-3. Health categories used by WET-Health for describing the integrity of wetlands (Kleinhans *et al*., 1999; Macfarlane *et al*., 2007).

Description	PES Score	PES Rating	Management
Unmodified, natural	> 4	A	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed.
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place, but the ecosystem functions are essentially unchanged.	>3 and <=4	B	Some human-related disturbance, but mostly of low impact.

Description	PES Score	PES Rating	Management
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact and the basic ecosystem functions are still predominantly unchanged.	>2 and <=3	C	Multiple disturbances associated with need for socio-economic development, e.g. impoundment.
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	<=2	D	Habitat modification and water quality degradation.
The change in ecosystem processes and loss of natural habitat and biota is serious. The loss of natural habitat, biota and basic ecosystem functions is extensive.	>0 and <2	E	Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality.
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0	F	

Table 6-4. Habitat assessment criteria for the wetlands on site (Source: Kotze *et al*., 2005).

Criteria and attributes	Relevance
Hydrologic	
Flow modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes and velocity, which affect inundation of wetland habitats resulting in vegetation changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water quality	
Water quality modification	From point or diffuse sources. Measured directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment load modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
Hydrolic/Geomorphic	
Canalisation	Results in desiccation or changes to inundation patterns of wetlands and thus changes in habitats. River diversions or drainage.
Topographic alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat directly in inundation patterns.
Biotic	
Terrestrial encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
Indigenous vegetation removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive plant encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien fauna	Presence of alien fauna affecting faunal community structure.
Over utilisation of biota	Overgrazing, overfishing, etc.

6.5.2. Ecological importance and sensitivity

Ecological importance is an expression of a wetland's importance to the maintenance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (DWAF, 1999). This classification of water resources allows for an appropriate management class to be allocated to the water resource and includes the following:

- Ecological Importance in terms of ecosystems and biodiversity;
- Ecological functions; and
- Basic human needs.

Habitat and biotic factors are rated to a four-point scale (Table 6-5). The median of the resultant score is calculated to derive the EIS category (Table 6-6).

Table 6-5. Four-point scale to assess biotic and habitat determinants that indicate importance or sensitivity.

Rating	Explanation
None, Rating = 0	Rarely sensitive to changes in biodiversity, landscape scale or wetland sensitivity
Low, Rating =1	One or a few elements sensitive to changes in biodiversity, landscape scale or wetland sensitivity
Moderate, Rating =2	Some elements sensitive to changes in biodiversity, landscape scale or wetland sensitivity
High, Rating =3	Many elements sensitive to changes in biodiversity, landscape scale or wetland sensitivity
Very high, Rating =4	Very many elements sensitive to in biodiversity, landscape scale or wetland sensitivity

Table 6-6. Environmental Importance and Sensitivity rating scale used for calculation of EIS scores (DWAF, 1999).

Ecological Importance and Sensitivity Categories	Rating	Recommended Ecological Management Class
Very High Wetlands that are considered ecologically important and sensitive on a national level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water in major rivers	>3 and <=4	A
High Wetlands that are ecologically important and sensitive on a provincial level. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers	>2 and <=3	B
Moderate Wetlands that are ecologically important and sensitive on a local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers	>1 and <=2	C
Low/Marginal Wetlands that is not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water in major rivers	>0 and <=1	D

6.5.3. WET-EcoServices

The overall goal of WET-EcoServices is to assist decision makers, government officials, planners, consultants and educators in undertaking quick assessments of the ecosystem services that wetlands provide. Ecosystem services

of wetlands include regulating services such as flood control, supporting services such as nutrient recycling, provisioning services such as food and water, and cultural services such as education and recreation. Ecosystem services for each HGM unit is assessed separately (Kotze *et al.*, 2005).

Table 6-7 below lists and describes the ecosystem services of wetlands that are assessed when using the WET-EcoServices tool.

Table 6-7. Ecosystem services included and assessed by WET-EcoServices (Kotze *et al*., 2005)

Ecosystem services supplied by wetlands	**Indirect benefits**	**Regulating and supporting benefits**	Flood attenuation		The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream.
			Streamflow regulation		Sustaining streamflow during low flow periods
			Water quality enhancement benefits	Sediment trapping	The trapping and retention in the wetland of sediments carried by runoff waters
				Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters
				Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters
				Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts carried by runoff waters
				Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation
			Carbon Storage		The trapping of carbon by the wetland, principally as soil organic matter
	Direct benefits	**Biodiversity maintenance**			Through the provision of habitat and maintenance of the natural process by the wetland, a contribution is made to maintaining biodiversity
		Provisioning benefits	Provision of water for human use		The provision of water extracted directly from the wetland for domestic, agriculture of other purposes
			Provision of harvestable resources		The provision of natural resources from the wetland, including livestock grazing, craft plants, fish etc.
			Provision of cultivated foods		Provision of areas in the wetland favourable for the cultivation of foods
		Cultural benefits	Cultural heritage		Places of special cultural significance in the wetland, e.g. for baptisms or gathering of culturally significant plants
			Tourism and recreation		Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife
			Education and research		Sites of value in the wetland for education or research

7. RESULTS

The EKZNW Guideline for Biodiversity Impact Assessments (2013) requires that vegetation specialist studies be conducted during the summer season (beginning of November to end of April). This study's field survey was undertaken outside the recommended sampling season on 9 July and 2 September 2019.

7.1. Vegetation assessment

The RBIDZ Phase 1F Estate, inclusive of this study area, has been investigated by numerous specialists from 2003. Consistently it's been documented that the RBIDZ: Phase 1F estate has been severely impacted by anthropogenic activities such as industry development, artificial concrete lined stormwater canals, historic plantations, foot paths, littering and most importantly, habitat fragmentation. Only a few degraded vegetation communities remain recognisable in the form of coastal forest, coastal grasslands and hygrophilous sedge wetlands. The Nyanza pilot plant development is proposed in the coastal grasslands and hygrophilous sedge wetland communities (Figure 7-1). These wetlands are described and assessed in Section 0 of this report.

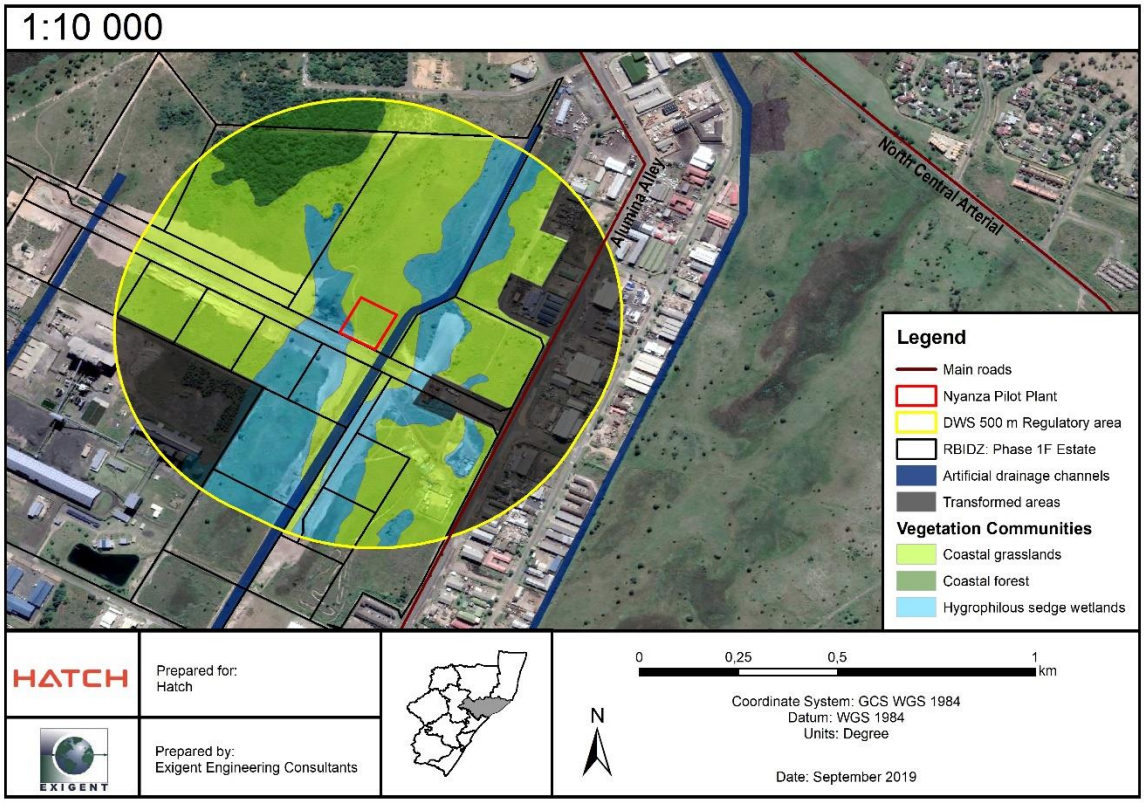

Figure 7-1. Vegetation communities within the study area.

7.1.1. Coastal grasslands

Approximately 0,8 hectares (89 %) of the Nyanza pilot plant development site is proposed in the degraded coastal grasslands (Figure 7-2a). This community comprise of approximately 47,28 hectares (50 %) of the study area and corresponds to the Grassland (Nemai, 2015) and Terrestrial weedy grassland (RHDHV, 2013) communities referred to in the previous reports. During the site investigations, several dirt tracks and bare ground adjacent to newly installed internal services were noted. The community is dominated by shrubs such as *Helichrysum krausii* and *Chrysanthemoides monolifera* subspecies *rotundata* and invaders such as *Psidium guajava*, *Cuscuta campestris, Chromolaena odorata* and *Lantana camara* were well represented.

Table 7-1. Coastal grasslands

Status:	Degraded with bare areas adjacent to recently installed internal services.
Species:	*Helichrysum krausii, Chrysanthemoides monolifera* subspecies *rotundata Imperata cylindrica, Aristida stipitata, Digitaria eriantha, Themeda triandra, Perotis patens, Melinis repens, Cyperus esculentus, Cyperus obtusiflorus, Cuscuta campestris, Solanum mauritianum*, Ricinus communis*, Psidium guajava, Lantana camara*, Parthenium hysterophorus*, Tagetes minuta, Gomphocarpus fruticosus, Bidens bipinata, Hibiscus trionum, Amaranthus spinosus, Chromolaena odorata*, Bidens pilosa, Pennisetum clandestinum, Stenotaphrum secundatum, Gomphrena celosioides, Conyza bonariensis, Sonchus oleraceus, Richardia brasiliensis, Taraxacum officinale, Pteridium aquilinum* and *Verbena bonariensis*
Red List and Declining species:	None observed
Conservation importance:	Low

* Alien invasive species

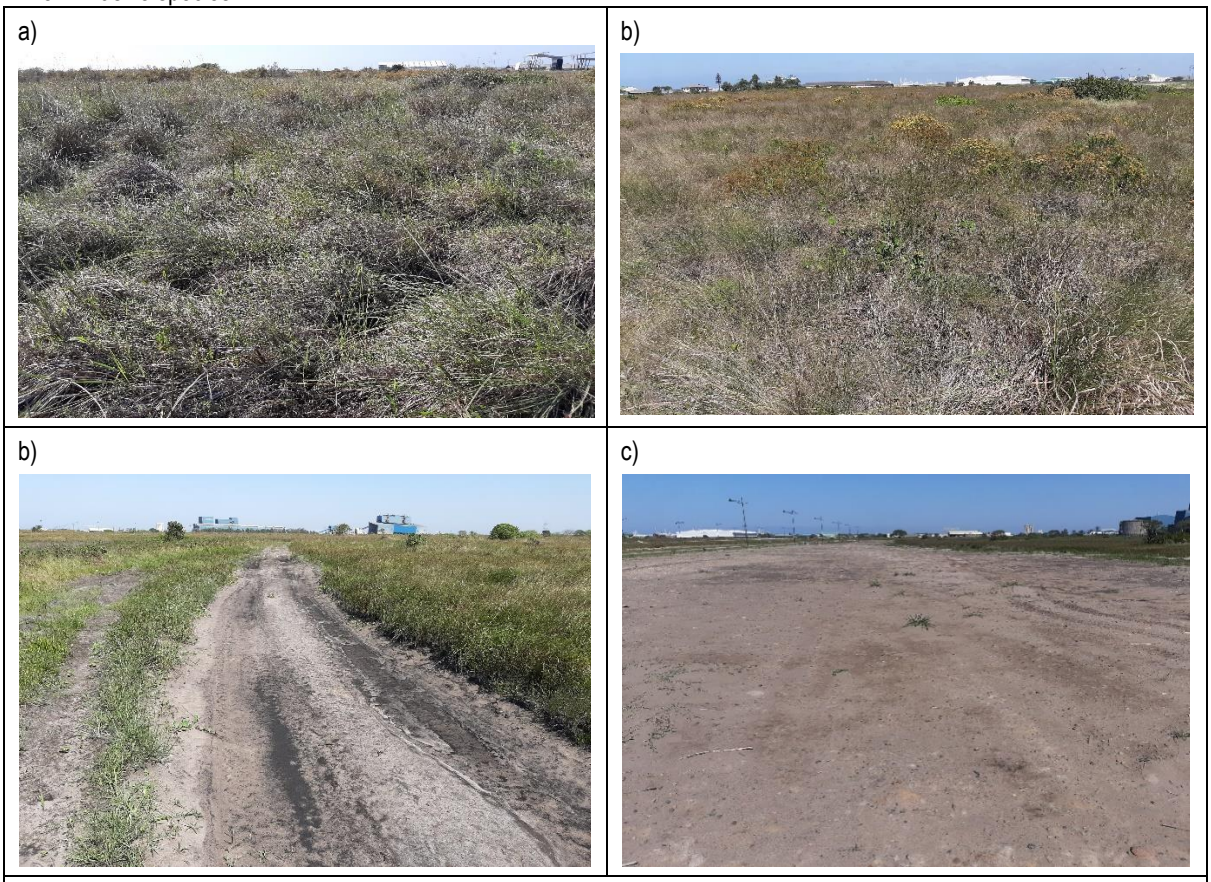

Figure 7-2. Degraded coastal grasslands where a) depicts the vegetation community at the proposed Nyanza pilot plant development site, b) the typical vegetation community c) dirt tracks traversing the RBIDZ: Phase 1F Estate and d) bare areas where internal services were installed.

7.1.2. Coastal forest

A small isolated patch of coastal forest is located to the northern boundary of the study area, approximately 350 m north of the proposed Nyanza pilot plant development site (Figure 7-3). This community was not identified RHDHV, (2013) but was referred to as the Forest patches community by Nemai (2015). It comprises of approximately 5,96 hectares (6%) of the study area and is severely degraded. This community lacks a developed understory and only remnants of the original coastal forest remain with species such as *Brachylaena discolour, Bridelia micrantha*, *Salacia kraussii*, *Phoenix reclinata*, *Rhus natalensis*, *Trema orientalis* and *Ziziphus mucronata*. The edges of this

community comprise of dense thickets of *Chromolaena odorata* and *Lantana camara*. Other dominant aliens include *Melia azedarach, Solanum mauritianum* and *Ricinus communis*.

Table 7-2. Degraded Coastal forest

Status:	Highly disturbed with some indigenous species
Species:	*Brachylaena discolour, Albizia adianthifolia, Bridelia micrantha, Vachellia karoo, Salacia kraussii, Syzigium cordatum, Trichillia emetica, Trema orientalis, Melia azedarach*, Ziziphus mucronata, Diospyros natalensis, Phoenix reclinata, Rhus natalensis, Hyphaene coriacea, Strelitzia nicolai, Psidium guajava*, Melinis repens, Digitaria eriatha, Cymbopogon plurnodis, Solanum mauritianum*, Ricinus communis*, Chromolaena odorata*, Pteridium aquilinum, Lantana camara*.*
Red List and Declining species:	None observed.
Conservation importance:	Medium

* Alien invasive species

Figure 7-3. Coastal forest vegetation community within the study area.

7.1.3. Hygrophilous sedge wetlands

Two wetland units are located within the study area and can be broadly categorised as hygrophilous sedge wetlands. The extent of this community is approximately 23,93 hectares (25%) of which 0,1 hectare extends into the western corner of the proposed Nyanza pilot plant development site. Here, topsoil stockpiling adjacent to recently installed services infrastructure has limited surface flow and resulted in ponding. In line with negotiations between RBIDZ and EKZNW and authorisations from DWS and DEDTEA, vegetation clearing and infill of sections of these wetlands have commenced in preparation for the industrial development of the RBIDZ: Phase 1F Estate (Figure 7-4).

However, due to the presence of the different wetness zones, the vegetation in this community is the most diverse in the study area, ranging from obligate water plant species such as the KZN Nature Conservation Ordinance protected species *Nymphaea nouchali* to facultative and opportunistic wetland plants such as *Kyllinga alba, Cynodon dactylon* and *Eragrostis racemosa*. Other plant species included *Ascolepis capensis, Bulbostylis hispidula, Centella asiatica, Cyperus articulatus, Cyperus congestus, Cyperus fastigiatus, Cyprus longus* var. *tenuiflorus, Cyperus natalensis, Eleocharis acutangula, Isolepis cernua, Juncus lomatophyllus, Imperata cylindrica, Ischaemum fasciculatum, Phragmites autralis* and *Typha capensis.*

These wetland areas are discussed and assessed in more detail in Section 7.2.

Table 7-3. Hygrophilous sedge wetlands

Status:	Disturbed with indigenous species
Species:	*Ascolepis capensis, Bulbostylis hispidula, Centella asiatica, Eleocharis acutangula, Isolepis cernua, Nymphaea nouchali, Juncus lomatophyllus, Imperata cylindrica, Ischaemum fasciculatum, Phragmites autralis, Typha capensis, Arundo donax, Cynodon dactylon, Digitaria eriantha, Eragrostis racemosa, Cyperus prolifer, Cyperus latifolious, Cyperus articulates, Cyperus congestus, Cyperus esculentus, Cyperus fastigiatus, Cyprus longus var. tenuiflorus, Cyperus natalensis, Kyllinga alba, Rhynchospora corymbosa, Pteridium aquilinum, Ipomoea purpurea** and *Pteridium aquilinum.*
Red List and Declining species:	*Nymphaea nouchali* protected in terms of the KZN Nature Conservation Ordinance No. 15 of 1974
Conservation importance:	Medium - High due to wetland properties

* Alien invasive species

Figure 7-4. Hygrophilous sedge wetlands within the study area where a) depicts the stockpiles that are preventing surface flow in wetland Unit B, b) ponding in the western corner of the Nyanza pilot plant development site c) typical wetlands in this vegetation community and d) vegetation clearance and infill of wetlands.

7.2. Wetland Assessment

The wetlands within the RBIDZ: Phase 1F Estate have been subject to numerous specialist studies since 2003 and the delineated boundaries have been confirmed by the various wetland specialists. Three wetland units were identified:

1. Unit A: depression / pan;
2. Unit B: interconnected unchannelled valley bottom and depression / pan wetlands; and
3. Unit C: interconnected unchannelled valley bottom and depression / pan wetlands.

Only wetland Unit B and Unit C lies within the study area for this assessment.

As the system of the Maputaland Coastal Plain is very strongly linked to the depth of the local water table, many of the wetland systems form as linked and partially linked expressions of topographic low points and associated hydrology. During drier periods the systems tend to dry out or shrink to form isolated pans or depressions. However during wetter periods, the systems expand with the rising water table and link up again through shallow groundwater and surface water links creating the unchannelled valley bottom wetlands (RHDHV, Nov 2013).

Furthermore, it is also accepted that the land of Phase 1F is historically water-logged in nature comprising predominantly wetland habitat due to its position in the low lying coastal plain. This necessitated the construction of drainage canals to mitigate flooding and enable development in the area (RHDHV Nov 2013). Three major stormwater drainage channels are located in Alton, two of which traverse RBIDZ: Phase 1F Estate. The central artificial drainage channel that borders the proposed Nyanza pilot plant development site to the east (Figure 7-5) transects wetland Unit B to the east and cuts through the centre of Unit C, notably drying both wetland units and specifically shifting the vegetation of Unit C to largely terrestrial. It comprises of homogenous stands of *Typha capensis* with stagnant to slow moving water (Figure 7-6).

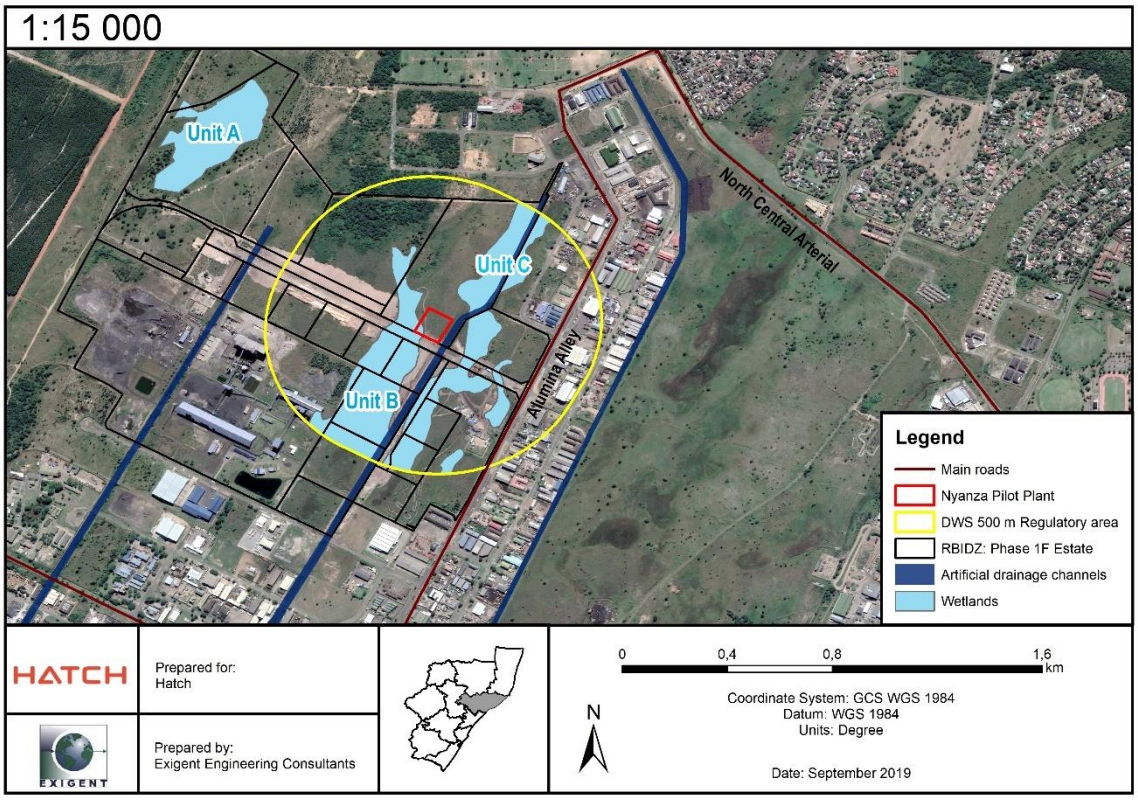

Figure 7-5. Wetlands and artificial drainage channels within the study area.

upstream

downstream

Figure 7-6. Concrete lined artificial drainage line east of the proposed Nyanza pilot plant development site.

7.2.1. Wetland Unit B

Wetland Unit B represents approximately 11,20 hectares of the study area (12%) and was previously classified as predominantly seasonal and temporary wetlands (RHDHV, Nov 2013) however permanently wet wetland zones where identified during the dry season sampling of this study south of the proposed Nyanza Pilot plant development site. Additionally, topsoil stockpiling adjacent to recently installed services infrastructure has limited surface flow and resulted in ponding of this unit which extends into the western corner of the Nyanza pilot plant development site. Large areas of this wetland unit have already been cleared of vegetation and infilled in preparation for the industrial development of the estate.

In line with previous studies, an Orthic A type soil mixture of low chroma clays and sands with active mottling was confirmed in this wetland unit (Figure 7-7).

a)

b)

c)

d)

Figure 7-7. Photographic presentation of Unit B wetlands where a) depict the ponding in the western portion of the proposed Nyanza development site, b) represents the typical wetland, c) the sandy soil with low chroma mottling and d) the cleared and infilled areas of Unit B.

Wetland condition and Services:

Irrespective of the vegetation clearance and ponding of this wetland unit, the EcoServices that this wetland unit performs remain overall intermediate across functions in terms of regulating services such as flood attenuation and streamflow regulation and supporting services such as phosphate, nitrate and toxicant removal. Other services include erosion control, carbon storage and biodiversity maintenance due the range of hydrological zones which provide a diversity of habitat and vegetation assemblages. However, the setting within the enclosed RBIDZ: Phase 1 F Estate, within the Alton industrial area, renders the utilisation of the wetland for water, food and resources limited.

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
B	11,2	100	3,5	-1	2,6	-1	1,2	-2
PES Category (See Table 5.29)			**C**	↓	**C**	↓	**B**	↓↓
Wetland Impact Score			**2,59**					
Wetland PES			**C**					

	Score	Confidence	Class
ECOLOGICAL IMPORTANCE & SENSITIVITY	**1,7**	**3,4**	**C**

7.2.2. Wetland Unit C

The total approximate extent of Wetland Unit C is 12,73 hectares of the study area (14%). It has previously been classified as predominantly seasonal and temporary in nature (RHDHV, Nov 2013) but a permanently wet pan was identified during this assessments' dry season site investigations (Figure 7-8). The pan has a distinct Orthic A type soil with the organic rich clay soil horizon above the grey regic sands. Elsewhere in this wetland unit, the soil profile conforms to the previously described typified well-drained sandy soils, absent of clay and mottling, indicative of conditions not conducive to wetland formation (RHDHV, Nov 2013).

The central artificial drainage channel bisects this unit within the northern reaches of the study area, effectively draining much of the northern portion of this unit and shifting the vegetation to terrestrial, typical coastal grassland, species. Southwards, this artificial channel cuts through its western edge.

a)

b)

c)

d)

Figure 7-8. Photographic presentation of Unit C wetlands in the study area where a) depicts the permanently wet pan, b) the organic rich permanently wet soil, c) the seasonal and temporary unchannelled portions of the wetland with its typical d) regic soil.

Wetland condition and Services:

The artificial drainage channel is severely impacting the functioning of this system and limiting the regulating services such as flood attenuation and sediment trapping, as well as stream flow regulation and erosion control functions. Furthermore, the shift to terrestrial vegetation, especially in the northern sections of this unit, limits the biodiversity maintenance services which are provided. As with wetland Unit C, the setting within the enclosed RBIDZ: Phase 1 F Estate, within the Alton industrial area, renders the utilisation of the wetland for water, food and resources limited.

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
C	12,73	100	4,0	-1	6,3	-1	6,4	-2
PES Category (See Table 5.29)			D	↓	E	↓	E	↓↓
Wetland Impact Score			5,33					
Wetland PES			D					

	Score	Confidence	Class
ECOLOGICAL IMPORTANCE & SENSITIVITY	0,8	3,2	D

For ease of reference the status of these wetlands is summarised in Table 7-4 below.

Table 7-4. Summary of study area wetland status.

Wetland Unit.	HGM Unit	Total Extent (ha)	Total area of watercourse impacted (ha)	GPS Coordinates of impacted area	Previously determined PES	Exigent			Functions
						PES	EIS	REC	
B	Interconnected unchannelled valley bottom wetlands and depressions	11,2	0,1	28°44'29.13"S 32°01'50.86"E	C	C	C	C	Regulating services: • Flood attenuation and streamflow regulation Supporting services: • Phosphate, nitrate and toxicant removal. Other services: • Erosion control, carbon storage and biodiversity maintenance.
C	Interconnected unchannelled valley bottom wetlands and depressions	12,73	N/A	N/A	D	D	D	D	Limited functioning in: Regulating services: • Flood attenuation and sediment trapping, as well as stream flow regulation Other services: • Erosion control and biodiversity maintenance

7.2.3. RBIDZ: Phase 1F Wetland Offsetting and Conservation

The RBIDZ: Phase 1F Wetland Mitigation Plan (RHDHV, 2016) sets out the previous discussions held with various stakeholders and competent authorities to discuss the management and conservation of wetlands within areas designated for development under the IDZ. The purpose of the meeting was to explore potential solutions to support industrial development.

The RBIDZ was granted approval to commence with construction form DAEA – Uthungulu (now DEDTEA), as well as DWS, while the necessary "offset" arrangements were being finalised with EKZNW. However, following an additional meeting, it was concluded that, in light of the low ecological value of Wetland Unit B, the finalised development plans and mitigation methods proposed, a wetland offset may not be required. Rather, rehabilitation of the remaining wetland area, i.e. Wetland Unit A and lower portions of Wetland Unit B (in erf 16674) and Unit C (in erf 16673) may be sufficient to mitigate any residual impacts relating to wetland functionality – specifically water quality (Figure 7-9).

Important to note is that the southern-most depression wetlands of Unit B include the Tata Steel wetland conservation amenity, which was offset at the time of the construction of the Tata Steel factory, and which cannot be included in any further offset plans (RHDHV, 2016).

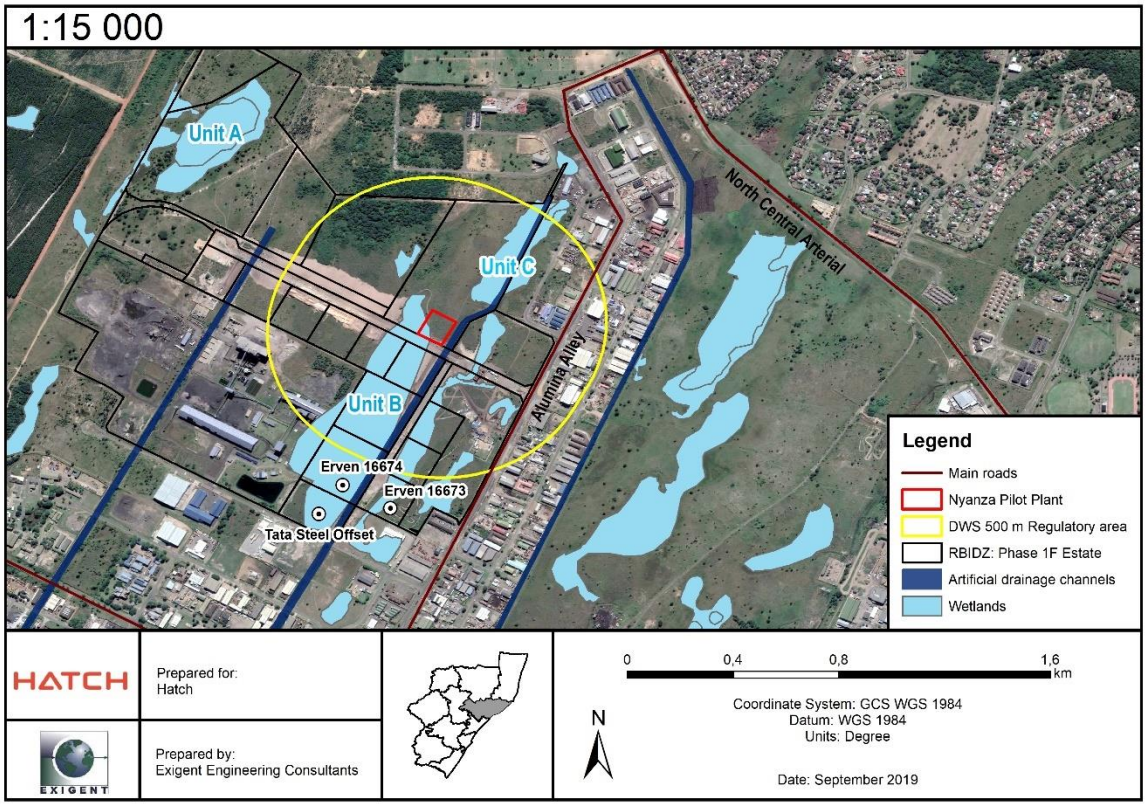

Figure 7-9. Tata Steel offset wetland and RBIDZ: Phase 1F wetland Unit B and C portions to be conserved.

On 14 July 2016, EKZNW provided an official comment stating that no offset will be required should the following recommendations made in the wetland mitigation plan be implemented. In summary, these recommendations entail the following (RHDHV, 2016):

1. At a maximum degree of infilling, a loss of 67% (28.7 ha) of wetland areas, and conservation of the remaining 33% (14.12 ha) comprising all of wetland A (11.37 ha) and the lower portion of wetland B (2.75

ha). This is without a minimum development buffer zone of 30 m to prevent anthropogenic impacts associated with development.

2. However, the above stated values must be considered as the maximum area of wetland loss (worst case scenario) that could potentially occur.
3. In addition, the most recent town planning layout proposed a Floor Area Ratio (FAR) of 40%, indicating that only 40% of each erf may be built up/occupied by a development. This allows for greater expanses of non-developed or conservation servitudes, particularly in respect to the lower portions of Wetland Unit B and Wetland Unit C.

Significance to the proposed Nyanza pilot plant

Approximately 0,1 hectare of Wetland Unit B extends into the western corner of the proposed Nyanza pilot plant development site. Based on the negotiations between the various Stakeholders and Competent Authorities, infilling of this wetland is deemed ***generally unacceptable*** however, its loss has been calculated and incorporated into the rehabilitation of the wetlands on Erven 16673 and 16674 and therefore ***approved*** and deemed ***acceptable.***

However, as the proposed Nyanza pilot plant development lies within the RBIDZ: Phase 1F Estate, they will be bound by mitigations recommended in the Wetland Rehabilitation Plan (RHDHV, 2016). In line with this Wetland Mitigation Plan, it is recommended that a portion of the 40% FAR of the full future extent of the Nyanza property be 'spent' on conservation of the portion of wetland in the western corner of the current pilot plant area.

Previously, it has been recommended that a minimum buffer of 30 m is required for the RBIDZ: Phase 1F wetlands. In light of the "no let loss" of wetlands already established within the estate and literature indicating that 15 m is the most frequently minimum width (Macfarlane *et al.*, 2014), a 15 m wide wetland buffer is recommended. The combined surface area recommended for conservation within the Nyanza pilot plant development site then calculates to 0,16 ha, which forms 17,78 % of the 0,9 ha development site (Figure 7-10).

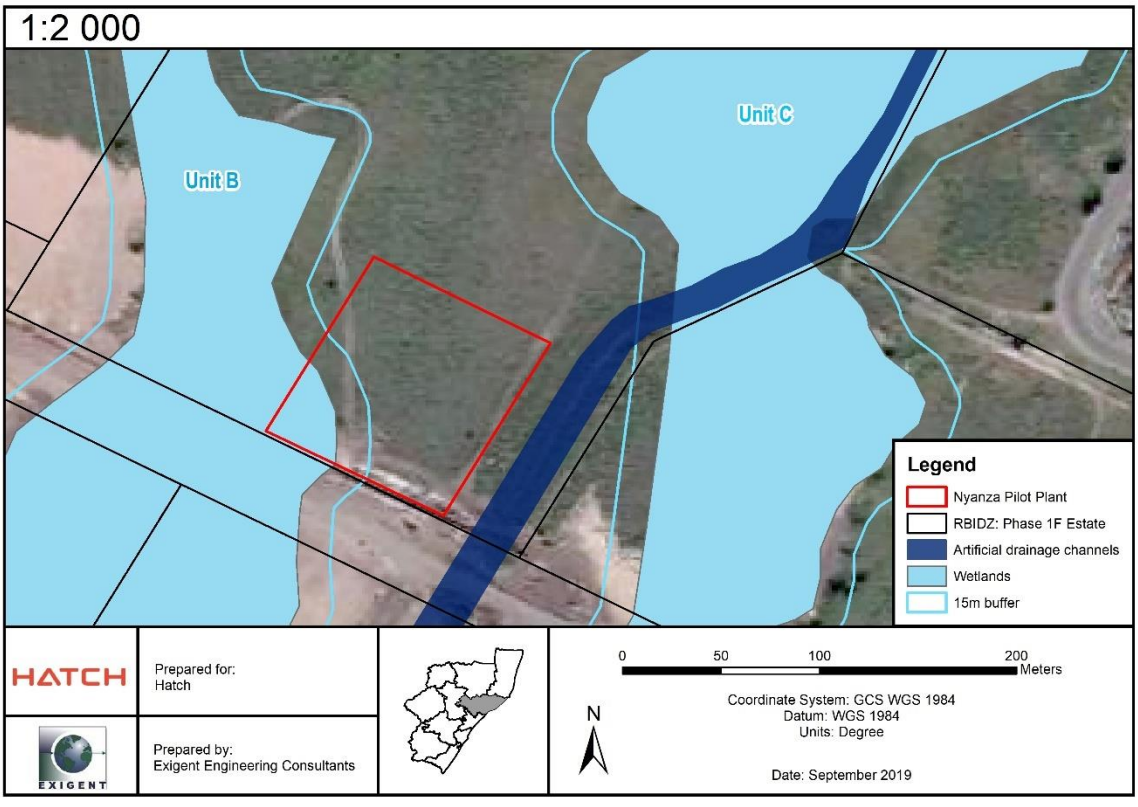

Figure 7-10. Area of direct impact the proposed Nyanza Pilot Plant will have in Wetland Unit B.

8. MEDICINAL PLANT SPECIES

Table 8-1 below indicate the medicinal species that were found in the various communities on site (Van Wyk et al. 2000; Van Wyk & Gericke 2003).

Table 8-1. Medicinal species recorded in the study area.

Species name	Common name	Use	Community
Catharanthus roseus	Madagascar periwinkle	Used to treat diabetes, rheumatism and various forms of cancer including breast cancer, urine cancer, as well as Hodgkin's and non-Hodgkin's lymphoma.	Coastal grasslands
Centella asiatica	Pennywort	Widely used for wound treatment, fever, syphilis and as a diuretic and purgative. It is also readily used in homeopathic remedies and for treatment of acne and allergies.	Coastal grasslands and hygrophilous sedge wetlands
Gomphocarpus fruticosus.	Milkweed	Leaves are used as snuff and as a sedative in the treatment of headache and tuberculosis. Roots are used to relieve stomach pain and general aches in the body. The floss is sometimes used for stuffing	Coastal grassland
Helichrysum species	Daisy family	Tea is prepared or the leaves boiled in milk to treat coughs and colds. The smoke from burning the leaves are inhaled for pain relief while the leaves are used on wounds to prevent infection.	Coastal grassland
Psidium guajava	Guava	The crushed leaves are boiled in water and the infusion is taken orally, as a tea or as an enema for diarrhoea. The leaves are often also used to treat ailments such as diabetes, coughs, cols, ulcers, boils and wounds.	Coastal grassland
Ricinus communis	Castor oil plant	Leaf infusions, administered orally or as enemas, of are used to treat stomach-ache while leave and root wrappings are applied to wounds, sores and boils.	Coastal grassland and hygrophilous sedge wetlands
Typha capensis	Bulrush	The thick, spongy rhizomes of are often harvested to treat venereal diseases and to ensure easy delivery during pregnancy. It is also used for dysmenorrhoea, diarrhoea, dysentery and to enhance the male potency and libido. It is also used to enhance fertility in woman and said to improve circulation.	Hygrophilous sedge wetlands
Vachellia species	Thorn trees	Treating diarrhoea and dysentery. The bark, leaves and gum are used for colds, conjunctivitis and haemorrhage, while the gum is also used for oral thrush.	Coastal grassland and degraded Coastal Forest
Ziziphus micronata	Buffalo thorn	Warm bark infusions are used to treat cough and chest problems while root infusions are popular in treating diarrhoea and dysentery. Roots and leaves are also applied externally on boils, sores and glandular swelling to promote healing and relief pain.	Coastal Forest

9. INVASIVE PLANT SPECIES

Any plant that occurs in an area where it is not indigenous is referred to as an alien (exotic, foreign, introduced, non-native and non-indigenous) plant. If these plants can maintain populations without human help they can be referred to as naturalised plants. If such naturalised plants are also able to spread over considerable distances into new, undisturbed, natural areas and replace the indigenous vegetation, they are regarded as alien invasive plants, or invaders (Klein 2002).

Alien invasive plants are like pioneer plants in that they rapidly colonise disturbed areas but differ from pioneer plants in having the additional ability to encroach upon undisturbed, pristine areas. They usually grow vigorously

and disperse rapidly, and instead of being outcompeted by better-adapted plants, the invasive plants actively displace the indigenous vegetation and often transform the plant community (Klein 2002).

Alien plant invasions can cause:

- A decline in biological diversity;
- Local extinction of indigenous species;
- Decrease in productivity of agriculture and rangeland;
- Increased agricultural input costs;
- Reduced streamflow in rivers;
- Choking of watercourses;
- A decline in animal species; and
- Respiration by submerged weeds can cause oxygen deficiencies in water.

The control of invasive plant species is addressed under the Conservation of Agricultural Resources Act (CARA), Act 43 of 1983 Regulations 15 and 16 and the National Environmental Management: Biodiversity Act (NEMBA), Act 10 of 2004. CARA classifies invasive species under three categories while NEMBA identifies four categories per the invasiveness and threat to the environment (Table 9-1).

Table 9-2 contains a list of invasive species observed during the site investigation. Not all species are classified as CARA or NEMBA species, although they may be recognised as typical ruderal species and problem plants within South Africa (Bromilow, 2001).

Table 9-1. Invasive plant species categories (Landcare South Africa, no date; NEMBA, 2004)

CARA categories		NEMBA categories	
1	Invaders are species that will no longer be allowed to occur on any property in South Africa because their harmful properties outweigh their useful qualities.	1a	These invader species must be controlled. The landowner must take immediate to control and maintain the control of the listed invasive species and allow an authorised official from the Department onto the land to monitor, assist or implement the control of the listed invasive species.
2	Plants are species proven to have a potential of becoming invasive, but with commercial value. Provision is made in CARA in Regulations 15 and 16 for the species to occur in certain demarcated areas, but the species requires removal from all areas outside the demarcated areas. Category 2 plants may never occur within 30 m of the 1:50 year floodline of any wetlands or watercourses.	1b	The plant invasive species must be contained. The landowner must control the listed invasive species in accordance with the Invasive Species Management Programme if it has been developed in terms of Regulation 7. The landowner must allow an authorised official from the Department onto the land to monitor, assist or implement the containment of the listed invasive species or compliance with the Invasive Species Management Programme contemplated in Regulation 7.
3	Invaders are plants that are proven to have the potential of becoming invasive. These plants are, however, popular garden plants (ornamentals or shade trees) and it will take a long time to replace these species. Category 3 plants are not allowed to occur anywhere, unless the plants were already in existence when the regulations came into effect. None of the plants may occur within 30 m of the 1:50 year flood zone of any wetlands or water courses.	2	These species require a permit to carry out a restricted activity within an area specified in the Notice, within National Parks, Provincial Reserves, mountain catchment areas or Forestry Reserves specified in the Protected Areas Act, or in the Permit. Landowners must ensure that the specimens do not spread outside the land or area specified in the permit. Any species listed as Category 2 Invasive Species outside the specified area must be considered as Category 1B Listed Invasive Species and must managed accordingly.
		3	These invasive species are subject to exemptions and prohibitions. However, any plant invasive listed in Category 3 that occurs in riparian areas, must be

CARA categories	NEMBA categories	
		considered as Category 1b Listed Invasive Species and must be managed accordingly.

Table 9-2. List of alien and invasive and weed species observed in the study area.

Species name	Type	CARA Category	NEMBA Category
Arundo donax	Alien and invasive	1	1b
Catharanthus roseus	Alien and invasive	-	1b
Chromolaena odorata	Alien and invasive	1	1b
Cuscuta campestris	Alien and invasive	1	1b
Lantana camara	Alien and invasive	1	1b
Parthenium hysterophorus	Alien and invasive	1	1b
Pennisetum clandestinum	Alien and invasive	-	1b in protected areas and wetlands
Schinus terebinthifolius	Alien and invasive	1	1b in KZN
Solanum mauritianum	Alien and invasive	1	1b
Verbena bonariensis	Alien and invasive	-	1b
Psidium guajava	Alien and invasive	2	2 in plantations in KZN 3 elsewhere in KZN
Ricinus communis	Alien and invasive	2	2
Melia azadarach	Alien invasive	3	1b
Amaranthus spinosus	Weed	Not categorised	
Bidens bipinata	Weed	Not categorised	
Bidens pilosa	Weed	Not categorised	
Conyza bonariensis	Weed	Not categorised	
Hibiscus trionum	Weed	Not categorised	
Richardia brasiliensis	Weed	Not categorised	
Pteridium aquilinum	Weed	Not categorised	
Sonchus oleraceus	Weed	Not categorised	
Sorgum bicolor	Weed	Not categorised	
Tagetes minuta	Weed	Not categorised	
Taraxacum officinale	Weed	Not categorised	

Failure of the owner to remove CARA Category 1 and contain NEMBA Category 1b invaders from his/her property may result in prosecution under CARA and NEMBA legislation.

It is recommended that the species present in the Nyanza Pilot Plant development site be removed during construction. It is further recommended that RBIDZ compile an overarching Alien and Invasive Eradication and Management plan for the entire Phase IF Estate.

10. PROTECTED PLANT SPECIES

Various plant species and/or plant communities are protected by legislation, namely:

1. KZN Nature Conservation Ordinance No. 15 of 1974;
2. KZN Nature Conservation Act, 1997 (Act 9 of 1997);
3. National Forest Act, 1998 (Act 84 of 1998);
4. NEMBA, 2004 (Act 10 of 2004); and
5. CITES.

The distribution ranges of all species were assessed and a list compiled of species with a distribution range within the study area. During the site visit, the distribution of these species was noted for permit application purposes.

10.1. KZN Nature Conservation Ordinance No. 15 of 1974

Schedule 12 of the KZN Nature Conservation Ordinance No.15 of 1974 lists the indigenous plant species specially protected (Table 10-1).

Table 10-1. Specially protected indigenous plant species in terms of the KZN Nature Conservation Ordinance No 15. of 1974. The species located within the proposed Nyanza pilot plant development site is highlighted in green.

Family / Species Name	Common names
All Zamiaceae	cycads
Stangeria eriopus	stangeria
All Liliaceae	lilies, irises, watsonias, aloes, blood flowers, clivias (bush lilies)
All Amaryllidaceae	christmas bells, climbing bells, crinums, haworthias, gladioli
All Iridaceae	brunsvigias (candelabra flowers), dieramas (fairy bells), fire lilies, catherine wheels, wind balls, spider lilies, butter lilies, pineapple flowers, red hot pokers, chinkerinchees, squills, ifafa lilies, tulps, harebells, grassbells, chinese lanterns
All Orchidaceae	orchids
All Cyathea	tree ferns
All Ceropegia	ceropegias
Gerbera aurantiaca	Hilton daisy
Dioscoreaceae	elephant's foot
Protea dracomontana	protea
P. gaguedi	protea
P. roupelliae	protea
P. simplex	protea
P. subvestita	protea
P. welwitschii subsp. *hirta*	protea
All Adenium	impala lilies
Pachypodium saundersii	spiny impala lily
All Stapelia	
All Huernia	succulent asclepiads
All Caralluma	succulent asclepiads
All Duvalia	succulent asclepiads
All Stultitia	succulent asclepiads
All Brachystelma	succulent asclepiads
All Nymphaeaceae	**water lilies**
All Zantedeschia	arum lilies
All Velloziaceae	blackstick lilies, monkeys' tails
Ocotea bullata	black stinkwood
Millettia grandis	umzimbeet

Nymphaea nouchali was identified within Wetland Unit B which extends into the western corner of the Nyanza pilot plant development site. **A permit will be required from EKZNW for the removal** of these individuals prior to the proposed impact on the wetland.

10.2. KZN Nature Conservation Act (1997)

In terms of Chapter 8 of the KZN Nature Conservation Act (1997), affected indigenous plant species are divided into "specially protected" and "protected" categories, each with particular protection criteria. "Specially protected" plants are those species that are deemed to be under most threat of extinction and therefore require the greatest possible legal protection. Protected plants ae those plants that are not currently considered to be as threatened as specially protected species but need legal protection to protect them from being over-exploited. If a person wishes

to gather, export, import, introduce, sell, relocate or translocate a specially protected or a protected species, a permit should be obtained from EKZNW before doing so.

Table 10-2 lists the KZN Nature Conservation Act species with a distribution range in the study area. A permit will be required prior to removal of any of these specimens.

Table 10-2. KZN Nature Conservation Act (1997) protected and specially protected species.

SPECIES NAME	COMMON NAME
Specially protected trees	
Warburgia salutaris	Pepper-bark tree
Protected species	
Bersama lucens	Glossy white ash
Brionadia salicina	Matumi
Cassipourea gerrardii	Common onionwood
Cassipourea mossambicus	Sand onionwood
Encephalartos lebomboensis	Lebombo cycad
Gladiolus dalenii	Natal lily
Haworthia limifolia	Harworthias
Huernia hystrix	Porcupine huernia
Huernia zybrina	Zebra huernia
Newtonia hildebrandtii	Lebombo wattle
Eulophia clitellifera	Orchidaceae
Eulophia speciosa	Orchidaceae
Eulophia streptopetala	Twisted-petal eulophia
Eulophia welwitschii	Orchidaceae
Eulophia petersii	Orchidaceae
Eulophia leachii	Orchidaceae
Podocarpus falcatus	Common yellowwood
Prunus africana	Red stinkwood
Albuca setosa	Small white albuca
Cryptocarya woodii	Cape quince
Stapelia gigantean	Giant stapelia
Sideroxylon inerme	White milkwood

None of these species were found within the study area during the site investigations. However, *Eulophia speciosa* was recorded in the RBIDZ Phase 1F, approximately 480 m west of the Nyanza Pilot Plant development site (Nemai 2015). It is recommended that a search and rescue operation be undertaken within the Nyanza development site prior to construction within the flowering season of this species.

10.3. National Forest Act (1998)

Based on an assessment of the list of protected tree species, as identified in Regulations 716 of the NFA, there are 17 species with a distribution range in the study area (Table 10-3). **However, none of these species occur with the study area.**

Table 10-3. DAFF Protected tree species with a distribution range in the study area.

Species name	Common name
Ficus trichopoda	Swamp fig
Mimusops caffra	Coastal red milk wood
Sideroxylon inerme	White milk wood
Boscia albitrunca	Shepard's tree
Cleistanthus schlechteri	False tamboti
Ocotea bullata	Stink wood
Barringtonia racemosa	Powder-puff tree

Species name	Common name
Pittosporum viridiflorum	Cheese wood
Podocarpus falcatus	Outeniqua yellow wood
Podocarpus latifolius	Red yellow wood
Bruguieria gymnorrhiza	Black mangrove
Rhizophora mucronata	Red mangrove
Ceriop tagal	Kirkiri
Catha edulis	Bushman's tea
Cassipourea swaziensis	Swazi onion wood
Balanites maughamii	Green thorn
Sclerocarya birrea subspecies *caffra*	Marula

10.4. Red data listed species

South Africa is a signatory to the United Nations Convention on Biological Diversity (1992) and, as such, needs to conserve biological diversity, promote the sustainable use of biological diversity, and ensure the fair and equitable sharing of benefits arising out of the utilisation of genetic resources. Principle 4(a) of the NEMA states that disturbance to ecosystems and loss of biodiversity should be avoided, minimised and remedied.

To promote the conservation of biodiversity, species of concern have been identified by the World Conservation Organisation (IUCN) Red Data lists which they feel require protection. The World Conservation Organisation (IUCN) has three threatened categories, namely Critically Endangered, Endangered and Vulnerable. Species that have been evaluated according to the IUCN criteria and do not fall into one of the threatened categories can be classified as Least Concern, Near Threatened or Data Deficient (Minter *et al.,* 2004; Hilton-Taylor, 1996):

Extinct: The species are presumed extinct when extensive surveys have failed to record an individual. Surveys should be in known and expected habitat, at appropriate times and throughout its historic range.

Extinct in the Wild: Exhaustive surveys in known and expected habitat, at appropriate times and throughout its historic range have failed to record an individual. Populations occur well outside the past range, in cultivation or in captivity.

Critically Endangered: Species facing an extremely high risk of extinction in the wild.

Endangered: These taxa are in danger of extinction and are unlikely to survive if the current situation continues.

Vulnerable: Vulnerable species are facing a high risk of extinction in the wild. Vulnerable species are taxa that are likely to move into the Endangered category in the near future if the factors causing the decline to continue to be present.

Near Threatened: Species are classified as Near Threatened when they do not meet the criteria for the threatened categories but are close to classifying as Threatened or will likely classify as Threatened in the near future.

Data Deficient: A species is classified as a Data Deficient when there is a lack of appropriate data on the distribution and/or population status of the species. The species may be well studied, and the biology known, but data on the abundance and/or distribution are not available. The category indicates that more data are required and that there is a possibility that the species may be classified into one of the threat categories in the future.

Least Concern: Species that are widespread and abundant are normally included in this category.

From the RDL/SEA species assessment, it was indicated that species listed for the quarter degree square (QDS) 2832CA are listed in Table 10-4 below.

Table 10-4. Results of the Red Data Listed/SEA assessment.

Species name	Current IUCN listing	Flowering season	Probability of occurrence	Motivation
Eulophia speciosa	Declining	October and January	High – an individual was confirmed west from the Nyanza Pilot Plant development site.	The plants normally grow in savanna grassland, bushland and wooded grassland, and have also been recorded from marshy coastal grassland and montane grassland. They are found from near sea level (often exposed to salt spray) to 1 700 m in southern Africa. In South Africa the plants usually grow in colonies of up to 50 plants in sandy soils or in clay (http://www.plantzafrica.com). **An individual of this species was found within the RBIDZ Phase 1F Estate.** It is located approximately 480 m from the proposed development.
Aloe cooperi	Declining	December to March. However *A. cooperi* subsp. *pulchra* flowers April to May	High	Grows in grasslands in dry, rocky areas or wet, marshy habitats in altitude from sea level to 1 800 m (Van Wyk & Smith, 2003). Habitat available in the study area and the development site.
Cineraria atriplicifolia	Vulnerable	March to July	High	Grassland, open dry thornveld, or sometimes at the edges of thicket or forest or below steep cliffs in river valleys, 30-800 m (Von Staden, 2008). Various habitats available within the study area.
Kniphofia leucocephala	Critically endangered	September to December, but occasional flowers appear throughout the year.	High	Known only from vleis or wetlands in low-lying coastal grassland in the Richards Bay area of KwaZulu-Natal (www.plantzafrica.com). Habitat available within the study area and on the proposed development site.
Kniphofia littoralis	Near threatened	August to October	High	Coastal grassland. Moist depressions, not usually in permanently waterlogged soils, 5-200m (Scott-Shaw & Victor, 2005). Available habitat with the study area and in the development site..
Raphionacme lucens	Near threatened	July to January	High	In Coastal Grassland Zululand (Pooley 1998). Habitat available in the study area and the development site.
Restio zuluensis	Vulnerable		High	Grows on the margins of wetlands in short coastal grassland (Von Staden & Scott-Shaw, 2007). Short coastal grassland wetlands present within the study area and the development site.
Elaeodendron croceum	Declining	August to April	Medium to high	Occurs on the margins of coastal and other moist inland forests (http://www.plantzafrica.com). Habitat within the study area.
Cyperus sensilis	Near threatened		Medium to high	Coastal grasslands and dunes. Associated with seasonal pans, forms a conspicuous zone around the water edge. Altitude 5-50 m. Perennial Herb. Species is potentially tolerant of wetland degradation (Agenbag, 2010). Possible habitat on site in the form of wetlands.
Freesia laxa subsp. *azurea*	Vulnerable	Mid-spring to mid-summer	Medium to high	Grassy dunes or light shade along margins of coastal forests (Von Staden, 2012). Possible habitat within the study area.

Species name	Current IUCN listing	Flowering season	Probability of occurrence	Motivation
Adenia gummifera var. *gummifera*	Declining	October to April	Medium	Forested ravines, forest patches and forest margins, forest scrub, miombo woodland, savanna, dune forest, on stony slopes, termitaria and littoral bush, 0-1800 m (Williams *et al*., 2008). Possible habitat within the study area.
Asclepias gordon-grayae	Endangered	September to April	Low	Tall, unburnt coastal grassland, in black peat soils in marshy areas, 10-100 m (Nicolas et al., 2007). No peat soils recorded within the study area..
Bonatea lamprophylla	Vulnerable	September to November	Low	Deeply shaded areas in coastal dune forest (Victor et al., 2006). No habitat present on site.
Disperis johnstonii	Near threatened	February to March	Low	Brachystegia woodland, forest patches, usually in shelter of rocks, 1050-1350 m (Kurzweil & Victor, 2009). No available habitat within the study area.
Sisyranthus franksiae	Threatened			Terrestrial (SANBI, 2014). Limited information available,
Nidorella tongensis	Threatened			No information available

11. IMPACT ASSESSMENT

The methodology as stipulated by Hatch have been applied to assess the impacts of the proposed Nyanza pilot plant and are described below.

The impact assessment will focus on the direct and indirect impacts associated with the project. All impacts will be analysed with regard to their extent, intensity, duration, probability and significance.

The significance of potential impacts that may result from the proposed project will be determined to assist decision-makers (typically by a designated authority or state agency, but in some instances, the proponent).

The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur.

The criteria used to determine impact consequence are presented in the table below.

Rating	Definition of Rating	Score
Extent – Physical extent or spatial scale of the impact		
Local	Confined to project or study area or part thereof (e.g. the development site and immediate surrounds)	1
Regional	The region (District Municipality or Quaternary catchment)	2
National	Nationally or beyond	3
Intensity – Impact would be destructive or benign		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
Duration – Timeframe in which the impact would occur		
Short Term	Up to 2 years and reversible	1
Medium Term	2 to 15 years and reversible	2
Long Term	More than 15 years and irreversible	3

The combined score of these three criteria corresponds to a Consequence Rating, as follows:

Combined Score	3-4	5	6	7	8-9
Consequence Rating	Very Low	Low	Medium	High	Very High

Once the consequence is derived, the probability of the impact occurring is considered, using the probability classifications presented in the table below:

Probability – Likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% – 70% chance of occurring
Probable	<70% – 90% chance of occurring
Definite	> 90% chance of occurring

The overall significance of impacts is determined by considering consequence and probability using the rating system prescribed in the table below:

		Probability			
		Improbable	**Possible**	**Probable**	**Definite**
Consequence	**Very low**	Insignificant	Insignificant	Very low	Very low
	Low	Very low	Very low	Low	Low
	Medium	Low	Low	Medium	Medium
	High	Medium	Medium	High	High
	Very high	High	High	Very high	Very high

Finally, the impacts are also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below:

Status of impact	
Indication of whether the impact is adverse (negative) or beneficial (positive)	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, Hatch's judgment and / or specialist knowledge	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **Insignificant**: Potential impact is negligible and will not have an influence on the decision regarding the proposed activity / development.
- **Very low**: Potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity / development.
- **Low**: Potential impact may not have any meaningful influence on the decision regarding the proposed activity / development.
- **Medium**: Potential impact should influence the decision regarding the proposed activity / development.
- **High**: Potential impact will affect the decision regarding the proposed activity / development.
- **Very high**: Proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended and impacts are rated in the prescribed way, both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential**: Measures that must be implemented and are non-negotiable
- **Best Practice**: Recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented.

The assessment of impacts adheres to the minimum requirements in the EIA Regulations and takes into account applicable official guidelines.

The following key issues have been assessed during construction and operational phases (Table 11-1 and Table 11-2):

- Loss of vegetation and terrestrial habitat;
- Loss of wetland/riparian habitat;
- Potential loss of Species of Special Concern;
- Sedimentation and erosion;
- Infestation of alien species;
- Hydrological impacts; and
- Pollution of surface and groundwater due to chemical, oil and fuel spills.

11.1. Temporary loss of vegetation and terrestrial habitat

Vegetation plays an important part in the functioning of ecosystems, as well as maintaining biological processes in the soil, reducing the loss of topsoil and nutrients, and recycling of nutrients. The removal of natural vegetation results in a loss of habitat for various fauna and flora species. It has however been recorded numerously that the vegetation in the study is degraded and has a long history of anthropogenic impacts.

Mitigation

- No indigenous vegetation may be collected or used for firewood.
- Where construction occurs close to the sensitive areas of natural vegetation or any plants of high conservation value, these must be suitably and visibly demarcated and cordoned off by the ECO prior to, and during the construction phase.
- If any plants of high conservation value are found on site, a plant 'rescue' operation must be undertaken under the direction of an ecologist/botanist prior to construction, where plants of high conservation value will be impacted by any part of the development (construction or operation phase). These should be carefully transplanted to a suitable site nearby and watered until established.
- Where clearing is required outside of earthwork/construction areas, vegetation should be brush-cut rather than cleared to speed re-establishment following site closure.

Table 11-1. Impact assessment for vegetation and wetland impacts during the construction phase.

Impact	Extent	Intensity	Duration	Consequence Score	Consequence Rating	Probability of occurrence	Significance of impact without mitigation	Significance of impact with mitigation	Status of impact	Confidence in assessment	Mitigation and optimization measures
Loss of vegetation and terrestrial habitat	1	1	3	5	Low	Definite	Low	Very low	Negative	High	Best practice
Loss of wetland habitat	1	2	3	6	Medium	Definite	Medium	Low	Negative	High	Essential
Potential loss of species of concern	1	2	3	6	Medium	Definite	Medium	Low	Negative	High	Essential
Sedimentation and erosion	1	2	2	5	Low	Possible	Very low	Very low	Negative	High	Essential
Infestation of alien invasive species	1	2	1	4	Very low	Probable	Very low	Very low	Negative	High	Essential
Habitat fragmentation (Loss of corridors)	1	2	2	5	Low	Possible	Very low	Very low	Negative	Medium	Best practice
Hydrological impacts	1	2	2	5	Low	Possible	Very low	Very low	Negative	High	Best practice
Pollution of surface and groundwater due to chemical, oil and spillages	1	2	2	5	Low	Possible	Very low	Very low	Negative	High	Essential

Table 11-2. Impact assessment for vegetation and wetland impacts during the operational phase.

Impact	Extent	Intensity	Duration	Consequence Score	Consequence Rating	Probability of occurrence	Significance of impact without mitigation	Significance of impact with mitigation	Status of impact	Confidence in assessment	Mitigation and obtimization measures
Sedimentation and erosion	1	2	2	5	Low	Possible	Very low	Very low	Negative	High	Essential
Infestation of alien invasive species	1	2	2	5	Low	Probable	Very low	Insignificant	Negative	High	Essential
Habitat fragmentation (Loss of corridors)	1	2	2	5	Low	Possible	Very low	Very low	Negative	Medium	Best practice
Hydrological impacts	1	2	2	5	Low	Possible	Very low	Very low	Negative	High	Best practice
Pollution of surface and groundwater due to chemical, oil and spillages	1	2	2	5	Low	Possible	Very low	Very low	Negative	High	Essential

11.2. Loss of wetland/riparian habitat

Three wetland units are located within the RBIDZ Phase 1F Estate. However, only Wetland Unit B and Unit C lies within the study area of the proposed Nyanza pilot plant. Approximate 0,1 hectare of Wetland Unit B will be directly impacted should it be infilled during the proposed development. These areas were discussed in detail in Section 0. When working within this sensitive wetland area, specific mitigation measures must be implemented together with those recommended within the RHDHV (2016) Wetland Mitigation Plan.

Mitigation

- If construction in Wetland Unit B is unavoidable, the development footprint should be kept to minimum.
- Construction activities within the wetland should take place during the dry season, where possible.
- Excavated soils should be placed on the upslope side, minimizing the risk of erosion and excess sediment entering the freshwater ecosystems.
- No vegetation clearing or earth moving activities to occur in the wetlands, outside of the development site.
- No rubble may be temporarily stockpiled or dumped within the wetlands.

11.3. Potential loss of species of special concern

Nymphaea nouchali was identified within Wetland Unit B which extends into the western corner of the Nyanza pilot plant development site. A permit will be required from EKZNW for the removal of these KZN Nature Conservation Ordinance species prior to the proposed impact on the wetland. No Red Data or protected species in terms of other legislation were observed during the site visit.

Mitigation

- It is recommended that a search and rescue operation be undertaken within the Nyanza development site prior to construction within the flowering season of the various species.
- The necessary permit applications must be obtained prior to removal of any species listed in section 10.
- Should these species of concern be identified, the ECO should be informed and appropriate action taken.

11.4. Sedimentation and erosion

Vegetation clearance may result in sheet erosion. The clearance of vegetation will further reduce the capacity of the land surface to retard the flow of surface water, thus, decreasing infiltration, and increasing both the quantity and velocity of surface water runoff and erosion. Should the stormwater management design of the engineers not be adequate, erosion problems could result from the proposed development.

Mitigation

- Erosion control structures must be put in place where soil may be prone to erosion.
- Topsoil and subsoil should be stockpiled separately, to not impact on areas outside the servitude.
- Topsoil storage should not exceed a height of 2 m.
- During rehabilitation, prompt and progressive reinstatement of bare areas is required. The topsoil layer is to be replaced on top during reinstatement.
- The control of soil erosion and siltation associated with construction and operation is important at all locations on site, and particularly adjacent to wetlands. Both temporary and permanent soil erosion control measures must be used during the construction and operation phases. Any earth-worked areas, which may lay bare for extended periods, should be temporarily grassed.
- Checks must be carried out at regular intervals to identify areas where erosion is occurring.
- Remedial action, including the rehabilitation of eroded areas and, where necessary, the relocation of the paths causing erosion, is to be undertaken.
- Large sediment loads must be prevented from entering watercourses.

11.5. Infestation of alien invasive species

The disturbance of the natural vegetation by the proposed activities may aid exotic species to invade. Alien and invasive species are already a problem in the study area. Utmost care should be taken not to disperse and increase the colonisation of these species.

Mitigation

- Natural open spaces outside the development footprint should be left in their undeveloped state.
- Any existing or new exotic vegetation within the proposed development site must be eradicated.
- A monitoring program should be put in place to remove exotic vegetation and maintain areas free from exotic invasions during construction.
- Within, and in proximity to the wetland, successful re-vegetation, if required, is crucial to stabilise soils and limit infestation by invasive alien plant species. Rehabilitation should be undertaken on a progressive basis in these areas.

11.6. Hydrological Impacts

This refers to any alterations in the quantity, timing and distribution of water inputs and through flows within wetlands and drainage lines. Construction activities associated with bulk earthworks (such as excavations, stockpiling, reshaping, back-filling and compaction) in the catchment area feeding downstream watercourses can alter natural patterns of surface runoff reaching water resources downslope/downstream. Excavations may impound and redirect water, thus starving downstream water resources. Infilling, compaction and rutting of soils caused by construction vehicles working outside the wetland also alter the patterns of diffuse surface and sub-surface flows by altering micro-topography and the permeability of soil profiles. Changes in flow patterns reaching aquatic ecosystems does not only affect hydrological functionality and thus ecosystem integrity, but may lead to erosion and sedimentation though increased runoff velocities linked to concentrated flow paths created during construction.

Mitigation

- Bare areas where vegetation has been removed pose a risk of becoming a sediment load into the downstream sections of wetland Unit B during heavy rainfall or windy conditions, this must be effectively managed for prevention.
- Temporary stormwater management structures should be used during construction.
- Any areas damaged as a result of stormwater runoff from the construction site must be rehabilitated immediately.

11.7. Pollution of surface and groundwater due to chemical, oil and fuel spills

Contaminants such as hydrocarbons, solids and pathogens will be generated from several potential sources (examples include petrol/diesel, oil/grease, paint, cement/concrete and other hazardous substances). These contaminants have the capacity to negatively affect aquatic ecosystems including sensitive or intolerant species of flora and fauna. Where significant changes in water quality occur, this will ultimately result in a shift in aquatic species composition, favouring more tolerant species, and potentially resulting in the localised exclusion of sensitive species. Sudden drastic changes in water quality can also have chronic effects on aquatic biota leading to localised extinctions. Deterioration in water quality can also affect the suitability for potential human domestic/agricultural use of wetlands.

During the construction and operational phase of the proposed project, the potential for spills and leakages will occur. Contaminants will include mainly pigments/ oil/ grease and petrol/ diesel. These pollutants may result from leakages from vehicles, oil changes during the servicing of vehicles or, or from spills as a result of incorrect handling of substances or equipment.

Mitigation

- Extra care must be taken to prevent any potentially hazardous substances from entering the wetlands during heavy rainfall events.
- The use of all chemicals and potentially hazardous substances must take place on a tray or an impermeable surface.
- All rubble and other types of waste must be disposed at a licensed waste disposal site to prevent it from entering the watercourses.
- In the event of the spilling of chemicals and potentially hazardous substances, this must be addressed immediately and reported to the relevant authority.

12. RECOMMENDATIONS

The following should be implemented:

- Throughout the lifetime of the proposed construction activities, nobody may capture, trap, hunt or kill any wild animal on study area.
- It is recommended that a search and rescue operation be undertaken within the Nyanza development site prior to construction within the flowering season of the various protected species to ascertain their absence.
- Permits should be obtained for all required species in terms of the DAFF, NEMBA, KZN Nature Conservation Ordinance and KZN Nature Conservation Act as described in Section 10.
- Specific wetland management measures should be implemented, as stipulated in Section 11.2.
- Pesticides should also be discouraged from use during the construction phase of the development.

13. CONCLUSION

Nyanza proposes to construct a commercial scale plant which will produce rutile TiO_2 pigment products, with the key objective to produce saleable TiO_2 pigment. The extent of the Nyanza TiO_2 Pilot Plant is approximately 0,90 hectares, this study's investigation however extends to a larger study area (98,93 ha) which includes the DWS required 500 m regulatory area surrounding the Nyanza TiO_2 Pilot Plant.

The RBIDZ Phase 1F Estate, inclusive of this study area, has been investigated by numerous specialists from 2003. Consistently it's been documented that the RBIDZ: Phase 1F estate has been severely impacted by anthropogenic activities such as industry development, artificial concrete lined stormwater canals, historic plantations, foot paths, littering and most importantly, habitat fragmentation. Only a few degraded vegetation communities remain recognisable in the form of coastal forest, coastal grasslands and hygrophilous sedge wetlands. The Nyanza pilot plant development is proposed in the coastal grasslands and hygrophilous sedge wetland communities

Specifically, approximately 0,1 hectare of the western corner of the proposed Nyanza pilot plant development site extends into the Wetland Unit B. Based on the negotiations between the various Stakeholders and Competent Authorities, infilling of this wetland is deemed ***generally unacceptable*** however, its loss has been calculated and incorporated into the rehabilitation of the wetlands on Erven 16673 and 16674 and therefore ***approved*** and deemed ***acceptable.***

However, as the proposed Nyanza pilot plant development lies within the RBIDZ: Phase 1F Estate, they will be bound by mitigations recommended in the Wetland Rehabilitation Plan (RHDHV, 2016). In line with this Wetland Mitigation Plan, it is recommended that a portion of the 40% FAR of the full Nyanza area be 'spent' on conservation of the portion of wetland in the western corner of the pilot plant area. The combined surface area recommended for conservation within the Nyanza pilot plant development site then calculates to 0,16 ha, which forms 17,78 % of the 0,9 ha development site.

However, when constructing within and in close proximately to these sensitive environments, specific management measures should be implemented. These include:

- Limit construction during the dry season, if possible.
- Demarcation of the wetland prior to start of construction.
- No placement of soil inside the demarcated wetland or buffer area.
- Immediate rehabilitation after completion of construction activities.
- Removal of alien species within the construction area.
- Specific care should be taken to limit erosion after rehabilitation efforts.
- Edge effects of activities, e.g. erosion and alien/ weed control need to be strictly managed.
- Prevent excavated material from entering water resources.
- All spills should be immediately cleaned up and treated accordingly.
- No dumping of construction waste material should be allowed.
- Incorporate adequate erosion management measures to limit erosion and associated sedimentation of the water resource.

A license from the DWS is required to carry out any activity involving modifications to wetlands. As the proposed upgrade will impact wetlands, approval in terms of the NWA will be required.

Nymphaea nouchali was identified within Wetland Unit B which extends into the western corner of the Nyanza pilot plant development site. A permit will be required from EKZNW for the removal of these KZN Nature Conservation Ordinance individuals prior to the proposed impact on the wetland. No Red Data or protected species in terms of other legislation were observed within the development site. However, these species may not have been observed due to the season of the assessment. It is therefore recommended that a search and rescue operation be undertaken within the Nyanza development site prior to construction within the flowering season of the various species. Permits must be obtained for removal of any of these species from the EKZNW and DAFF.

To conclude, the specialist is of the opinion that this specialist study was conducted independently and based on our expertise. The sensitivities where presented based on the findings of the site visits. The proposed project footprint lies within sensitive wetland areas, however approval for infill of this wetland is already in place. It is the opinion that should the mitigation measures recommended herein and within the RHDHV (2016) Wetland Mitigation Plan be adhered to, the competent authority may approve the proposed development.

14. GLOSSARY

Aerobic: having molecular oxygen (O^2) present.

Anaerobic: not having molecular oxygen (O^2) present.

Anthropogenic: of human creation

Delineation (of a wetland): to determine the boundary of a wetland based on soil, vegetation, and/or hydrological indicators (see definition of a wetland).

Endorheic: closed drainage e.g. a pan.

Infilling or Fill: dumping of soil or solid waste onto the wetland surface. Infilling generally has a very high and permanent impact on wetland functioning and is similar to drainage in that the upper soil layers are rendered less wet, usually so much so that the area no longer functions as a wetland.

Mottles: soils with variegated colour patters are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.

Permanently wet soil: soil which is flooded or waterlogged to the soil surface throughout the year, in most years.

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

Runoff: total water yield from a catchment including surface and subsurface flow.

Seasonally wet soil: soil which is flooded or waterlogged to the soil surface for extended periods (>1 month) during the wet season, but is predominantly dry during the dry season.

Sedges: Grass-like plants belonging to the family Cyperaceae, sometimes referred to as nutgrasses.

Soil drainage classes: describe the soil moisture conditions as determined by the capacity of the soil and the study area for removing excess water. The classes range from very well drained, where excess water is removed very quickly, to very poorly drained, where excess water is removed very slowly. Wetlands include all soils in the very poorly drained and poorly drained classes, and some soils in the somewhat poorly drained class. These three classes are roughly equivalent to the permanent, seasonal and temporary classes

Temporarily wet soil: The soil close to the soil surface (i.e. within 50 cm) is wet for periods > 2 weeks during the wet season in most years. However, it is seldom flooded or saturated at the surface for longer than a month.

Water regime: When and for how long the soil is flooded or saturated.

Water quality: the purity of the water.

Waterlogged: soil or land saturated with water long enough for anaerobic conditions to develop.

Wetland: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

Wetland catchment: the area up-slope of the wetland from which water flows into the wetland and including the wetland itself.

Wetland delineation: the determination and marking of the boundary of a wetland on a map.

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Addendum A: Curriculum Vitae

P.O. Box 9514 | P.O. Box 11634
Richards Bay, 3900 | Erasmuskloof, 0048
Tel: 035 788 0398 | Tel: 012 743 6202
Fax: 086 614 7327 | Fax: 086 614 7327

CURRICULUM VITAE

SURNAME	ADAM (Weiermans)
FIRST NAMES	JACOLETTE
IDENTITY NUMBER	7407190109082
DEGREES	MSc; LLM (Environmental Law)
PROFESSIONAL REGISTRATION	Professional Natural Scientist (400088/02)
NATIONALITY	South African
CONTACT NUMBER	+27 82 852 6417
YEARS OF PROFESSIONAL EXPERIENCE	19

CAREER HISTORY:

Jacolette obtained a Master of Science in Zoology from the University of Pretoria, South Africa in 2000. Her thesis, *Roads as Ecological Edges for Rehabilitating Coastal Dune Assemblages in Northern KwaZulu-Natal, South Africa (*published in *Restoration Ecology* Vol 11, Issue 1, p: 43-46) was based on field work conducted in the rehabilitating forests of Richards Bay Minerals, north of Richards Bay. In 2019 she also obtained a LLM degree in Environmental Law. For this degree, her dissertation assessed the '*Legislative challenges with wetland mitigation banking in South Africa'*. This included aspects such as the available and required policy, tools and frameworks required for implementing wetland banking, specifically also addressing the finance options, such as BIOFIN and debating the business aspects of wetland banking.

Since 2016, Jacolette has been the Director of WETREST (Centre for Wetland Research and Training). WETREST is a Public Benefit Organisation (PBO) with the following objectives:

1. Identify research gaps/needs in wetland conservation, and raise funds to address these with scientific based research;
2. Establish a series of university accredited wetland training modules, and develop a series of practical/technical training courses to support wetland practitioners;
3. Render free expertise and support to Interested and Affected Parties where wetlands are threatened by development (mining, infrastructure, damming, pollution, draining etc); and
4. Develop a wise-use centre to support sustainable wetland utilization.

This PBO has been involved in various research projects within South Africa and on an international scale.

Jacolette has gained 19 years of professional experience in the environmental sector and has been a certified Professional Natural Scientist with the South African Council for Natural and Scientific Professionals (SACNASP) since 2002. She has been a Fellow member of the Water Institute of South Africa (WISA) since 2012.

Since 2002, she has led and completed numerous environmental assessments in terms of various legislated processes throughout South Africa and Africa, for a wide range of clients, including the mining sector, large-scale housing developments, private lodge developments, telecommunication industry, various engineering projects including linear projects such as pipelines, road construction, road upgrades as well as site based engineering services. She has also been responsible for various strategic projects such as Integrated Environmental Management Programmes for municipalities as well as Provincial State of the Environment Reports.

Jacolette has proven the capability to complete environmental assessments of challenging projects with various approvals required from different authorities, including Department of Environmental Affairs,

Department of Agriculture, Forestry and Fisheries, Department of Water and Sanitation and Department of Mineral Resources. Her expertise is in managing these complex projects with the wide range of specialists and identifying the key risks which needs to be mitigated.

As part of her specialist expertise, she has conducted ecological and wetland assessments throughout South Africa, for various different types of projects, including the challenges of linear and large-scale infrastructure. Linked to these ecological and wetland assessments, lies her passion for successfully implementing biodiversity offsets with relevant government Departments and related authorities. She has also been responsible and part of teams to conduct ecological cost benefit analysis for projects such as the Richards Bay Port Expansion Programme.

Her knowledge of statistical analysis was developed during her MSc studies, and further evolved during the years of assessing field work data. She has proven experience in time series analysis, linear and non-linear modelling, classification and clustering.

Being the managing member of Exigent, an environmental and engineering consultancy firm, since 2002, her responsibility has included on-time delivery, finance management and client liaison of the overall project, specifically focussing on management of the Environmental Impact Assessment (EIA) process, especially the interdisciplinary team of specialists, both in-house and contracted - thereby including all specialist studies, the EIA application process, the Integrated Water Use License Application and Environmental Management Programme Reporting process, ecological and/or wetland specialist studies, Red Data Species application, water quality assessments, biodiversity offsets, other related permits e.g. heritage and archaeological, protected species removal permits and Environmental Control Officer duties, where required.

As part of the environmental services to various mining houses, financial closure calculations have been assessed based on the previous and the more recently promulgated South African regulations. Furthermore, as part of her project manager responsibilities', was compiling the first draft of the Mining and Biodiversity Guidelines for the Chamber of Mines in 2008.

Jacolette has been involved in compilation of various strategic Environmental Management Documents, e.g. the Umhlathuze Integrated Environmental Management Plan, Environmental Aspects of the Mbonambi Nodal Framework Plans, Interim Report on Sustainable Development for the Department of Environmental Affairs in Northern Province as well as Strategic Business Plans for Johannesburg Water.

In 2008, she compiled an environmental awareness training course for a large Consulting Engineering firm, and it was presented it to all their branches country-wide. Throughout the years, she introduced the value of an environmental feasibility studies to various clients by assisting with initial site screenings for Red Data species, sensitive ecological habitats, such as watercourses and wetlands and their related buffers. This also involves an initial assessment of the environmental legal and physical site constraints. Numerous of these studies were conducted to a range of clients, which assists in decision-making early in the project development phase, reducing the risk to the client.

Since 2002, she has been appointed as the environmental specialist on various Public Private Partnership projects, as regulated by the Public Finance Management Act. This included strategic environmental input to various phases of the project, ranging from between different levels of detail of environmental contribution throughout the process.

During the 19 years, she has proven herself in a broad range of environmental expertise which includes the following: *Strategic Biodiversity Planning; Biodiversity Offset Plans; Red Data Species Evaluation, Environmental project management of large scale project; Environmental Impact Assessments (EIA); Environmental Management Programmes and Plan; State of Environment Reporting; Environmental license audits; Public Private Partnerships; Geographic Information Systems (GIS) based analysis; Applicability of Environmental Legislation; Environmental Control officers during project implementation; Specialist studies such as Wetland Assessments, Ecological Assessments, Water Quality Assessments, Wildlife Management Plans*; *Management Plans such as Mine Rehabilitation Plans, Ecosystem*

rehabilitation plans; Water Services Development Plan; Environmental management legal and implementation course compilation and training and Environmental feasibility studies.

EMPLOYMENT HISTORY:

Date	Employer	Position
2002 – currently	Exigent	Managing member
2001 – 2002	Dynacon Technologies	Environmental Project Manager
2000 – 2001	VKE Engineers	Environmental Scientist
1999	University of Pretoria	Conservation Researcher

2002 – Currently Exigent

In 2002 Jacolette took the step to exit corporate employment and became the Manager of the Environmental Business Unit. She is thus responsible for all project deliverables from within the Environmental Business Unit of Exigent. Exigent grew from 2002 being only herself, to 16 staff members in 2008, of which 14 were professional scientists. Exigent provides the full spectrum of all environmental services from the two offices, located in Richards Bay and Pretoria, and conducts projects throughout South Africa, and selected countries within Africa.

In December 2008, the Environmental Business Unit downscaled for a few years whilst circumnavigating on their yacht as a family. During this period of downscaling, Jacolette was responsible for an environmental assessment process for a large international mining company in Kwa-ZuluNatal. The legislated environmental assessment process started in 2009, and included 14 specialists with various expertise. This was a very sensitive and challenging project in terms of the surrounding ecosystems in close proximity to protected environments, Red Data species, as well as socio-economic aspects such as neighbouring communities and job opportunities. All three required environmental authorisations were successfully obtained.

Since 2013, the projects of Exigent has grown and are currently involved in a variety of projects for local and District level Municipalities, Richards Bay Minerals, Richards Bay Industrial Development Zone, Gautrain Management Agency, TRANSNET, Mpact, SMEC, Aurecon, Cosmopolitan Projects, SASOL and various private developers. The offices have since 2013 again grown into an entity of 5 professional environmental personnel.

PREVIOUS EMPLOYMENT:

2001 – 2002 Dynacon Technologies (VKE Engineers merging company) – Environmental Project Manager

After the merge of Dynacon Technologies with VKE Engineers, Jacolette was appointed as the Manager of the Environmental Impact Assessment section and had to manage all phases of the project process, client liaison, compiling proposals, financial management, specialist appointments and scope of works, compiling EIA reports, public meetings and public participation processes.

2000 – 2001 VKE Engineers - Environmental scientist

Jacolette joined the Environmental Department at the Johannesburg offices of VKE Engineers in 2000. Various EIAs and environmental management projects were conducted throughout South Africa and she was responsible for contacting specialists, client liaison and overall management of the projects as well as financial project flows and estimates. Specifically related to the project duties, her duties included compilation of the environmental assessment reports, ecological field assessments and specialist studies, as well as conducting the public participation processes and facilitation of public meetings.

1999 - University of Pretoria, Dr. Albert van Jaarsveld (for the Peregrine fund - Research position)

Jacolette conducted a GIS research project on the distribution of birds of prey in Madagascar for the Peregrine Fund. This project included making contact with various research organisations in South Africa as well as Madagascar in order to obtain sighting and other data of the various birds included in the study. All available information contained in atlases and research papers were included in the dataset and distribution maps.

Her responsibilities included the final report including maps on the distribution status of endangered raptors of Madagascar, as well as an electronic GIS database.

QUALIFICATIONS OBTAINED AND COURSES ATTENDED:

Date	Institution	Qualification Obtained
2019	**University of KwaZulu-Natal**	**LLM (Environmental Law)**
2019	UNDP Global Programme on Nature for Development. Learning for Nature.	Welcome to Climate Change course *(in process)*
		Ecosystem Services Valuation *(in process)*
		Protected Area Law *(in process)*
		Biodiversity Finance *(in process)*
2018	Alliance for Water Stewardship	AWS accreditation as a Water Stewardship Service Provider
2017	Water Institute of South Africa, KZN Branch	Water Use Licensing Workshop
2016	Department of Water and Sanitation	General Authorisation (GA) 509 training workshop
2017	Shepstone and Wiley	Environmental Law Breakfast Seminar, 2017 EIA Regulations
2015	Terra Firma Academy	Carbon Footprint Analyst (certificate course)
2015	Shepstone and Wiley	Environmental Law Half-Day Seminar, EIA Regulations
2015	WetRest – Centre for Wetland Research and Training	Wetlands – The basics: Identification, function and delineation (certificate course)
2004	The Directorate of Professional Programmes of the Geological Society of South Africa	Groundwater in South Africa: Our most valuable future resource (Certificate Course)
2003	Working for wetlands	Wetland Rehabilitation Certificate Course
	Shangoni Management	Environmental Auditing Certificate Course-ISO 14001
	Rhodes University	Environmental and Resource Economics (Certificate Course)
2002	University of South Africa	Certificate course on Advanced Business Communication (1 year)
	DEA	Project Developer's Forum on Cleaner Development Mechanisms (CDM)
2001	AfriDev Consultants	SASS5 Biomonitoring Techniques Certificate
2000	VKE Engineers	Managing Projects in a Consulting Engineer's Practise Certificate
1999	University of Pretoria	GIS project Researcher - Madagascar raptors
2000	**University of Pretoria**	**MSc Zoology (Restoration Ecology)**
1996	**University of Pretoria**	**BSc (Hons) (Zoology)**
1995	**University of Pretoria**	**BSc (Zoology)**
1992	Verwoerdburg High School, Pretoria	Matriculation

SCIENTIFIC PUBLICATIONS AND CONFERENCES ATTENDED:

Date	Conference/publication
2019	Annual Environmental Law Association Conference, KZN. Presentation: 'Legislative challenges with wetland mitigation banking in South Africa' *–26, 27 September 2019*
2019	Wetland Forum KZN, Specialist presentation: Legislative challenges with wetland mitigation banking in South Africa
2018	National Wetlands Indaba, Kimberley, Northern Cape. Presentation: 'Legislative challenges with wetland mitigation banking in South Africa'. Awarded 'Best presentation' at the Indaba.
2015	National Wetlands Indaba, Western Cape.
2012	Conservation Biology Oceania Conference, Charles Darwin University, Darwin, Australia
2000	Weiermans, J. & R. J. van Aarde. The effects of habitat edges in rehabilitating coastal dune communities in Richards Bay, KwaZulu – Natal, South Africa. *Restoration Ecology* Vol 11, Issue 1, p: 43-46.
2000	Weiermans, J. & R. J. van Aarde. The effects of habitat edges in rehabilitating coastal dune communities in Richards Bay, KwaZulu – natal, South Africa. Paper presented at the Wildlife Management Association of Southern Africa 2000 Symposium.
1997	Weiermans, J., A. van Jaarsveld & S. Chown. A multiple scale analysis of South African bird body – size distributions. Paper presented at the Zoological Society of Southern Africa 1997 conference.

MEMBERSHIP OF OTHER PROFESSIONAL BODIES OR RELEVANT ORGANISATIONS:

Jacolette is registered as a Professional Natural Scientist (Pr. Sci. Nat., Reg number: 400088/02) since 2002 and a Fellow member of the Water Institute of South Africa (WISA). She is also a member of the Environmental Law Association of South Africa (ELA) (2016/224/KZN), the Wetlands Society of South Africa and Wetland Forum in Kwa-ZuluNatal, and the North Coast Region representative of the South African Affiliate of the International Association for Impact Assessment (IAIASA).

Jacolette has been Director of a Public Beneficial Organisation (WETREST) since 2016. WETREST is involved in research projects for organisations such as the Water Research Council (WRC) involved in scientific research, with specific focus on wetlands and restoration.

CURRICULUM VITAE

SURNAME	:	SMUTS (Coetzee)
FIRST NAMES	:	Charleen
IDENTITY NUMBER	:	8303150185080
PROFESSIONAL REGISTRATION	:	Professional Natural Scientist (Pr. Sci. Nat., Reg number: 115412) South African Affiliate of the International Association for Impact Assessment (IAIA, Membership Number 3824) South African Wetland Society, as well as Wetlands Forum KZN (Member)
NATIONALITY	:	South African
CONTACT NUMBER	:	081 398 1163
YEARS OF EXPERIENCE	:	6

CAREER HISTORY:

Charleen obtained a Master of Science in Botany from the University of Pretoria in 2012. Her thesis, *The effect of vegetation on the behaviour and movements of Burchell's Zebra, Equus burchelli (Gray 1824) in the Telperion Nature Reserve, Mpumalanga, South Africa*, was based on field work conducted in the eZemvelo Nature Reserve in Bronkhorstspruit.

She has gained 6 years of professional experience in the environmental sector. She has been certified as a Professional Natural Scientist and is a member of the South African Affiliate of the International Association for Impact Assessment, the South African Wetland Society and Botanical Society of South Africa.

She has successfully conducted project management for numerous environmental assessments in terms of various legislated processes throughout South Africa for a wide range of clients, including the large-scale housing developments, private lodge developments, various engineering projects including pipelines, road construction and road upgrades. She has been responsible for strategic projects such as Integrated Environmental Management Programmes for uMhlathuze Municipality.

Due to her training as an ecologist/botanist she also provides the specialist skill of wetland and ecological assessments. Charleen has worked in six of the provinces of South Africa.

Charleen has proven the capability to complete environmental assessments of challenging projects with various approvals required from different authorities, including Department of Environmental Affairs, Department of Agriculture, Forestry and Fisheries, and Department of Water and Sanitation. Her expertise is in managing these complex projects with the wide range of specialists, and identifying the key issues which needs to be mitigated. In line with the newer developments in the environmental field, she has obtained valuable experience in compiling biodiversity offset documents and negotiating these aspects with relevant government Departments and related authorities.

She has proven expertise in a broad range of environmental expertise which includes the following:

- *Strategic Biodiversity Planning*
- *Biodiversity Offset Plans*
- *Environmental project management of large scale projects*
- *Environmental audits*

- *Environmental Impact Assessments*
- *Environmental Management Plans*
- *State of Environment Reporting (SoER)*
- *Geographic Information Systems (GIS) based analysis*
- *Applicability of Environmental Legislation*
- *Environmental Control officers during project implementation*
- *Specialist studies such as Vegetation Assessments, Wetland Assessments, Ecological Assessments, Water Quality Assessments*
- *Environmental Feasibility Studies*

EMPLOYMENT HISTORY:

Date	Employer	Position
2014 – currently	Exigent	Environmental Scientist
2007-2009	MSA Group Services	Project Manager/Ecologist
2006-2007	University of Pretoria	Demonstrator/Field assistant

2014 – Current Environmental scientist – Exigent Engineering

Charleen joined Exigent in 2014. Together with the Managing Member, Jacolette Adam, she conducts various Environmental Impact Assessments and environmental management projects throughout South Africa. Charleen is responsible for liaison with specialists, clients, authorities and stakeholders. She is also responsible for overall management of the projects. Specifically related to the project duties - her duties included development of terms of reference, tenders and project proposals. She manages project timeframes and compiles environmental risk assessment reports, screening reports, scoping reports, impact assessment reports, basic assessment reports and environmental auditing reports. She is responsible for water use license applications, ecological assessments, vegetation assessments and wetland delineations, well as conducting and facilitating the public participation processes.

2007 – 2009 Environmental Project Manager and Ecologist – MSA Group Services

At MSA, Charleen was responsible for overall project management and administration of various projects around KwaZulu-Natal. She managed and co-ordinated project teams and specialists, liaison with clients, authorities and stakeholders, Co-ordinated and facilitated the public participation process. In addition, she developed of terms of reference, tenders and project proposals, managed project timeframes; and compiled basic assessment reports, environmental impact assessments, scoping reports, environmental screening reports, ecological assessments and wetland delineations, and used Geographic Information Systems (ArcGIS).

2006-2007 Demonstrator and field assistant – University of Pretoria

As a postgraduate student at the University of Pretoria, Charleen marked second year botany (BOT251) semester tests and were a demonstrator for first year Molecular and Cell Biology course (MLB 111), stand-in demonstrator for the first-year Biology course (BLG 150) and a demonstrator for the first year Botany 161 course. She also assisted in fieldwork of other postgraduate students throughout South Africa.

QUALIFICATIONS OBTAINED AND COURSES ATTENDED:

Date	Institution	Qualification Obtained
2018	KZN Department of Agriculture & Rural Development - Cedara College of agriculture	Soil classification and land capability
2017	Water Research Commission	Wetland Plant Taxonomy Training
2015	WetRest – Centre for Wetland Research and Training	Wetlands – The basics: Identification, function and delineation

Date	Institution	Qualification Obtained
2015	International Association for Impact Assessments	IAP Public Participation Mini Training Event
2012	University of Pretoria	MSc Plant Science
2006	University of Pretoria	BSc (Hons) (Botany)
2005	University of Pretoria	BSc (Ecology)
2001	Brandwag High School, Benoni	Matriculation

SCIENTIFIC RESEARCH OUTPUTS AND CONFERENCES / WORKSHOPS ATTENDED:

Date	Research Outputs
2017	National Wetlands Indaba, KwaZulu-Natal
2017	Environmental Law Breakfast Seminar, Shepstone and Wiley
2017	Water Use Licensing Workshop, Water Institute of South Africa, KZN Branch
2016	General Authorisation (GA) 509 training workshop, Department of Water and Sanitation
2015	National Training and Development – Buffer Zone Workshop, Water Research Commission
2015	Environmental Law Half-Day Seminar, Shepstone and Wiley
2015	National Wetlands Indaba, Western Cape
2012	Coetzee, C. & Bredenkamp, G.J. The effect of vegetation on the behaviour and movements of Burchell's Zebra (*Equus burchelli burchelli*) in the Telperion Nature Reserve, Mpumalanga, South Africa). Dissertation.
2008	Coetzee, C & Bredenkamp, G.J. Black or white, which habitat is right? Department of Botany, University of Pretoria, dissertation Symposium 2008.
2006	Coetzee, C. & Van Rooyen, M.W. Seed bank size and species composition in the Upland Succulent Karoo: Commercial *versus* Communal rangelands.
2005	Coetzee, C. & Van Rooyen, M.W. Seed bank size and species composition in the Upland Succulent Karoo: Commercial *versus* Communal rangelands. Department of Botany, University of Pretoria, Project Presentation Symposium 2005.
2005	Coetzee, C & Van Wyk, A.E. *Acacia* species and ants: a love-hate relationship. Department of Botany, University of Pretoria, Seminar.
2005	Coetzee, C. & Bredenkamp, G.J. *Themeda triandra*: A prominent grass of South Africa. Department of Botany, University of Pretoria, Seminar
2005	Coetzee, C., Henstock, R., Wolmarans, R., Strumpher, C. Habitat fragmentation on the University of Pretoria Main campus and its effect on the bird populations.
2004	Coetzee, C., Wolmarans, R., Henstock, R., Peacock, F., Strumpher, C. A comparative study of the vegetation in the Drakensberg along different altitudinal gradients.

MEMBERSHIP OF OTHER PROFESSIONAL BODIES OR RELEVANT ORGANISATIONS:

Charleen is a member of the South African Council for Professional Natural Scientists (Pri. Sci. Nat. Reg. No. 115412), the South African Affiliate of the International Association for Impact Assessment (IAIAsa) and a member of the South African Wetland Society (SAWS) and the KwaZulu-Natal Wetland Forum branch.

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Addendum B: Declaration of Independence

edtea
Department :
Economic Development, Tourism and Environmental Affairs
PROVINCE OF KWAZULU-NATAL

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	DC/
NEAS Reference Number:	
Date Received:	

Application for an environmental authorisation in terms of section 24(2) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) or for a waste management licence in terms of section 20(b) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).,

PROJECT TITLE

Vegetation and Wetland Status Quo Assessment for the proposed Nyanza Light Metals (Pty) Ltd. TiO_2 Pilot Plant, within the RBIDZ Phase 1F, Richards Bay, KwaZulu-Natal.

Specialist:	Exigent Engineering Consultants cc		
Contact person:	Jacolette Adam		
Postal address:	PO Box 9514		
Postal code:	3900	Cell:	082 852 6417
Telephone:	035 788 0398	Fax:	086 614 7327
E-mail:	jacolette@exigent.co.za		
Professional affiliation(s) (if any)	Pr. Sci. Nat. (400088/02). Environmental Law Association (ELA) of SA. International Association of Impact Assessment (South African Chapter). South African Institute of Ecologists and Environmental Scientists. Fellow member of the Water Institute of South Africa.		

Project Consultant:	Hatch		
Contact person:	Margaret Muller		
Postal address:	Private Bag X20 Gallo Manor		
Postal code:	2052	Cell:	073 765 3760
Telephone:	011 612 4478	Fax:	
E-mail:	margaret.muller@hatch.com		

4.2 The specialist appointed in terms of the Regulations_

I, **Jacolette Adam** , declare that --

General declaration:

- I act as the independent specialist in this application;
- do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist:

Exigent Engineering Consultants cc

Name of company (if applicable):

22 October 2019

Date: