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DRAFT Basic Assessment Report
North Park Sewer Reticulation
eThekwini Water & Sanitation
EIA Ref: DM/0008/2017

Prepared by

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This report was prepared by EnviroPro Environmental Consulting in terms of Appendix 1 to GNR 982

3 (1) (a) details of (i) the EAP who prepared the report; and (ii) the expertise of the EAP. Please see Appendix I for EAP Declaration and full Curriculum Vitae;

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Executive Summary

eThekwini Municipality's Water and Sanitation (EWS) Department propose to construct the North Park Area Sewer Reticulation scheme to provide a waterborne sewer connection to residents in Northdene, neighbouring the North Park Nature Reserve. The new uPVC reticulation pipelines tie into existing bulk sewer pipelines within the North Park Nature Reserve. Sewage will be treated at the existing Mhlatuzana Waste Water Treatment Works (WWTWs).

The proposed sewer reticulation pipelines (160mmØ) will be placed underground within road reserves and along residential fence lines, outside of the North Park Nature Reserve. Within the North Park Nature Reserve, a bulk ductile iron outfall pipeline (200mmØ) will be constructed above-ground and will tie into the existing bulk line before the pipe crosses the Mhlatuzana River gaining access to the Mhlatuzana WWTWs.

The pipeline crosses the Mhlatuzana River (WC1) and a tributary of this river (WC2). Concrete stepping stones/blocks will be constructed on an existing weir across the Mhlatuzana River for ease of crossing during high flow periods. Due to the design of the crossings, there will be less than $10m^3$ of material excavated and deposited into the watercourses in total. Pipeline infrastructure will be constructed within the North Park Nature Reserve, a protected area declared in terms of the National Environmental Management: Protected Areas Act (57 of 2003). The placement of the pipeline through the Nature Reserve will result in more than $300m^2$ of vegetation being cleared within the Durban Metropole North Coast Grassland Ecosystem (critically endangered) and a Critical Biodiversity Area, identified in the KZN Wildlife Conservation Plan. A Basic Assessment process is therefore triggered.

The following key impacts and mitigation measures were assessed:

- **Damage to watercourse banks, wetland areas and riparian zones during construction:** A concrete pipe bridge will be used to span the length of the watercourse at WC1 to avoid construction in the channel of the Mhlatuzana River. The pipeline will be tied onto an existing bridge structure at WC2, avoiding excavation in the watercourse itself. As per specialist recommendations, a 23m buffer is to be maintained around the remainder of the wetlands during construction with no stockpiling to occur within 23m of the watercourses. Any excavation in the buffer is to be carried out by hand, where possible, to avoid vehicles travelling in the watercourse. The trench is to be kept to a minimum width to reduce the disturbance footprint.
- **Pipeline impeding or altering flow of the watercourses:** The sewer pipeline will span the length of the watercourses and will therefore not impede / alter the flow. There will be sufficient space between the concrete blocks across the weir to ensure free flow of water through the blocks. The blocks will be constructed on the existing weir so there will be no further alteration to the bed of the watercourse.
- **Removal of indigenous vegetation from within a critically endangered ecosystem in the North Park Nature Reserve:** The sections of pipeline in the protected area are to be laid above-ground to reduce disturbance associated with excavation during the construction phase. Vegetation clearing is to be kept to a minimum with the alignment avoiding the larger tree species. Work in the Nature Reserve is to be carried out by hand, to prevent unnecessary disturbance.
- **Encroachment of alien vegetation into areas disturbed during construction:** Disturbance associated with the construction, will result in an increase in alien invasive species in the area. These species, within the construction footprint, must not be allowed to encroach into the North Park Nature Reserve. Alien vegetation must be continually removed during construction and bi-annually for three years after the completion of construction (as per vegetation specialist recommendation).
- **Construction impacting on the faunal communities with the Nature Reserve:** Construction activity could disrupt animal and/or bird species foraging and nesting in the Nature Reserve. There is to be no construction within the Nature Reserve during the breeding season of the endangered Spotted Ground Thrush (May – August). A full time ECO is to be present during construction in the North Park Nature Reserve to monitor vegetation clearing and the presence of the Thrush species. The full time ECO is to perform a herpetofauna (chameleon, reed frogs, kloof frog and burrowing skink) search along the pipeline route within the North Park Nature Reserve at the beginning of each day to ensure no chameleons are disturbed by construction activities.
- **Long term pollution risk from the sewer pipeline in the Nature Reserve:** The pipeline will be constructed above-ground making it easier to detect and repair any leaks that may arise. EWS are to monitor and manage the pipeline during operation.
- **Improved services:** The sewer pipeline will improve service delivery to the Northdene area. The municipal connection will allow the residents to stop utilizing the septic tanks / soak-aways. This is a positive impact.

These impacts can be mitigated by following the recommendations in this report and the attached Environmental Management Program (EMPr). Construction activities will be monitored twice a month by an independent Environmental Control Officer (ECO) and controlled through the implementation of the EMPr.

Taking into consideration the above impacts and mitigation measures, it is the EAP's opinion that there are no significant environmental impacts associated with the proposal which cannot be mitigated. Therefore, it is recommended that the preferred layout for the North Park Sewer Reticulation project be authorised.

Contents

Appendices

Section 1: Scope of Work and Location of Activity

1.1 Project Title

North Park Area Sewer Reticulation

1.2 A Description of the Activities to Be Undertaken Including Associated Structure and Infrastructure As per Section 3(d) (ii)

eThekwini Water and Sanitation (EWS) propose to construct the North Park Area Sewer Reticulation project within Ward 63 of the eThekwini Municipality. Northdene residents within the study area are currently using septic tanks and soak-aways to treat and dispose of domestic sewage on site. This project will provide a water-borne sewage connection for all the Northdene residents. The new house connections and reticulation pipelines will connect to the proposed new outfall / bulk pipeline, which ties into the existing municipal bulk pipeline in the North Park Nature Reserve at 29°52'24.24"S; 30°52'54.75"E. The sewage will be transported to and treated at the Mhlatuzana Waste Water Treatment Works (WWTWs), south of the study site.

The following pipe diameters are planned:

- House Connections: 110mm dia. uPVC
- Reticulation: 160mm dia. uPVC (outside the Nature Reserve)
- Outfall/Exposed Pipelines: 200mm dia. Ductile Iron (within the Nature Reserve)

The house connections and reticulation pipes will be placed underground with the majority falling within municipal road reserves and transformed garden vegetation. The bulk outfall pipeline will be laid above-ground in the North Park Nature Reserve to ensure easy leak detection, repair and management. Figures 2 and 3 illustrate the locality of the proposed pipeline route in the residential area with the two sections which pass through the North Park Nature Reserve shaded in white in Figure 3.

Where the pipeline crosses the Mhlatuzana River (WC1), a concrete pipe bridge will be used to span the length of the watercourse. The columns will be located outside of the 1:100 year floodline as shown in the engineering drawing provided in Appendix A of the report. The pipeline will be tied onto an existing bridge structure where it crosses a narrow tributary of the Mhlatuzana River at WC2. The wetland specialist has delineated channeled valley-bottom wetland associated with both watercourses. Concrete stepping stones / blocks will be placed on the existing weir across the Mhlathuzana River. It is anticipated that each block will be approximately 800mm wide, 300mm long and 300mm high. Cumulatively, this will result in less than $10m^3$ of material being infilled / excavated from within the watercourse.

Approximately 1.1km of pipeline falls within the boundary of the North Park Nature Reserve, which was proclaimed a protected area in 1968 under the National Environmental Management: Protected Areas Act, 2003. The majority of the pipeline runs along the fence-line of the Reserve with approximately 320m of pipeline traversing through the protected area to tie into existing bulk lines within an existing municipal servitude. During construction, vegetation within this protected area will be cleared for the laying of the pipe. The entire study area, excluding the North Park Nature Reserve, falls within Critical Biodiversity Area 1 (CBA) according to the KZN Wildlife Conservation Plan (C-Plan). Cumulatively, more than $300m^2$ of vegetation will be cleared from within this CBA. The Basic Assessment Report and Environmental Management Report (EMPr) therefore focus on construction in and adjacent to the watercourses and the clearance of vegetation during construction.

1.3 Description Of Feasible Alternatives As Per Section 3(h)(i)

Site Alternatives

The aim of the project is to provide a municipal water-borne sewage connection to the Northdene area and therefore there are no site alternatives. Different pipe materials were initially investigated however there is only one technology alternative as the pipe specifications need to fall within the appropriate designs standards. There were three route alternatives assessed, where the bulk pipeline runs through the North Park Nature Reserve.

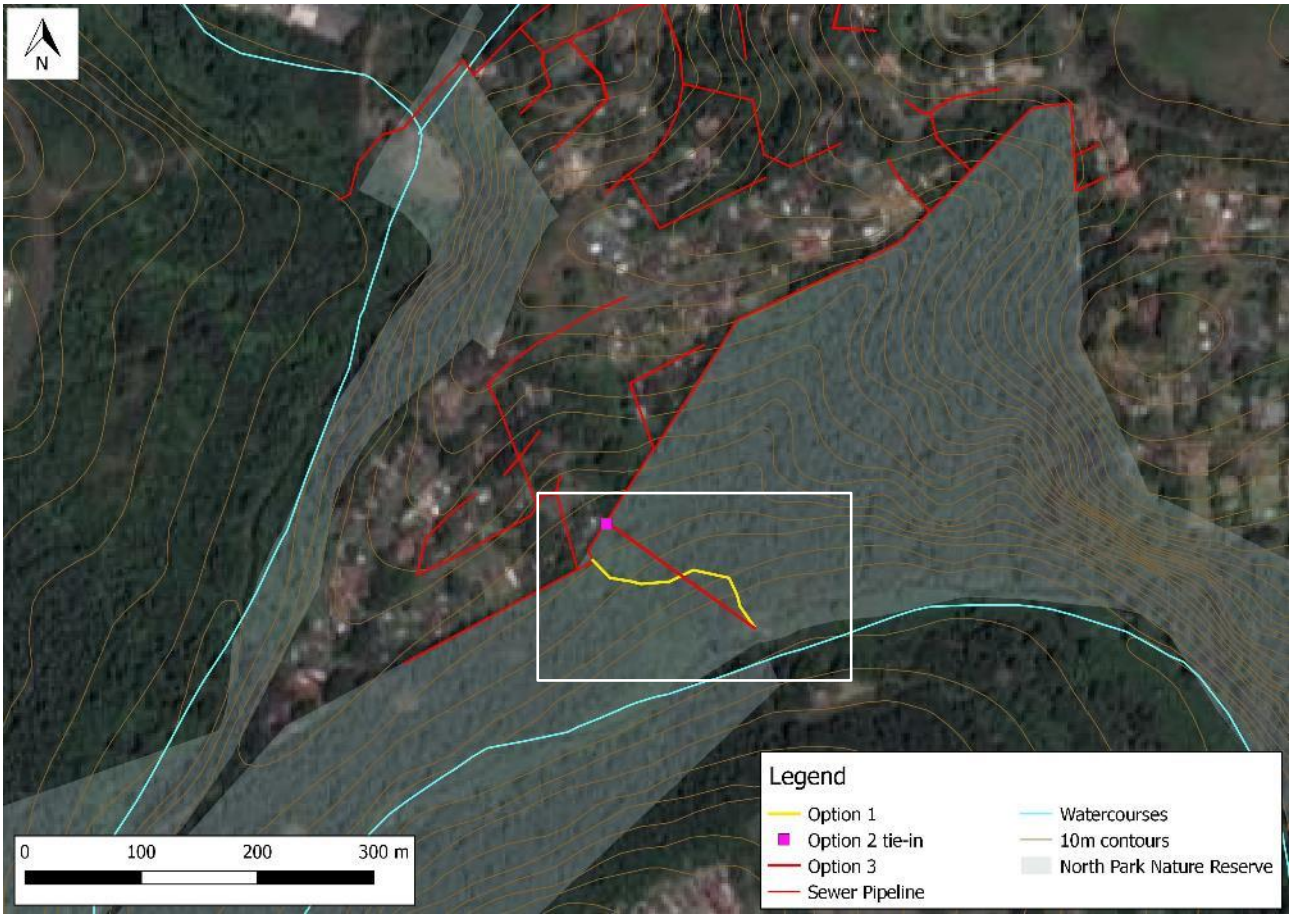
Alternative 1 – The 200mm diameter bulk pipeline will be aligned above-ground through the Nature Reserve. The pipe is not straight down the slope but accommodates the gradient of the hill. This alternative was initially proposed after a site visit with KZN Wildlife and aimed to follow already disturbed / highly invaded areas. This alternative requires EWS to register a new servitude in the Nature Reserve and will include refurbishment work to an existing pedestrian bridge across the Mhlatuzana River in the Nature Reserve. The refurbishment will improve the safety of the bridge when people visit the reserve. There will be no construction within the watercourse and therefore there are no EIA triggers for the refurbishment (replacement of the wooden deck, installation of railings etc.). Alternative 1 is shown in yellow in Figure 1.

Alternative 2 – Breaking into the existing pipe tunnel and connecting the proposed new reticulation pipelines to the existing bulk sewage pipeline. The tie-in point is on the edge of the Nature Reserve. This alternative avoids a new section of bulk pipeline passing through the Nature Reserve however Alternative 2 is not feasible from an engineering perspective. The pipeline tunnel is very old and was constructed without meaning to be accessed with maintenance to the old pipeline done through man holes. The likelihood of breaking the tunnel and associated bulk sewer line during construction is therefore high and could result in a large sewage leak on the edge of the Nature Reserve. The existing bulk line is 20m underground so would require extensive excavations and heavy machinery to even access the tunnel. The tunnel itself is very narrow and was not designed to have any other pipelines tie into it. This alternative has therefore been dismissed at the beginning of the assessment as it is not considered feasible.

Alternative 3 (*preferred*) – The 200mm diameter bulk pipeline will be aligned above-ground through the Nature Reserve. The pipeline with be laid within the existing 3m wide municipal sewer pipeline servitude which runs in a straight line down the hill. No new servitudes will therefore need to be registered by EWS. The vegetation specialist concluded that if both alternative pipeline routes use the same methodology (i.e. pipes laid above ground, with minor changes in alignment to avoid larger trees), one does not appear greatly superior to the other and therefore Alternative 3 was considered the preferred alternative (red in Figure 1).

See Appendix A for the various layout alternatives.

Figure 1: Maps showing the location of the alternate bulk sewer pipeline locations with the preferred alternative being Option 3, in red (source: QGIS, 2017).



The No Go Alternative

The construction of the North Park Sewer Reticulation project will not occur and Northdene residents will continue to use private septic tanks and soak-aways to treat and dispose of their domestic sewage on site. These systems can be unreliable if they are not effectively and timeously managed and maintained by the individual landowners. This is an additional expense for the residents, who would not have the option to connect to a municipal line.

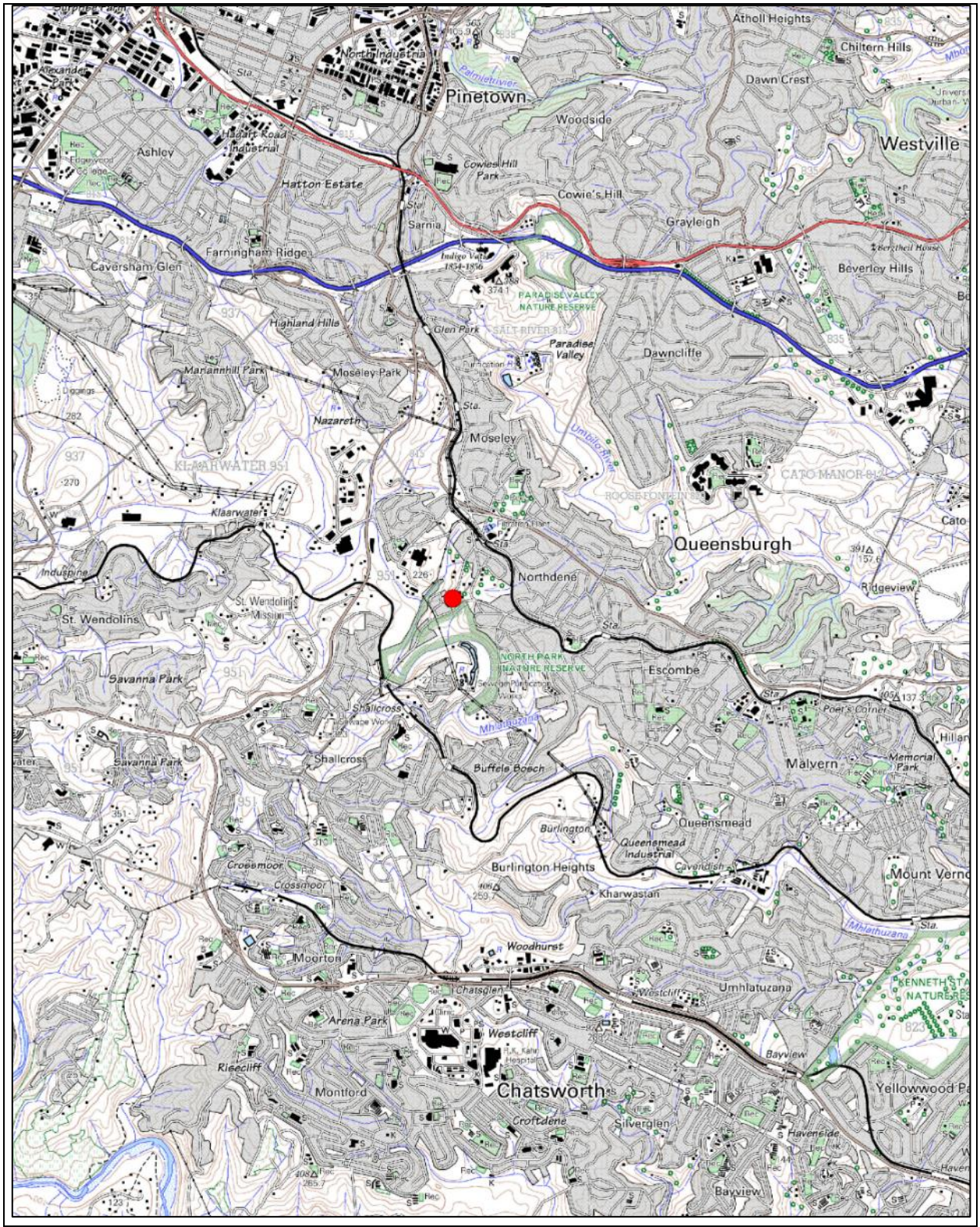
1.4 All Listed and Specific Activities to Be Triggered and Being Applied For as Per Section 3(d) (i)

GNR	Activity Number	Activity as per the legislation	Activity as it applies to the proposal
GNR 985 Listing Notice 3; 4th December 2014	12 (b)(iv), (vii) & (viii)	*The clearance of an area of 300m^2 or more of indigenous vegetation* *(b) In KZN* *(iv) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA* *(v) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.* *(vii) On land, where, at the time of the coming into effect of this Notice, or thereafter such land was zoned open space, conservation or had an equivalent zoning.* *(viii) A protected area identified in terms of NEMPAA, excluding conservancies.*	The excavation of the pipeline trench will cumulatively result in more than 300m^2 of indigenous vegetation being cleared from the Durban Metropole North Coast Grassland Ecosystem, identified as critically endangered by SANBI. The entire study area, excluding the North Park Nature Reserve, falls within Critical Biodiversity Area 1 (CBA) according to the KZN Wildlife Conservation Plan (C-Plan). Vegetation will also be cleared from the North Park Nature Reserve, zoned for conservation and protected in terms of NEMPAA.
GNR 985 Listing Notice 3; 4th December 2014	14 (xii) (c) (d)(iv) & (vii)	*The development of –* *(xii) infrastructure or structures with a physical footprint of 10m^2 or more,* *Where such development occurs –* *(c) if no development setback has been adopted, within 32m of a watercourse, measured from the edge of a watercourse* *(d) In KZN* *(iv) A protected area identified in terms of NEMPAA; and* *(vii) Critical biodiversity areas or ecological support areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.*	Cumulatively, more than 10m^2 of pipeline will be placed within 32m of the Mhlathuzana River and associated tributary within the North Park Nature Reserve and a CBA identified in the KZN Wildlife C-Plan.

1.5 Location Of Activity As Per Section 3 (b)(i)-(iii)

District Municipality		eThekwini Municipality.	
Local Municipality		eThekwini Municipality.	
Ward		63	
Area / Town / Village		Northdene	
Co-ordinates:		**Latitude**	**Longitude**
	Pipeline Start	29°51'46.28"S	30°53'04.34"E
	Pipeline Tie-In / End point	29°52'24.24"S	30°52'54.75"E
Mhlatuzana River	**WC 1**	29°52'12.56"S	30°52'42.77"E
Tributary of the Mhlatuzana River	**WC 2**	29°52'11.11"S	30°52'44.16"E
Property Description		Please refer to Property Description Table in Appendix A.	
21 Digit Surveyor General's numbers:		Please refer to Property Description Table in Appendix A.	

Figure 2: 1:50 000 Topographical map showing the position of the North Park Sewer Reticulation Project circled in red (source: PlanetGIS, 2017)



Title	North Park Sewer Reticulation	**Legend**	
Co-ordinates	29°52'9.01"S; 30°52'56.93"E		Watercourse
Scale	1:50 000		Wetland
Topographical Sheet No.	2930DD		Plantations
Drawing No.	NorthPark #01		20m contours
Date Prepared	04th April 2017		Study Site
Prepared By	Stephanie Denison		Urban Areas

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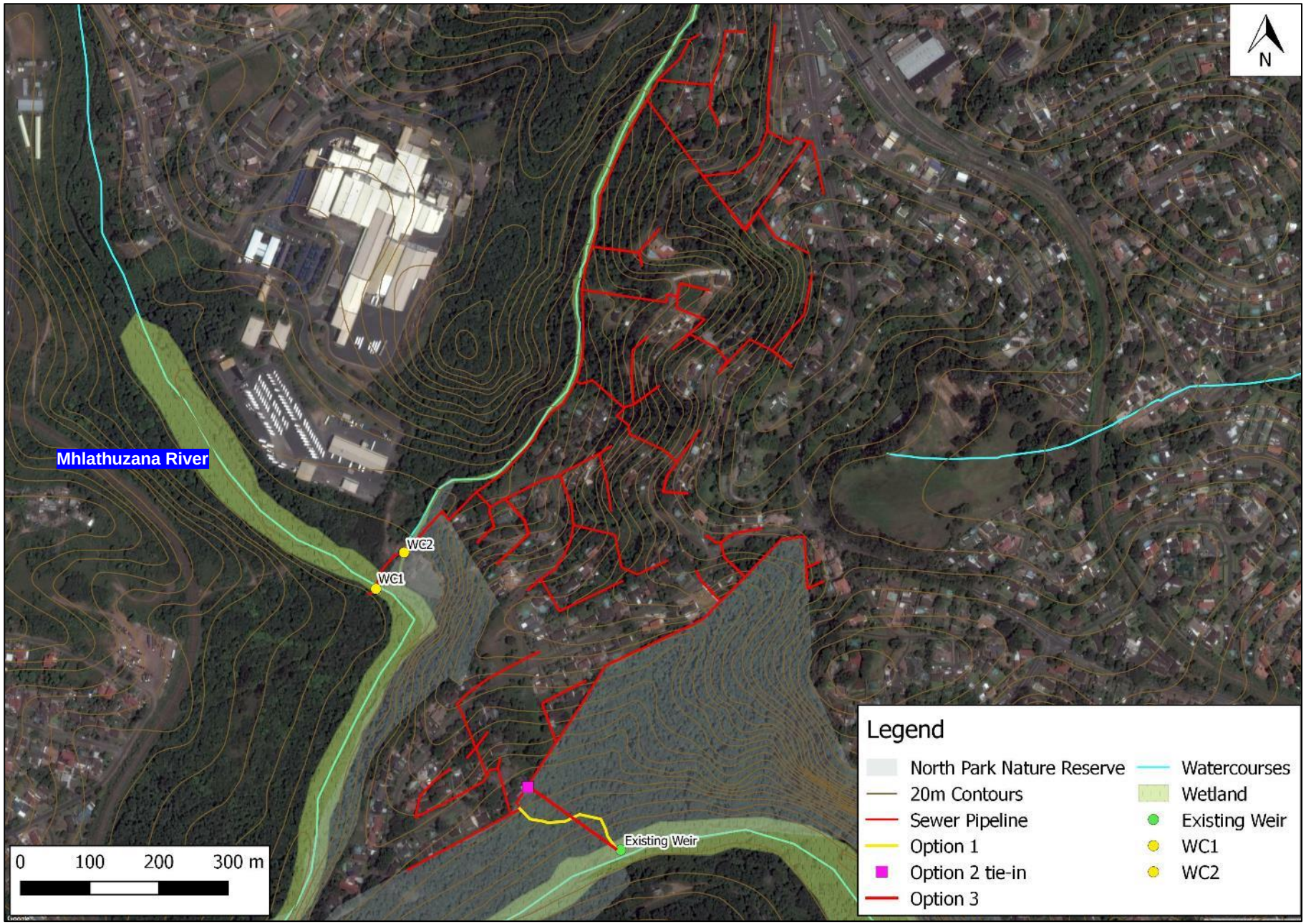
Figure 3: Aerial photograph showing an overview of the proposed North Park Sewer Reticulation (red) and associated watercourses (blue). Delineated wetland areas are shaded in green (source: QGIS, 2017).



Section 2: Site Description and Surrounding Land Use as per section 3(h)(iv) and (k)

Information provided in this section has been extracted from the various specialist reports, which are attached under Appendix B of the BAR.

2.1 Topography and Physical Characteristics of Site

The area associated with the proposed sewer reticulation project consists of the gently sloping residential area of Northdene before the gradient increases down towards the Mhlatuzana River in the south and the tributary of the Mhlatuzana River, along the western boundary of the study area. The project area is located at an elevation of approximately 200m above mean sea level. An elevation profile of where the bulk sewer pipeline will traverse the Nature Reserve is provided in Figure 4 with photographs taken within the study area showing the surrounding topography included in Figure 5.

The gradient of the site is as follows:

Gradient	Description
Flat	
1:50 – 1:20	In the centre of the study area, there is a slight gradient associated with the residential area of Northdene.
1:20 – 1:15	N/A
1:15 – 1:10	The gradient increases towards the edge of the Nature Reserve and towards the tributary of the Mhlatuzana River, along the western boundary of the project area.
1:10 – 1:7,5	There are steeper sections where the bulk pipeline traverses the Nature Reserve to tie-in with the existing bulk line.
1:7,5 – 1:5	N/A
Steeper than 1:5	N/A

The topographical features and landforms of the site and surrounding area are as follows:

Topographical Feature	Description
Ridgeline	Sections of the reticulation pipeline will be laid along ridgelines which is where the fence-line of the Nature Reserve is located.
Plateau	N/A
Side slope of hill/mountain	N/A
Closed valley	N/A
Open valley	There are open valleys associated with the Mhlatuzana River and the tributary running along the western boundary of the project area.
Plain	N/A
Undulating plain/low hills	The gradient associated with residential area is very gentle with low undulating hills.
Dune	N/A
Sea-front	N/A

Figure 4: Elevation profile showing the gradient associated with the section of bulk sewer pipeline traversing the North Park Nature Reserve (source: Google Earth Pro, 2017).

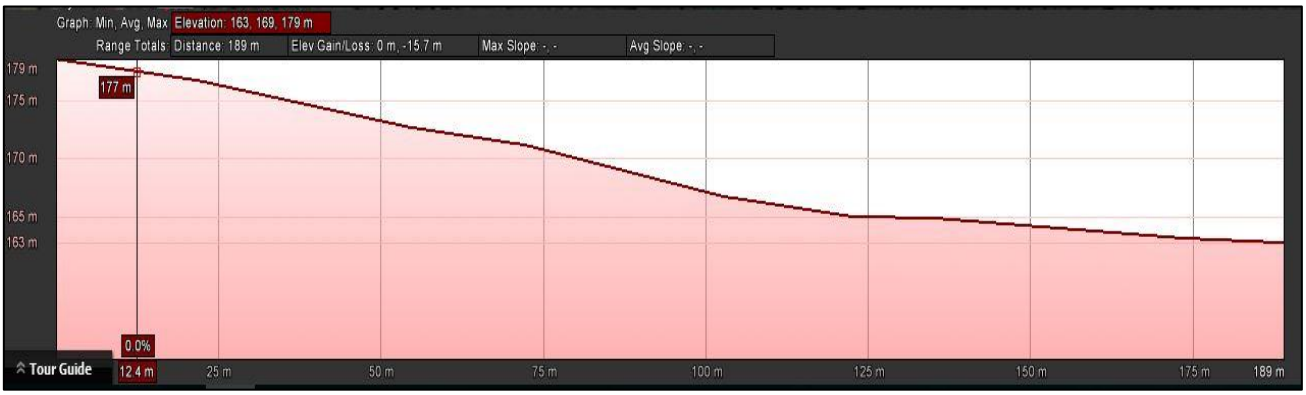


Figure 5: Photographs showing the topography and characteristics of the North Park Sewer Reticulation study area.

(a) Photograph showing the gradient in the northern section of the North Park Nature Reserve; **(b)** Photograph showing the gentle slope of the Northdene residential area in the centre of the study site.

2.2 Surface Water and Ground Water

The project area is located within the U60F Quaternary Drainage Region within the Mvoti to Umzimkulu Water Management Area (WMA 11). The region has a mean annual precipitation rate of 800 to 1 500 mm and is considered humid. The section of the Mhlatuzana River associated with the project area is in a largely modified state predominately due to the modified state of the local aquatic biota and instream and riparian habitats. Sampling in the project area showed that the water quality within the study area is of a good standard (section 6.2.1 of the Aquatic and Wetland Assessment in Appendix B).

The pipeline crosses the main channel of the Mhlatuzana River at 29°52'12.56"S; 30°52'42.77"E (WC1; Figure 6a). The aquatic ecosystem of the Mhlatuzana River associated with WC1 was characterized by the aquatic specialist as “very slow flow with most of the river being covered by aquatic macrophytes” (section 3.1 of the Aquatic Assessment in Appendix B). The engineering drawing showing the proposed pipe bridge across the river has been attached under Appendix A. There will be no excavation in the watercourse with the columns being located outside of the 1:100 year floodline.

A tributary of the Mhlatuzana River is crossed by the pipeline at WC2 (29°52'11.11"S; 30°52'44.16"E). Photographs showing the condition of the watercourses at WC2 are provided in Figure 6b. The existing structure over the tributary which the pipeline will be tied to, is visible in the photograph.

Concrete stepping stones / blocks on the existing weir across the Mhlatuzana River are proposed at 29°52'24.83"S; 30°52'55.99"E. The stepping stones aim to improve the safety of the crossing when KZNW staff cross the weir in high flow conditions. The blocks will be placed at intervals to allow water to continue to flow around the blocks. The impact of the concrete blocks in the weir was rated as “low” in section 8 of the Aquatic & Wetland Assessment (Appendix B). Photographs of the weir are included under Figure 7.

Figure 6: Photographs showing the conditions of the watercourse at WC1 & WC2 with the red line indicating the approximate location of the proposed 160mm diameter sewer pipeline.

(a): Dense riparian vegetation associated with WC1 **(b):** Photograph taken facing upstream of the Mhlatuzana Tributary at WC2; and **(c)** Photograph taken facing downstream where the tributary meets the main Mhlatuzana channel.

Figure 7: Photographs of the existing weir across the Mhlatuzana River

(a): Photograph of the weir with the red squares showing the approximate location of the proposed concrete blocks **(b):** Photograph taken facing upstream of the weir; and **(c)** Photograph taken facing downstream of the weir. The existing bulk sewer pipeline can be seen where it crosses the river towards the WWTWs.

2.2.1 Wetlands

The Wetland Assessment carried out by The Biodiversity Company in February 2017, identified one National Freshwater Ecosystem Priority Areas (NFEPA) within 500m of the pipeline (downstream of the weir). During the site visit, Channelled Valley Bottom wetland was found to be associated with both the Mhlatuzana River and the tributary crossed by the pipeline (shaded in green in Figure 3 above). The soils were dominated by sandy Dundee forms and the vegetation was that of *Phragmites spp* (section 6.3 of the Aquatic & Wetland Assessment).

The wetlands identified were rated as being in a largely natural state for all wetland drivers (Present Ecological State B). The proximity of the urban environment which alters runoff quantities as well as increasing the degree of alien vegetation encroachment, was the only impact in the immediate area impacting on the health of the watercourse.

When determining the buffer zones associated with the wetlands, the largest risk posed by the project is during the construction phase where there is a "high risk of sediment input and toxic organic contaminants" (section 6.4 of the Aquatic & Wetland Assessment). A buffer zone of 23m was calculated by the wetland specialist for the construction phase. There are sections of the pipeline that pass over wetland areas however these are unavoidable as this is where the new sections of pipe cross over the watercourses at WC1 & WC2.

There are sections of the pipeline running along the western boundary of the study area which appear to pass through delineated wetland area. The wetland specialist confirmed that the wetland is directly associated with the tributary. The pipeline will follow an existing municipal servitude in this area, which is adjacent to the tributary. There will therefore be no excavation in the wetland with no net loss of wetland. It is recommended that soil be stockpiled on the eastern side of the trench (i.e. away from the tributary and associated wetland). This section has been identified as a sensitive area and specific mitigation measures provided in the EMPr.

Provided that the mitigation measures provided by the wetland specialist and included in the EMPr (Appendix J) are followed during construction, all risks were rated as "low" in the risk assessment (section 8 of the Aquatic & Wetland Assessment). Due to the construction methodology (pipe bridge used to cross watercourse & attaching the pipe to existing structures), there will be no net loss of wetland.

2.3 Fauna and Flora

Arising out of KZN Wildlife's Mission Statement, which is to ensure the conservation and wise use of KZN's indigenous living resources (biodiversity) in partnerships with people[1], KZN Wildlife have mapped "Critical Biodiversity Areas" (CBAs) across the province. Formally protected areas are not effective enough at conserving biodiversity and therefore CBAs identify natural / near-natural areas, outside of the formally protected areas, which are used as a tool for land-use planning and decision-making.

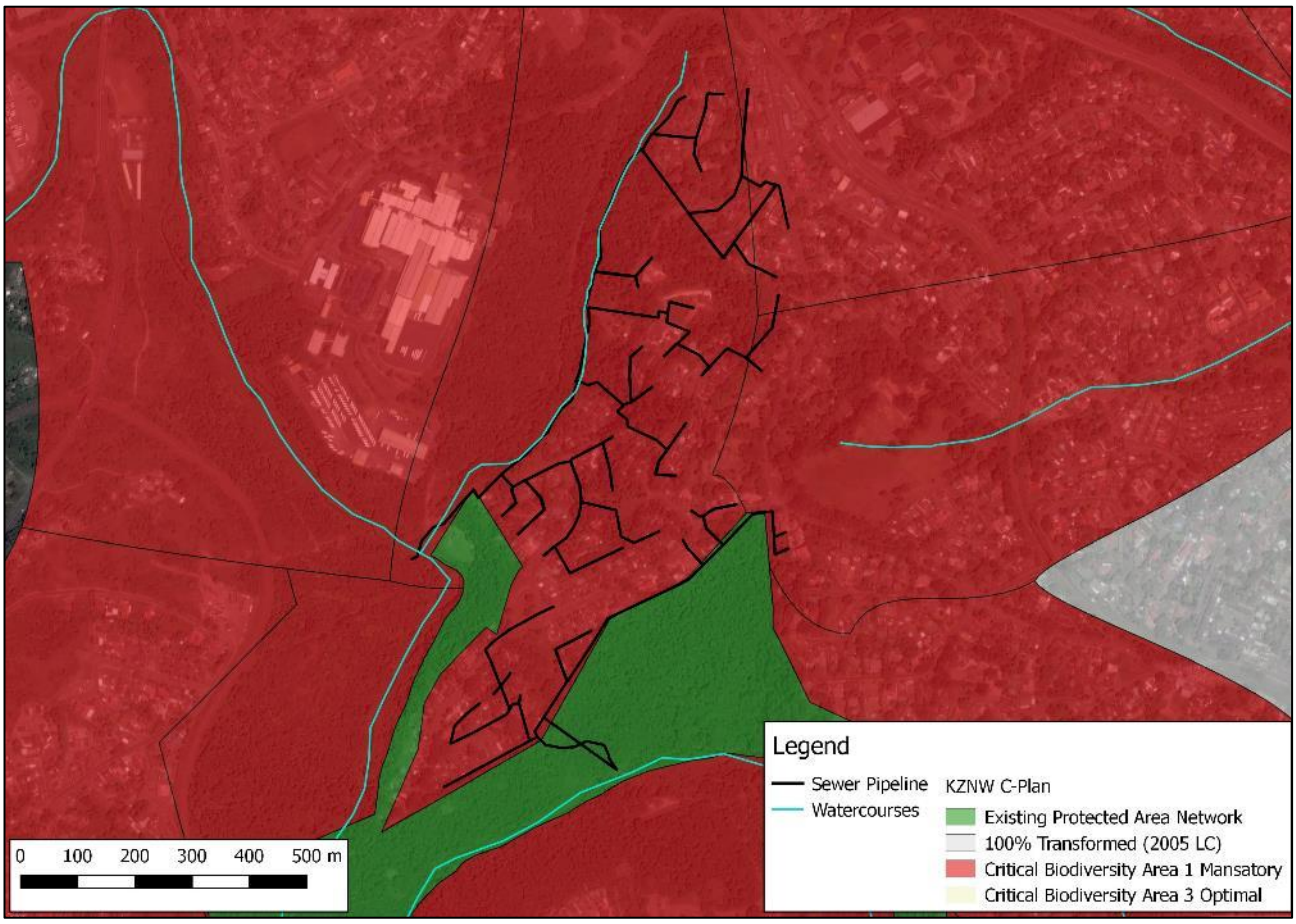
The entire study area, excluding the North Park Nature Reserve, has been identified as "Critical Biodiversity Area 1 Mandatory" (shaded in red in Figure 8). This CBA contain one or more features within an "Irreplaceability" = 1. This means that there are no other localities which KZNW have been able to identify as alternates to try and meet the conservation target for certain features located in the CBA. The distribution of these features is not always applicable to the entire extent of the mapped area but is more often than not

[1] Ezemvelo KZN Wildlife website (www.kznwildlife.com). Accessed on the 13th April 2017.

confined to a specific niche habitat e.g. a forest or wetland. Should this be the case, special mitigation measures would have to be considered to safeguard these features, then the potential for development (dependant on its nature of course) could be permitted in the area[2].

An Ecological & Fauna Assessment was therefore carried out to assess the impact of the sewer pipeline within a CBA. The specialist study is attached to Appendix B and summarised below.

Figure 8: The proposed sewer pipeline route within a Critical Biodiversity Area (shaded in red) identified in the KZN Wildlife Conservation Plan (source: QGIS with KZNW C-Plan Overlay).



As per section 3.1 of the Ecological & Fauna Assessment, much of the study area is either ecologically compromised (vegetated urban) or fully ecologically intact (North Park Nature Reserve) and is well connected to similar ecologically intact vegetation (associated riverine and cliff vegetated habitat). The faunal specialist identified 3 habitat units (vegetated urban, Nature Reserve & Rivers/Waterways). Overall, all habitats on site are considered to be optimal in regards to ecologic integrity, and sound ecologically viable attributes remain intact, especially within the Nature Reserve and the River Habitat (section 3.4 of the Ecological & Fauna Assessment).

The following key findings include:

- A high richness of threatened and near threatened bird species are sympatric to the region but not necessarily all within the area of influence of the pipeline options;
- High reporting rates are observed for the Endangered Spotted Ground Thrush and the Vulnerable African Finfoot and Crowned Eagle.
- It is highly likely that the Red Listed avifaunal taxa are breeding residents.
- Many of the Red-Listed avifaunal species are foraging residents.
- The mammalian Red-Listed species does not represent a fatal flaw, although mitigation measures may be required in regards to the upgrade of the weir (maintenance of water flow).
- There is a high risk of the presence of Pickersgill Reed Frogs, Kloof Frog, Black-headed Dwarf Chameleon, Durban Burrowing Skink and other red listed herpetofauna on site. A SACNASP registered ecologist with sufficient herpetological experience should be present on site for ALL vegetation removal

[2] Escott BJ, SANBI GID METADATA for Terrestrial Critical Biodiversity Areas in KZN developed in 2010 by KZN Wildlife (2010).

and earthworks. The following actions have been incorporated into section 2.4 of the EMPr as well as photographs of the red listed herpetofauna.

- Prior to construction each morning, all vegetation should be searched for individual chameleons and frogs
- All individual chameleons and frogs should be relocated to at least 200 metres away from the construction activities in similar habitats.
- Under no circumstances can wild date palm *Phoenix reclinata* be removed due to the preference shown by Dwarf Chameleons to the plant.

General and Red-Listed Species specific mitigation measures have been provided in section 5.1 of the Ecological & Fauna Assessment, which have been included in section 2.4 of the attached EMPr. The faunal specialist's professional opinion is that Option 3 be considered the preferred. There is to be no construction in the North Park Nature Reserve between May-Aug as this is the breeding season for the endangered Spotted Ground Thrush.

According to the North Park Nature Reserve's Protected Area Management Plan[3], the Reserve supports a population of Black-headed Dwarf Chameleon's (*Bradypodion melanocephalum*). These chameleons are endemic and restricted to KwaZulu-Natal. The Ecological & Faunal Assessment also refers to Durban Dwarf Burrowing Skink (*Bradypodion melanocephalum*), Pickersgill reed frog (*Hyperolius pickersgilli*), Kloof Frog (*Natalobatrachus bonebergi*), Natal leaf-folding frog (*Afrixalusspinifrons*) and Spotted Shovel Nose Frog (*Hemisus guttatus*), which have the potential to be found within the study area. Images of these highly threatened amphibian species have been included under section 2.4 of the EMPr as well as the requirements for a faunal sweep prior to construction in the North Park Nature Reserve.

Due to the size of the pipeline and the limited construction footprint, it is recommended that the full time ECO perform a chameleon and frog search along the pipeline route within the North Park Nature Reserve. The ECO is to walk the length of the pipeline at the beginning of each day to ensure no chameleons or frogs are disturbed by construction activities. Should a specimen be found, it is to be carefully relocated to another section of the park with similar habitat, where there is no disturbance. A Method Statement for the search and relocation is included under section 2.4 of the attached EMPr.

David Styles mapped the vegetation types within the study area and identified a number of protected / endemic plant species. The vegetation within the study area is described as follows:

- Nationally, the ecosystem type is Durban Metropole North Coast Grassland
    - This ecosystem has been identified by the South African National Biodiversity Institute (SANBI) as "critically endangered".
    - Two vegetation types are found in the project area: KZN Coastal Belt Grassland (outside the Reserve) and Northern Coastal Forest (mainly inside the Reserve).
- Provincially, the vegetation outside the Nature Reserve is shown as mainly KZN Coastal Belt Grassland and KZN Coastal Belt Thornveld with the vegetation inside the Nature Reserve consisting of North Coast KZN Coastal Forests: Southern Mesic Coastal Lowlands Forest.
    - Much of the area outside of the Nature Reserve is now suburban homes and gardens, disturbed by alien vegetation.
- Vegetation noted on site:
    - There is a stark difference between vegetation inside the North Park Nature Reserve and outside the reserve. Vegetation outside the reserve either comprises alien species, or indigenous pioneer or common species prolifically mixed with alien species, or is secondary. Inside the reserve, there is disturbance and varying amounts of alien plant invasion along the suburban edge and along the Mhlatuzana River, but away from these edges there is no extensive alien plant presence. Instead the vegetation comprises well developed Northern Coastal Forest mixed with patches, some large, of more seral forest.
    - The following vegetation components were found along the route and are mapped in Figure 9: Primary Forest, Scarp Forest elements, Seral Forest, Alien Reeds & Disturbance, Alien Vegetation, |Mixed Seral & Alien Vegetation, Gardens & Alien Vegetation and Mown Grass & Scattered Indigenous Trees.
    - Except for the *Sclerocarya birrea* subsp. *caffra* (Marula) trees seen away from the route, rare, red listed and protected species were only seen inside the North Park Nature Reserve, not outside. The position of these species is shown in Figure 10.
    - Alternative 1 & 3 both begin by flanking an area of disturbance that contains much alien and ruderal vegetation. They then pass through the same patches of seral forest, primary forest,

[3] North Park Nature Reserve: Management Plan. Version 1.0 (February 2014), Ezemvelo KZN Wildlife, Pietermaritzburg.

and band of primary forest shown as Scarp Forest elements (section 7 of the Vegetation Report).

- The vegetation specialist concluded that the option that is preferable is the one that will result in least disturbance to ground, but if both use the same methodology (i.e. pipes laid above ground, with minor changes in alignment to avoid larger trees), one does not appear greatly superior to the other.

Small sections of the pipeline pass through the Durban Metropolitan Open Space System (DMOSS; Figure 11). These sections of the pipeline are outlined in white below and are associated with the North Park Nature Reserve. Due to the size of the project and the mitigation measures included in the attached EMPr, the project will not impact on DMOSS.

Photographs of the vegetation associated with the site are included in Figure 12.

The pipeline has been aligned to follow existing roads and servitudes where the vegetation tends to be more disturbed and invaded by alien species. The small size of the trench (approximately 1m wide) means that very little vegetation will require clearing. The contractor must however ensure that invasive species do not gain a foothold along the cleared route until the planted indigenous vegetation has had time to re-establish.

Figure 9: Vegetation mapping of the North Park Sewer Reticulation Project (source: David Styles, 2017).

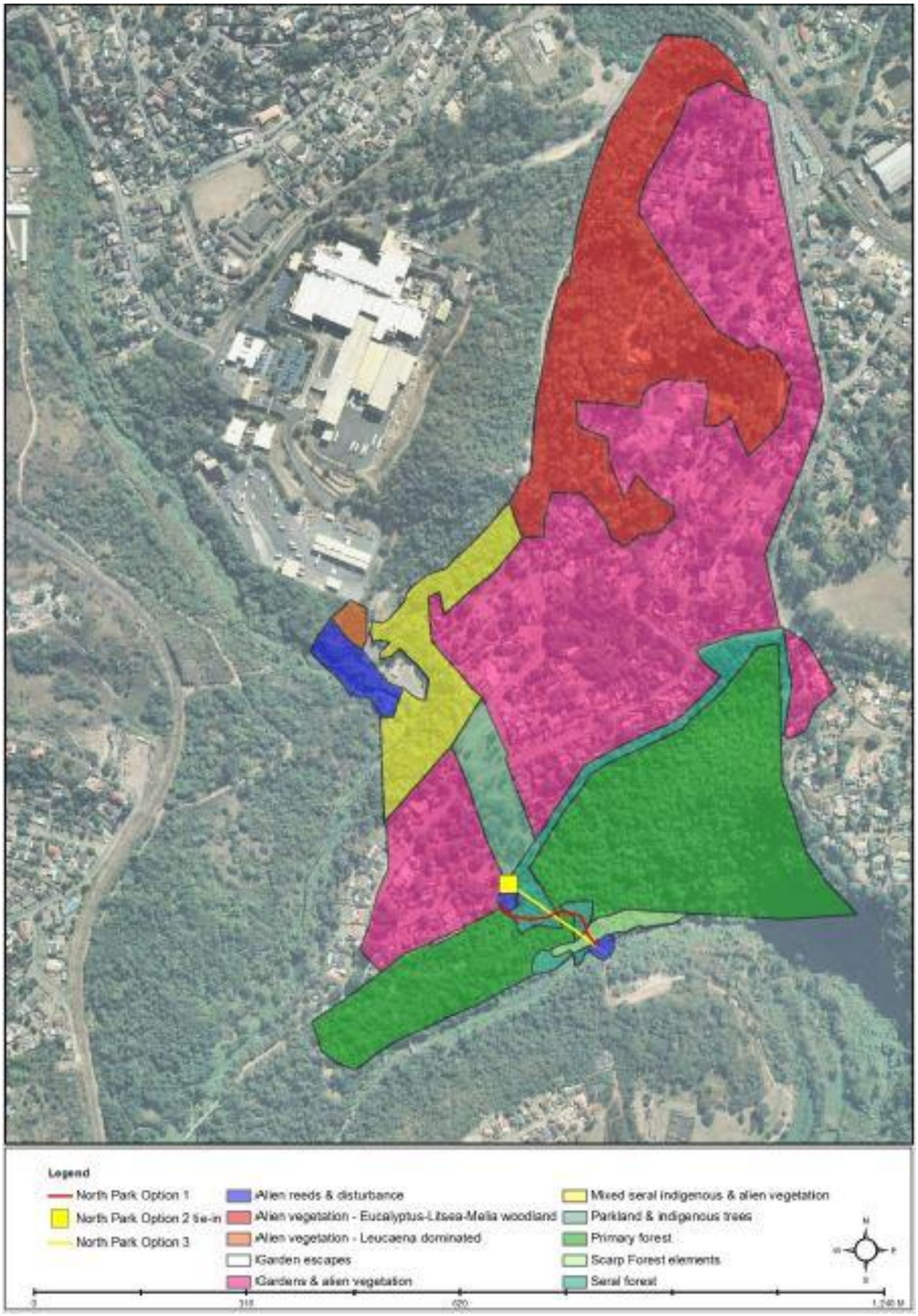


Figure 10: Fieldwork-based vegetation mapping showing the position of rare, red listed and protected plant species (source: David Styles, 2017).

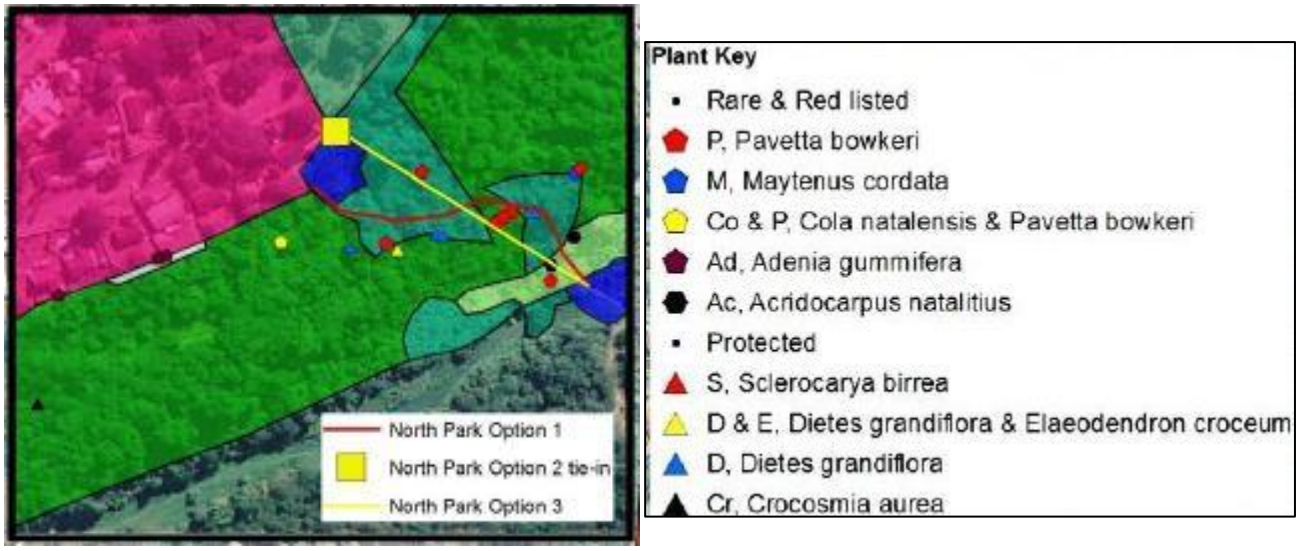


Figure 11: Aerial image showing the DMOSS areas shaded in green. Sections of pipeline in DMOSS are outlined in white (source: Google Earth Pro with eThekwini GIS overlay, 2017).

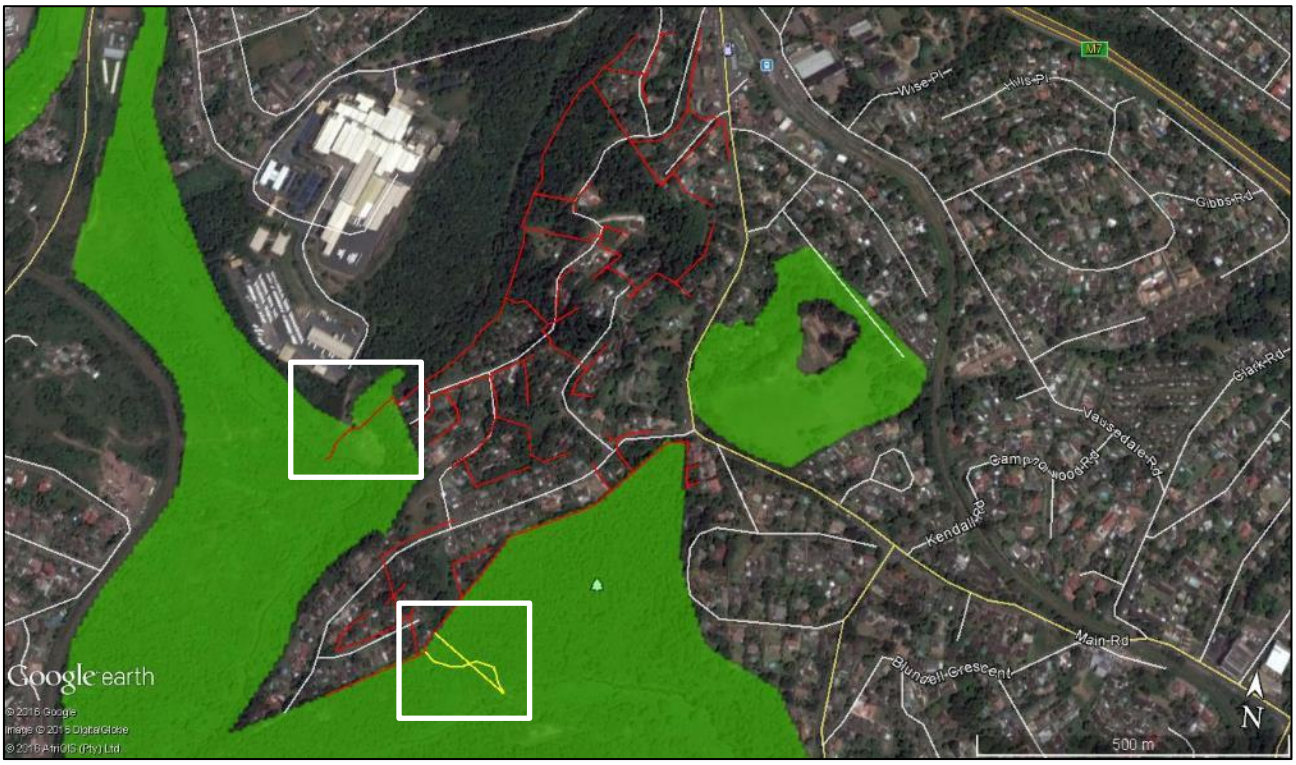
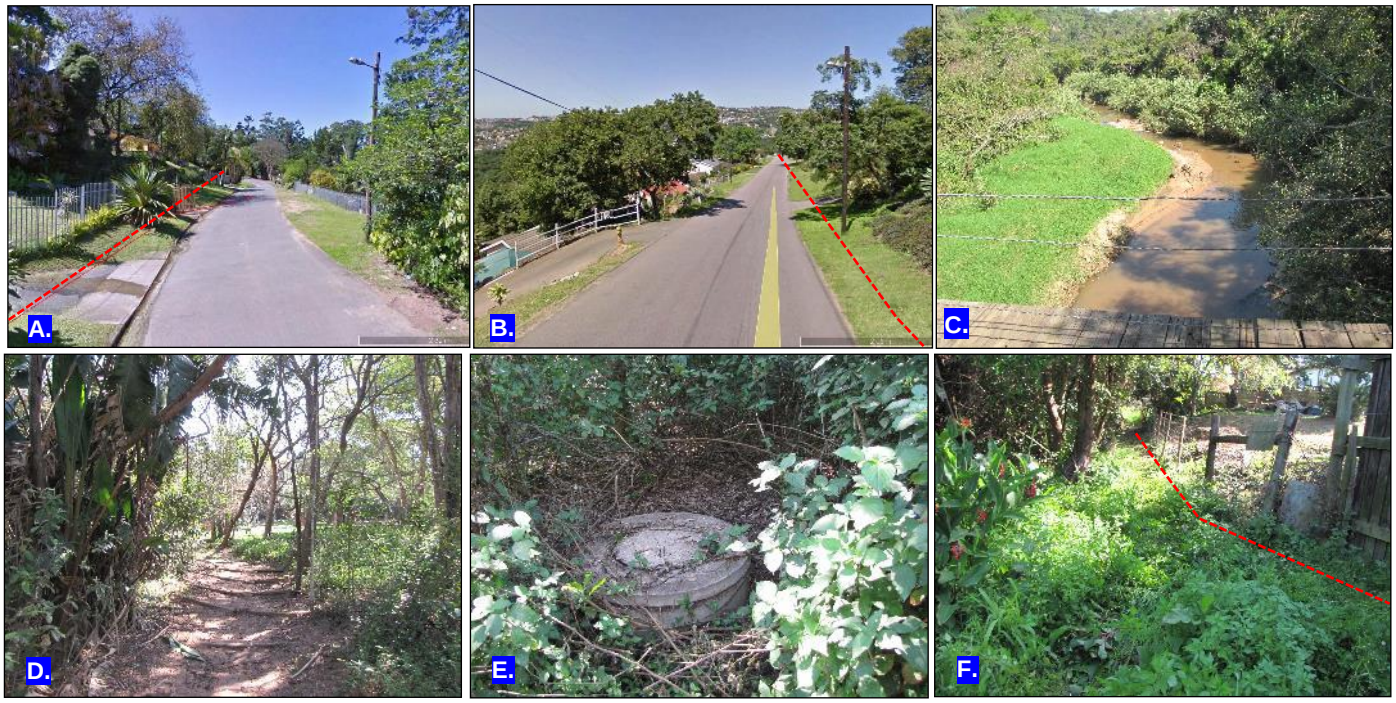


Figure 12: Photographs showing the vegetation on site. The approximate location of the pipeline is shown with the red line.



(a): Vegetation associated with the Schroeders Road reserve **(b):** Disturbed area associated with the Umgeni Pipeline near WC1 **(c):** Vegetation in the northern portion of the pipeline route where the road joins the P154 Road reserve **(d):** Vegetation associated with the P154 Road reserve. Photographer facing west **(e):** Grassland associated with WC2. Photographer facing east towards WC2 **(f):** Fence-line associated with the North Park Nature Reserve.

2.4 Heritage and Cultural Aspects

North Park Nature Reserve derived its name from George and Elizebeth North who settled the area in the 1860's. The Reserve which contains the North family graves, which was donated to the Reserve in 1969. The graves are approximately 200m south-west of the nearest pipeline and will therefore in no way be impacted by the proposed development.

A Heritage Impact Assessment was carried out by Active Heritage cc to identify any cultural or architecturally important features associated with the study area. The heritage survey, attached under Appendix B, identified no heritage sites or features on the footprint. The area is also not part of any known cultural landscape. The specialist concluded that “there is no archaeological reason why the proposed development may not proceed as planned”.

Attention is drawn to the National Heritage Resources Act, 1999 (Act No. 25 of 1999) which, requires that operations that expose archaeological or historical remains should cease immediately, pending evaluation by the provincial heritage resources authority (AMAFA).

2.5 Socio-Economic Environment

The project area is located in Northdene, a suburb of Queensburgh. The surrounding land uses include a mix of residential and open, protected areas mainly associated with watercourses. All residential properties in the area are located outside the road reserves, where the majority of construction activity will be taking place. The new municipal sewer pipeline is a strategic development to facilitate community development within the local area and will therefore have a positive impact on the socio-economic environment.

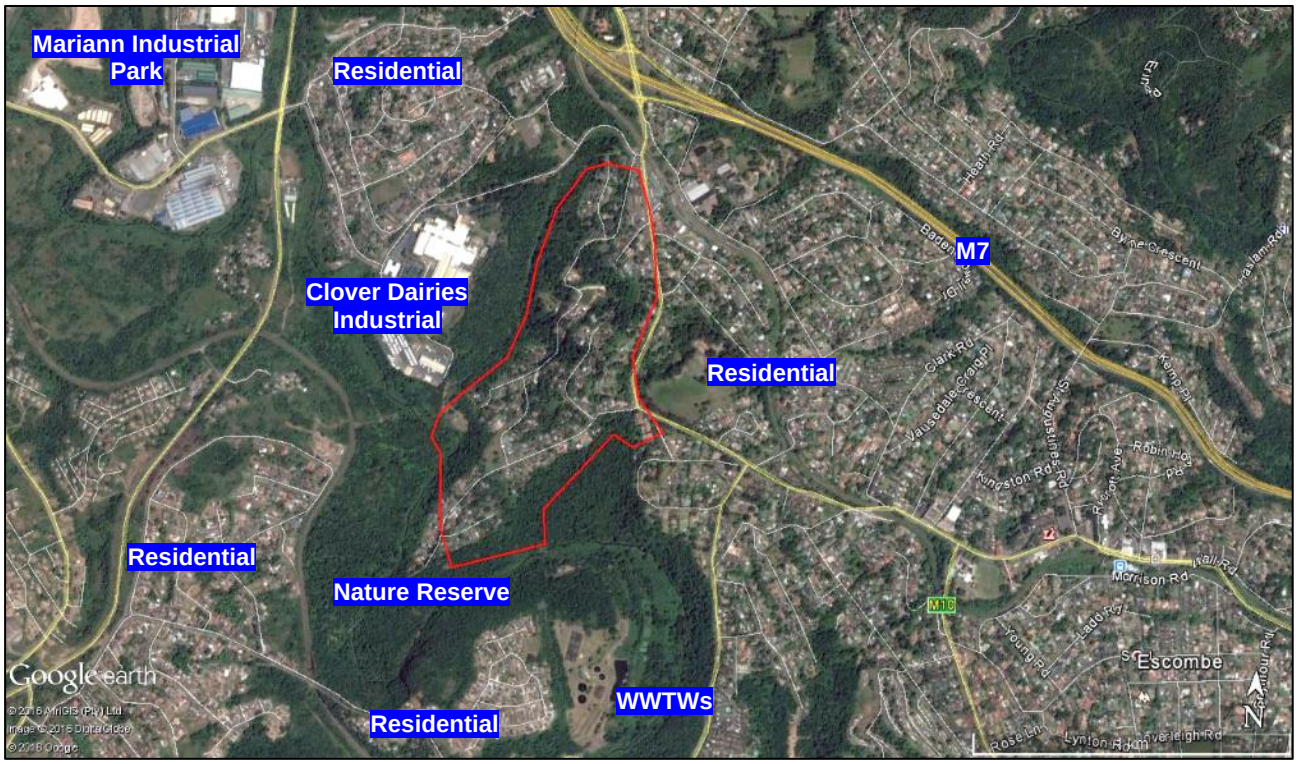
2.6 Surrounding Environment and Land Uses

The environment and surrounding land uses within and adjacent to the pipeline are shown on Figure 13 below and described as follows:

- Located within the residential area of Northdene.
- There are other residential areas surrounding the entire study area.
- The North Park Nature Reserve is located along the southern boundary of the study area.
- Light industry is located to the west (Clover Dairies) and north-west (Mariann Industrial Pak).
- The Mhlatuzana WWTWs is located directly south of the Nature Reserve and study area.

Due to the size of the pipelines, the surrounding environment and land use will not be negatively affected by the pipeline. The Northdene residential area will benefit from the project. Where possible, the pipeline has been aligned to follow existing servitudes in road reserves.

Figure 13: Aerial Image Showing the Surrounding Environment and Land Uses Associated with the Study Area (source: Google Earth Pro, 2017).



Section 3: Policy and Legislative Context

3.1 Identification of all Legislation, Policies, Plans, Guidelines, Spatial Tools, Municipal Development Planning Frameworks and Instruments As Per Section 3(e)(i) and Compliance of Proposed Activity with Legislation and Policy 3(e)(ii)

Legislation	Compliance of Activity
National Environmental Management Act 1998	The National Environmental Management Act (Act 107 of 1998) (NEMA) is South Africa's overarching environmental legislation. It includes a set of principles that govern environmental management and against which all Environmental Management Programmes (EMPrs) and actions are measured. These principles include and relate to sustainable development, protection of the natural environment, waste minimisation, public consultation, the right to an environment that is not harmful to one's health or wellbeing, and a general duty of care. The Environmental Impact Assessment (EIA) Regulations, 2014: GN R982, R983, and R985 under Section 24 of NEMA define the activities that require Environmental Authorisation (EA) and the processes to be followed to assess environmental impacts and obtain EA. EA is required for the construction of the sewer pipeline in the North Park Nature Reserve and surrounding CBA. The construction of the concrete stepping stones / blocks across the Mhlatuzana River also requires EA from EDTEA. This application is therefore in line with the requirements of NEMA.
National Water Act 1998	The construction of the pipeline across the watercourses will result in alternations to the bed and banks of these watercourses. The specialist has delineated wetland associated with the watercourses and therefore a Water Use Authorisation (WUA) will be required under Section 21 c and i of the National Water Act. After early discussions with the Department

	of Water & Sanitation (DWS), EWS will be applying for a directive in terms of Section 19 of the National Water Act (NWA) and submitting all necessary documentation requested by DWS to ensure that there is a municipal sewer connection available to the residents.
National Waste Management Act 2008	Reforms the law regulating waste management to prevent pollution and ecological degradation. Section 19 allows the Minister to publish a list of activities, which require a Waste Management License. The most recent list is published in Government Gazette 37083 Notice No. 921 dated 29 November 2013. The proposal will not trigger a Waste Management Activity.
Environmental Conservation Act 1996	Makes provisions for the application of general environmental principles for the protection of ecological processes, promotion of sustainable development and the protection of the environment. This Act has mostly been repealed by NEMA.
National Environmental Management Biodiversity Act 2004	To provide the framework, norms, and standards for the conservation, sustainable use and equitable benefit-sharing of South Africa's biological resources. Section 52 allows for the publication of a list of threatened ecosystems in need of protection. The list was published in Government Gazette No. 34809 Notice No. 1002 dated 9 December 2011. The entire pipeline falls within the Durban Metropole North Coast Grassland ecosystem, which is listed as "critically endangered".
National Heritage Resources Act 25 of 1999	For the protection of South African Heritage to nurture and conserve communities legacy. No areas of cultural or heritage significance have been identified within the study area however AMAFA will be contacted should any objects of importance be found during construction.
Municipal Planning Framework	
eThekwini Municipality: Sewage Disposal By-Laws, 2015	To provide for efficient, affordable, economical and sustainable access to sanitation and sewage services; to provide for different mechanisms of sanitation; to provide for the management and regulation of sewage; to provide assistance to those who cannot afford to pay for sanitation and sewage services; to provide offences and penalties; to provide for the repeal of laws and savings; and to provide for matters incidental thereto. The applicant is EWS and therefore the project is in line with the bylaws.
eThekwini Municipality: Draft Integrated Development Plan for 2017/2018 – 2021/2022.	This project falls in line with the eThekwini Municipality's Integrated Development Plan, which is to ensure that the municipality provides a healthy living environment with the provision of sanitation services identified as a key factor. The municipality is to ensure that there is dignity for all through the provision of sanitation services that support good hygiene potable water to all communities within the municipality. EWS continually strives to introduce new and innovative methods to delivery these services to the citizens.

Section 4: Motivation, Need and Desirability

4.1 Need and Desirability as Per Section 3(F)

There is currently water-borne sewage connections available to the majority of the Northdene area (east of the study site). This project is for the expansion of the existing reticulation network across the Main Road, into the western residential area of Northdene. Residents in this area are currently using septic tanks to treat and dispose of sewage. The cost for the private residents to maintain the septic tanks is high and maintenance needs to be carried out regularly to ensure the system is functioning effectively. The effectiveness of the system can decrease due to chemicals being poured down drains into the tanks. Currently, there is therefore a higher risk of soil and groundwater contamination in the Northdene area resulting from the private septic tanks. This residential area is located directly adjacent to the North Park Nature Reserve, which is located at a lower elevation than the residential area.

During the public participation phase, a number of local residents have shown interest and support for the project which will allow them a municipal sewage connection.

4.2 Motivation for Preferred Site, Activity and Technology Alternative

The aim of the project is to provide a municipal water-borne sewage connection to the Northdene area and therefore there are no site alternatives. Different pipe materials were initially investigated however there is only one technology alternative as the pipe specifications need to fall within the appropriate designs standards. There were three route alternatives assessed. Alternative 2 is not feasible from an engineering perspective and was therefore not considered further in the EIA. There are slight alignment differences between Layout Alternative's 1 and 2, with both passing through a section of the North Park Nature Reserve. Alternative 1 is 15m longer than Alternative 2. Both layout alternatives will allow for slight re-alignments on site to accommodate large trees and the rare, red-listed and protected plan species identified in the Vegetation Assessment. With Alternative 2 being located in an existing servitude, this is the preferred layout alternative.

Considering the mitigation measures provided by the specialist, included in the attached EMPr, it is the opinion of the EAP that there are no significant environmental impacts that cannot be mitigated and that the preferred North Park Sewer Reticulation route be authorised.

Section 5: Public Participation

5.1 Notification of Interested and Affected Parties

1) *fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of-*
   - i. *the site where the activity to which the application or proposed application relates is or is to be undertaken; and*
   - ii. *any alternative site;*

Noticeboards (in English) were placed at the entrance of the North Park Nature Reserve and along Anderson Road on the 03rd February 2017. The noticeboard detailed eThekwini Water & Sanitation's proposal to provide waterborne sewer connections in the Northdene area, subject to a Basic Assessment. See Appendix C – Proof of Placement of Notice Board.

2) *giving written notice, in any of the manners provided for in section 47D of the Act, to-*
   - i. *the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;*
   - ii. *the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;*
   - iii. *the municipality which has jurisdiction in the area;*
   - iv. *any organ of state having jurisdiction in respect of any aspect of the activity, and;*
   - v. *any other party as required by the competent authority;*

A site inspection meeting was held with EKZNW on the 31st August 2016 where the project and pipeline route were discussed extensively. EKZNW were also officially notified of the project over email on the 30th January 2017. The remainder of the project is located within a dense residential area. Notices were therefore hand delivered to all residential households and small businesses in the project area on the 03rd February 2017. Proof of notification is attached under Appendix D. An onsite meeting was held with Clover on the 03rd February 2017, where a small section of the pipeline passes through their property into the North Park Nature Reserve. EnviroPro met with the Ward Councilor, Mr Chris Van de Berg on the 03rd February 2017. The meeting register and minutes are attached under Appendix D. The wad councilor was given a number of pamphlets to hand to other members of the ward committed. With regards to authority communications, all relevant authorities have been notified of application and have been provided with copies of the Draft BAR.

See Appendix D – Proof of Notification.

- i. *owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;*

As described above, pamphlets were hand delivered to all residential households and small businesses in the project area on the 03rd February 2017. EKZNW have been notified and are registered as I & APs to receive more information. A meeting with Clover also took place on the 03rd February 2017. Email notifications to all I

& APs in the area were sent out on the 30th January 2017. Signboards were placed in the project area on the 03rd February 2017.

See Appendix D – Proof of Notification.

3) placing an advertisement in-
i. one local newspaper; or
ii. any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;
4) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii);and

As recommended by the Ward Councillor, an advert was placed in the local newspaper, the Queensburgh News on the 24th February 2017 detailing the proposed project, Basic Assessment process and providing contact details of EnviroPro should anyone wish to register as an I&AP.

See Appendix E – Proof of Advert Placement.

5.2 Registered Interested and Affected Parties

42. A proponent or applicant must ensure the opening and maintenance of a register of interested and affected parties and submit such a register to the competent authority, which register must contain the names, contact details and addresses of-
(a) all persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;
(b) all persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and
(c) all organs of state which have jurisdiction in respect of the activity to which the application relates.

The contact details of all I & APs that have registered have been provided in the Registered I & AP list in Appendix F.

5.3 Comments

Comments of interested and affected parties to be recorded in reports and plans 44.

1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.
2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to-
i. a lack of skills to read or write;
ii. disability; or
iii. any other disadvantage;
iv. reasonable alternative methods of recording comments must be provided for.

All comments received from I & APs have been recorded in the comments and response table. The original comments provided have been provided together with the C&R table. This report has been provided to the eThekwini Municipality, the Department of Water & Sanitation and KZN Wildlife for comment.

See Appendix G – Comments and Response table and Comments received to date.

Section 6: Impact Assessment

6.1 Methodology To Determine And Rank Significance And Consequences Of Impacts Associated With All Alternative As Per Section 3(h)(vi)

Impacts are assessed qualitatively and quantitatively, looking at the duration / frequency of the activity and likely impacts associated with that activity during both construction and operation. If the activity happens frequently, the risk of the associated impact occurring is much higher than if the activity happens less frequently. The geographical extent of the impact is assessed i.e. will the impact be restricted to the point of occurrence or will have it have a local or regional effect. Impacts are also reviewed looking at severity levels and consequences should the impact occur i.e. will the severity be low, medium or high and then probability of the impact occurring is taken into account.

Whether or not the impact can be mitigated and the extent to which it can be avoided, managed, mitigated or reversed is assessed i.e. the probability of occurrence after mitigation has been applied. This also takes into account likelihood of human error based on construction and operational auditing experience i.e. even though spills can be completely mitigated against and prevented, there is always a small chance that spills will still occur (residual risk). Based on all of these factors, the impact is then rated to determine its significance. For example an impact can have a regional affect with severe environmental implications, however the probability of it occurring is very low and the implementation of the proposed mitigation measures means that the ultimate rating is medium or low.

Please see below a description of the scoring. The full impact scoring tables detailing how the significance rating was calculated can be found in Appendix H.

Scoring of Impacts	
Duration / Frequency of activity likely to cause impact	0 = No impact 1 = short term / once off 2 = medium term / during operation 3 = long term / permanent
Geographical Extent	0 = No impact 1 = point of impact / restricted to site 2 = local / surrounding area 3 = regional
Severity (level of damage caused) if impact were to occur	0 = No impact 1 = minor 3 = medium 5 = major
Probability of impact without mitigation	1 - 5 = low. 6 -10 = medium. 11 -14 = high.
Significance before application of Mitigation Measures	A score of between 1and 5 is rated as low. A score of between 6 and 10 is rated as medium. A score of between 11 and 14 is rated as high.
Will activity cause irreplaceable loss of resources?	10 = Yes 0 = No
Mitigation measures	0 = No impact - 5 = can be fully mitigated - 3 = can be partially mitigated -1 = unable to be mitigated
Probability of impact after mitigation	0 = No impact 1 = Low 2 = Medium 3 = High
Significance after application of Mitigation Measures	A score of between 1and 5 is rated as low. A score of between 6 and 10 is rated as medium. A score of between 11 and 14 is rated as high.

6.2 Preferred Site and Layout Alternative

See Appendix H for the full impacts scoring matrix, which assesses the environmental impact of the North Park Sewer Reticulation scheme.

Table 1: Impacts and mitigation measures associated with the *preferred* layout (i.e. Layout Alternative 3)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
Construction			
1. Dusty conditions generated during construction and by construction vehicles.	4 (low)	Since the pipeline will be placed adjacent to tar roads in the residential area of Northdene, there is unlikely to be a large amount of dust generated by construction vehicles. Since the pipeline will be constructed above-ground and by hand, in the North Park Nature Reserve, there is unlikely to be dust generated in this section of the study area. There will however be some dust generated during the construction phase which will be a temporary impact i.e. the site will be worked continuously for a few months until construction is completed. Further to this: • Water carts must be used on site should dust levels elevate to a nuisance level. • Water cart will be utilised to dampen dusty surfaces and suppress dust from road surfaces. • Shade cloth is to be utilised for stockpiled materials where required. This impact can be managed and mitigated to a large degree with the implementation of the EMPr. The applicant must comply with the National Dust Regulations (Government Notice R827, 2013) with regards to dust levels produced on site.	2 (low)
2. Generation of emissions from construction vehicles.	5 (low)	Due to the small scale of the project and with the majority of the pipeline trench being excavated by hand in sensitive areas, emissions generated from construction vehicles will be negligible and are not expected to significantly affect the surrounding environment or residents. Measures to reduce emissions have however been incorporated into the EMPr with a complaints register included in section 5 of the EMPr. All construction vehicles must be fitted with the appropriate silencers and exhausts. This impact can be managed and mitigated.	0 (low)
3. Impact on existing services i.e. power lines, Telkom lines, infrastructure, etc.	5 (low)	As standard construction practice the engineer and contractor will identify all existing services that may be affected along the route prior to construction. Open Serve have indicated that there is existing underground infrastructure in the study area, which may be impacted (see	1 (low)

[4] See Appendix H for more details.

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		comments & response table in Appendix G). Any infrastructure that is removed must be replaced and any damage caused from construction must be repaired. This impact can be managed and mitigated.	
4. Damage to properties, fencing etc. during laying of pipework.	5 (low)	For the most part the pipeline will be laid within the road reserves however if any properties are likely to be affected, the contractor will liaise with the landowner. This process is currently underway by the applicant and consulting engineers. Any damage to the North Park Nature Reserve fence line, is to be repaired prior to the contractor vacating the site. The pipeline trenches will be approximately 1m and 1m deep, thereby limiting the area of the excavation and damage that could be caused by large vehicles. This impact can be avoided and mitigated.	1 (low)
5. Erosion of exposed soil during the excavation of trenches and prior to the rehabilitation of the construction area.	5 (low)	Exposed soil is very susceptible to erosion and therefore erosion control is critical during the excavation of the trench. There are steep areas associated with the Northdene residential area and therefore: • Exposed areas will be rehabilitated and re-vegetated as soon as possible during construction. • Only the minimum area required for the trench may be cleared. • Trench size should not need to be more than 2m wide at most, therefore the most suitably sized equipment must be used to excavate the trench. • It is recommended that the trenches be dug by hand to reduce unnecessary clearance and disturbance. • Cleared areas may not be left exposed for long periods of time and should be re-vegetated in stages on completion of a section of the pipework. • Small inspection holes may be left open along the route but the rest of the trench must be closed once the pipe has been laid. • In certain steeper sections (along the edge of the North Park Nature Reserve) additional precautions to manage erosion will be required (e.g. sand bags or gabions). This impact is to be monitored during construction and can be mitigated.	1 (low)
6. Trenches remaining open for long periods of time, causing them to collapse, creating an erosion and safety hazard for Northdene residents.	6 (med)	Trenches must not remain open indefinitely. Trench work must be completed in sections and then closed once the pipe has been laid in that section. Small inspection holes may be left open along the	2 (low)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		route but the rest of the trench must be closed. Cleared areas may not be left exposed for long periods of time and must be re-vegetated as each stage of pipework is completed. Trenches must not remain open during building shut down periods i.e. over Christmas and Easter. Trench work must be planned so that trenches are closed before these shut down periods as there is a risk that the trenches will either collapse or fill with water if left unattended and this can create a hazard for children and animals. Trenches must be demarcated. This impact can be avoided.	
7. Incorrect filling of trenches on completion creating points of erosion, especially on slopes and near watercourses.	6 (med)	Care must be taken to ensure that when closing trenches, soil is compacted sufficiently and left so that the level of the trench is slightly higher than the surrounding land, to allow settling. Should soil settle below the level of the surrounding land, it will leave a depression along which water will travel and this could create a focal point for erosion. This can be especially problematic on sloped sections where water will follow the depression along the pipeline route, building up speed down steeper sections and creating furrows. Rehabilitation through replanting of indigenous grass species soon after closure will aid in stabilising soil and preventing erosion and will also assist in dust control. This impact can be avoided and mitigated.	4 (low)
8. Deposition of sediment into the watercourses when laying the pipeline across the watercourses (WC1 & WC2) as well as during the construction of the concrete stepping stones / blocks across the Mhlathuzana River. The sediment increase may negatively impact the water quality (increased turbidity, reduction of dissolved oxygen).	7 (med)	Caution needs to be exercised when working near the watercourses (at WC1 & WC2 as well as at the existing weir site). The following mitigation measures will be carried out and are included in the EMPr[5]: • All construction activities occurring in close proximity to the watercourses must be done with extreme care to avoid damage to the watercourses and associated wetland area. • Where the reticulation pipeline runs down the side of the tributary (western boundary of the study area), soil from the excavated trench must be temporarily stockpiled on the eastern side of the trench (i.e. away from the tributary and associated wetland). • No heavy vehicles will be permitted to work in any watercourse. • No storage of materials will be permitted within 23m of the watercourses, which will be agreed on and demarcated	3 (low)

[5] Recommendations from the Aquatic and Wetland Assessment have been included under these mitigation measures.

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		before construction begins on each section. • Where the two watercourse crossings are required, the pipe will span the length of the watercourse (i.e. no construction of columns in the river bed and no excavation in the watercourse). • Where the pipeline crosses the Mhlatuzana River (WC1), a concrete pipe bridge will be used with columns located outside of the 1:100 year floodline (see typical section through the river crossing attached under Appendix A). • Where the pipeline crosses the narrower tributary (WC2), the pipe will be tied onto an existing bridge structure. • No excavation will take place in the Mhlathuzana River during the construction of the concrete stepping stones / blocks on the weir. This impact can be managed and mitigated to a degree.	
9. Construction work impacting the flow and water quality of the Mhlatuzana River during the laying of the stepping stones /blocks at the existing weir.	6 (med)	Since the weir is located in the centre of the North Park Nature Reserve, pre-cast concrete blocks will be brought onto the site and reinforced onto the weir. • The contractor is to ensure that this work is carried out during the low flow season (i.e. June – August). • Any epoxy and/or cement mixing is to be carried out away from the edge of the watercourse, associated wetland area and riparian area.	2 (low)
10. Physical damage to wetland areas associated with the Mhlathuzana River and its tributary during excavation of the pipeline trench adjacent to the watercourses.	6 (med)	Construction activities are to be restricted to the pipeline route. The rest of the surrounding area must be demarcated as 'no-go areas' to prevent workers from unintentionally encroaching into wet areas. • Workers are to be made aware of the location of the tributary and associated wetland running along the western boundary of the study area. • There is to be no excavation in the wetland area with pipes spanning the width of the watercourse at the crossing points. • No storage of material, vehicles or equipment is permitted within the wetland areas. All materials are to be stored outside the 23m wetland buffer. • No heavy vehicles will be permitted to work in the wetland areas. • No dumping of material or waste may occur within the wetlands. All material and waste must be taken back to the	3 (low)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		construction camp at the end of the day. • Designated stockpile storage areas must be established outside of the wetland areas. • Where the reticulation pipeline runs down the side of the tributary (western boundary of the study area), soil from the excavated trench must be temporarily stockpiled on the eastern side of the trench (i.e. away from the tributary and associated wetland). This impact can be managed during construction through the implementation of the EMPr.	
11. Clearing of indigenous vegetation from within the critically endangered Durban Metropole North Coast Grassland ecosystem during the laying of the pipeline and temporary access points.	7 (med)	The majority of the pipeline will be placed in road reserves within the Northdene residential area which means that the area has been previously disturbed (mapped as "Gardens & Alien Vegetation by the vegetation specialist). High quality vegetation is therefore only associated with the North Park Nature Reserve. Approximately 680m of the pipeline runs along the Nature Reserve fence line (mapped as Seral Forest by the vegetation specialist). During the excavation of the trench, vegetation will be cleared from this area. Measures to minimise the disturbance footprint are as follows: • The relatively small trench size should result in the loss of only a narrow strip of vegetated area. • There is to be no stockpiling of material adjacent to the trenches, which will increase the disturbance footprint. • No unnecessary clearance of vegetation, vines and large tree species is to take place. • The bulk pipeline running through the Nature Reserve is to be constructed above-ground with minimal clearing of forest undergrowth taking place. • The bulk pipeline is to accommodate larger tree species by making minor alignments during construction. • A trained ecologist is to be present full-time during construction activities in the North Park Nature Reserve to monitor the clearance of vegetation. This impact can be managed and mitigated.	4 (low)
12. Removal / clearance of the rare, red listed and protected flora species identified in the Vegetation Assessment and shown in Figure 10.	9 (med)	All rare, red listed and protected species are to be clearly marked with red & white tape prior to construction in the North Park Nature Reserve takes place. Since the pipe will be constructed above-ground, the	4 (low)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		species should be avoided. If it is not possible to avoid disturbing the species, the ECO is to be informed and a permit from DAFF (Forest Saffron) or KZN Wildlife (*Crocosmia aurea* & *Dietes grandiflora*) will be required for their relocation. This impact can be avoided and managed.	
13. Encroachment of alien vegetation into disturbed areas during construction.	10 (med)	A large amount of alien vegetation occurs outside the reserve with *Litsea sebifera* invading and displacing indigenous vegetation around the North Park Nature Reserve (section 6.5 of the Vegetation Assessment). The risk of alien vegetation encroachment into the North Park Nature Reserve during the construction phase is therefore high. Disturbance during trench excavation will facilitate further invasion particularly along the forest edge where there is already some alien vegetation present. • Alien vegetation within the construction footprint must not be allowed to encroach into the North Park Nature Reserve and must be continually removed during construction. • The vegetation specialist recommends that alien plant control work be carried out biannually for three years after construction (see operational section in the table below). This impact can be managed and mitigated.	6 (med)
14. Loss of riparian vegetation during excavation for pipework crossings on watercourses, leading to erosion and damage to stream banks.	5 (low)	According to section 6.4 of the Vegetation Report, very little good hygrophytic or hygrophilous vegetation occurs on the banks of the watercourses. The reeds are alien and are mixed with a number of other alien species. Few indigenous species were noted by the specialist. Due to the small size of the pipeline (160mm in dimeter), the clearance of the riparian vegetation will be minimal at WC1. There is no riparian vegetation associated with WC2. There is existing access to the weir and therefore there will be no riparian vegetation cleared during construction in this section. This impact can be avoided.	2 (low)
15. Construction of infrastructure in the DMOSS.	8 (med)	The small scale of the pipeline within DMOSS will not significantly impact the services provided (i.e. biodiversity, open space, clean air provision etc.) The north-western section of the pipeline, which passes through DMOSS, will be placed under-ground and will therefore not impact DMOSS in the long-term. This impact can be avoided.	3 (low)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
16. Construction within an area identified by KZNW as a Critical Biodiversity Area.	8 (med)	All sections of the pipeline outside the North Park Nature Reserve have been identified as a CBA. The Ecological & Faunal Assessment has mapped this habitat as "urban vegetation" with a low habitat sensitivity. The majority of the pipeline in the CBA will be placed in existing road reserves in previously disturbed areas. The tributary and associated wetland along the western boundary of the study area has been identified as a highly sensitive habitat (Figure 7 in the Ecological & Fauna Assessment attached under Appendix B). The pipeline avoids this tributary and wetland and therefore the highly sensitive habitat. Since the pipeline will be placed underground in the CBA, there will be no long-term impact on the biodiversity in the Northdene area. This impact has been avoided.	4 (low)
17. Construction activity disturbing sensitive fauna in the North Park Nature Reserve.	7 (med)	Construction activities will impact locally on the various species in the North Park Nature Reserve. Since there will be limited clearance of riparian vegetation (see impact 14 above), many sensitive faunal habitats will be avoided (i.e. Pickersgill Reed Frog, Dwarf Chameleons etc.). Mitigation measures have been provided by the faunal specialist to reduce the impact: • Minimise the pipeline servitude footprint and buffer away from areas designated as high sensitivity (watercourses and wetlands); • Appoint a trained herpetologist / ecologist to monitor the construction phases of the project in the North Park Nature Reserve; • If individual pythons are discovered on site during construction, an expert herpetologist should be commissioned to remove the animal safely for the purposes of safe relocation; • No construction in the North Park Nature Reserve is to take place between the May - August as this is the breeding season for a resident pair of Spotted Ground Thrush. • A chameleon & frog search is to be performed by the full time ECO during construction within the North Park Nature Reserve at the beginning of each day. Methodology for the search is included under section 2.4 of the attached EMPr. This impact can be managed and mitigated.	4 (low)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
18. Temporary increase in waste and litter due to the construction process.	6 (med)	The construction phase of the project will see an increase in workers and therefore an increase in waste in the Northdene area. • Littering will not be permitted in the study area; • Designated waste storage areas with appropriate waste receptacles must be set up within the construction site camp; • Waste will be removed from site and disposed of at a registered waste disposal site; • Safe disposal slips for the disposal of all waste must be obtained and kept on site as proof of safe disposal. • All waste is to be removed from the North Park Nature Reserve on a daily basis. Waste management will be controlled through the implementation of the EMPr. This impact can be managed and mitigated.	2 (low)
19. Insufficient number of toilet facilities on site resulting in the contamination of the environment.	6 (med)	The increase of construction personnel during the construction phase will require an appropriate number of toilet facilities for the site. • Appropriate and sufficient toilet facilities (1 toilet per 15 employees) must be provided by the contractor; • All toilet facilities must be checked on a daily basis; • All toilet facilities must be emptied and cleaned on a weekly basis. • A registered waste removal contractor must remove effluent waste from site or effluent waste must be disposed of at a permitted Waste Water Treatment Site; • Safe disposal slips for the disposal of effluent waste must be obtained and kept on site as proof of safe disposal. This impact can be managed and mitigated.	2 (low)
20. Contamination of the receiving environment due to inappropriate storage and usage of hazardous materials and substances (cement, fuel etc.).	6 (med)	It is unlikely that there will be many hazardous materials used during construction however any potentially hazardous substances (including cement and paint) will be stored within a secured area in the construction camp. No storage of material is to occur within 23m of any watercourse. The storage area will be a hard surfaced, bunded and covered area. Cement mixing must be done on a hard surface that is protected from stormwater runoff. This impact can be prevented by managing the storage.	2 (low)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
21. Construction vehicles and personnel creating a nuisance to the surrounding Northdene residents.	6 (med)	The pipeline runs through the Northdene residential area and therefore there will be a temporary impact on the road users. Speed limits will be obeyed and enforced by the contractor. A complaints register will be kept on site in the environmental file. A points-man may be required where construction interferes with the road network. This impact can be avoided and managed.	3 (low)
22. Potential impact on heritage / culturally / architecturally important features discovered during excavation.	6 (med)	Provided that workers are restricted to the pipeline route, there will be no disturbance / impact on the graves in the North Park Nature Reserve. The heritage survey identified no heritage sites or features on the footprint. The area is also not part of any known cultural landscape. Should any items with historical or archaeological value be found during construction, these must be reported to AMAFA and work in the affected area should be stopped immediately.	1 (low)
Operation			
23. Municipal sewer connection for the Northdene residents.	0	This is a positive impact.	0
24. Erosion around watercourses and damage to watercourse banks where pipe crossings have been placed.	6 (med)	Since the pipeline will span the length of the watercourse, it is unlikely that the project will cause a long-term erosion impact. It must also be ensured that trench rehabilitation has been effectively carried out before contractors leave the site. Soil in the trenches must be compacted effectively to the same level or slightly higher than the surrounding land to prevent settling which could create depressions for water to travel along, creating erosion funnels and exposing the pipeline. It must be ensured that indigenous vegetation is planted after the soil has been compacted and that this vegetation has taken successfully before contractors leave the site. This impact can be avoided during the construction phase.	3 (low)
25. Leaking pipes resulting in sewage leaking into the soil.	9 (med)	All sewer infrastructure within the municipality are constantly managed and maintained under strict principles and maintenance procedures that allow the municipality to continuously evaluate the condition of the infrastructure on a regular basis. EWS ensure that all sewer infrastructure is specifically designed towards a low maintenance outlook with various steps taken to ensure that excessive strain is not exerted on the sewer system therefore prolong the infrastructure lifespans. Prevention of leaks is therefore the aim of the design.	5 (low)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		The EWS maintenance teams are fully qualified and skilled to deal with various challenges that may occur during any routine maintenance operation that may be carried out. The EWS team are also backed up by a large panel of private contractors, ready to act on behalf of the utility should in a rare case, repair levels peak beyond expectations. The following emergency procedures are followed in cases where leak or burst events occur on any sewer bulks or smaller reticulation: • Calls are logged to the EWS toll free number: 080 131 3013. • Call centre staff pinpoint exact locations on GIS Software and log as much information about the leak. • Leak information such as leak severity and flow rates are assessed on a scale of 1 - 10. • 1 being minor, 5 being moderate, and 10 being extremely severe. • Burst sewer trunk mains will always take priority over smaller reticulation. • The faults are forwarded to the Control room for action. • The control room has direct contact with EWS Maintenance teams on a 24 hour basis, thus all information is handed over to Blockage crews and plumbers in order for repairs to be completed in the shortest possible time period. • EWS is mandated to attend to any leak or burst occurrence within a 24 hour period. • In the case where emergencies such as burst sewer mains are reported to EWS, priority will be given as such and response time will be shortened significantly. • Leaks are to be repaired within 24 hours and reported back. In the case of emergency spills occurring due to theft, bursts or negligence, eThekwini are responsible for the clean-up operations with financial provisions budgeted for by the municipality. It is unlikely that a major leak will occur due to the low pressure in the pipelines. The following procedures will however be carried out to ensure that there is as little damage as possible on the immediate environment, particularly the nearby water resources:	

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		• Once the pipeline has been repaired and the leak ceased, the EWS maintenance team will assess the magnitude of the spill and the likelihood of an environmental incident occurring. • A minor sewage spill directly into a water resource will be allowed to dissipate without any significant impact on the environment. • A minor sewage leak directly onto the soil will be cleaned-up by the EWS team on site. • Should a major sewer leak occur (i.e. more than 5 mega litres of raw sewage), the spill is to be dealt with in an appropriate manner. This impact is managed.	
26. Stepping stones / blocks impacting the flow of the Mhlathuzana River.	6 (med)	The stepping stones will be constructed on the existing hard surface of the weir with sufficient spaces to allow water to flow in-between the blocks. During high flow events, water will flow over the blocks, unrestricted. The stones will therefore have no impact on the flow of the river. This impact has been avoided.	1 (low)
27. Encroachment of alien vegetation into disturbed areas during operation.	10 (med)	The risk of alien vegetation encroachment into the North Park Nature Reserve once the proposed work is complete is rated as "high". As per the vegetation specialist, managing the long term impact will require commitment to alien plant control work along the parts of the route that flank or pass through the reserve. Alien plant control work must therefore focus on the bulk pipeline in the Nature Reserve and on the north-western edge of the reserve, where its joins the residential area. Alien plant control is to occur on a biannual basis for three years after the completion of construction. The alien plant control work is to be undertaken only by a contractor who is known to and acceptable to both Ezemvelo KZN Wildlife and the eThekwini Municipality's Environmental Planning and Climate Protection Department. This impact can be managed.	7 (med)
Decommissioning			
28. Rubble, soil and material left on site and in close proximity to the watercourses.	5 (low)	It is unlikely that the pipeline will be decommissioned however should this be required, all rubble and pipework is to be removed from the site and disposed of at a registered landfill site. The trenches are to be backfilled and the soil compacted. The cleared areas are to be rehabilitated to prevent pooling in this section during heavy rainfall.	1 (low)

Nature and Consequences of impact	Significance rating of impacts[4]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		This impact can be managed and mitigated.	
Cumulative			
29. General increase in pollution and sedimentation within the catchment during construction.	5 (low)	Provided that the Contractor is compliant with the measures included in the attached EMPr, waste management and erosion control will be sufficiently managed to prevent this cumulative impact. This impact can be managed and mitigated.	1 (low)
30. Lack of capacity at the uMhlatuzana WWTWs to treat the additional volume of sewage.	7 (med)	This concern was raised by the Ward Councillor during the public participation phase. EWS have confirmed that there is sufficient hydraulic and organic capacity at the WWTWs to cater for the flow of 200kL/day from the proposed new reticulation scheme. Proof of capacity is attached under Appendix B of the BAR. This impact has been avoided.	3 (low)
31. Improved service delivery to the local area.	0	This is a positive impact.	0

6.3 Layout Alternative

See Appendix H for the full impacts scoring matrix, which assesses the environmental impact of the North Park Sewer Reticulation scheme.

Table 2: Impacts and mitigation measures associated with the *alternative* layout (i.e. Layout Alternative 1)

Nature and Consequences of impact	Significance rating of impacts[6]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
Construction			
1. Construction impacts 1 – 10 remain the same as those discussed for the preferred layout alternative.	-	Mitigation measures for construction impacts 1 – 10 remain the same as the preferred layout alternative.	-
2. Clearing of indigenous vegetation from within the critically endangered Durban Metropole North Coast Grassland ecosystem during the laying of the pipeline and temporary access points.	7 (med)	Layout Alternative 1 is approximately 20m longer than the preferred alternative During the excavation of the trench, vegetation will be cleared from this area and therefore the mitigation measures are the same as the preferred alternative. The impact is slightly higher due to the longer length of pipeline. • The relatively small trench size should result in the loss of only a narrow strip of vegetated area. • There is to be no stockpiling of material adjacent to the trenches, which will increase the disturbance footprint. • No unnecessary clearance of vegetation, vines and large tree species is to take place.	5 (low)

[6] See Appendix H for more details.

Nature and Consequences of impact	Significance rating of impacts[6]:	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		• The bulk pipeline running through the Nature Reserve is to be constructed above-ground with minimal clearing of forest undergrowth taking place. • The bulk pipeline is to accommodate larger tree species by making minor alignments during construction. • A trained ecologist is to be present full-time during construction activities in the North Park Nature Reserve to monitor the clearance of vegetation. This impact can be managed and mitigated.	
3. Impacts 12 -22 remain the same as those discussed for the preferred layout alternative.	-	Mitigation measures for construction impacts 12 – 22 remain the same as the preferred layout alternative.	-
Operation			
4. Operational impacts remain the same as those discussed for the preferred layout alternative.	-	Mitigation measures for operational impacts remain the same as the preferred layout alternative.	-
Decommissioning			
5. Decommissioning impacts remain the same as those discussed for the preferred layout alternative.	-	Mitigation measures for decommissioning impacts remain the same as the preferred layout alternative.	-
Cumulative			
6. Cumulative impacts remain the same as those discussed for the preferred layout alternative.	-	Mitigation measures for cumulative impacts remain the same as the preferred layout alternative.	-

6.4 Environmental Impact Statement as per section (l)

The key impacts associated with the North Park Sewer Reticulation scheme related to the construction period and include:

- Excessive clearing of indigenous vegetation from within the North Park Nature Reserve,
- Alien vegetation monitoring and removal in the North Park Nature Reserve;
- Physical damage to the watercourses and associated wetlands during construction of the pipeline in the western portion of the study area and during the installation of the stepping stones / blocks; and
- Managing erosion while the trench is open.

These impacts need to be addressed and managed by the contractor during construction. This can be best managed by demarcating the area requiring clearing (i.e. width of the trench), identifying and mechanically removing alien vegetation in the construction footprint, treating the watercourses as sensitive areas and implementing effective erosion control measures. All construction related impacts are managed through the EMPr attached under Appendix J and include specialist recommendations.

Once construction is complete, alien vegetation control is to continue biannually for three years after construction. EWS are also to monitor and manage the pipeline to ensure there are no significant sewage leaks. Construction of the bulk pipeline above-ground will allow easy detection of any major leaks.

Taking into account the impact assessment above, there should be no significant impacts related to the construction and operation of the sewage pipeline. Taking into consideration the above impacts and mitigation measures, it is the EAP's opinion that the North Park Sewage Reticulation scheme be authorised, as per the preferred layout in Appendix A.

6.5 Impact Management Objectives and Outcomes for the Development for Inclusion in the EMP as Per Section 3(m)

The following objectives and outcomes must be considered for this project:

- Objectives:
  - For there to be no lasting negative impacts on the environment once construction is complete, specifically within the watercourse.
  - To practice responsible construction, 'best practice' with regards to housekeeping on site during construction (outlined within the EMPr) and enforce the polluter pays principle. The applicant / contractor must be responsible for their actions on site during construction and the rehabilitation of the site post construction.
- Outcomes:
  - To promote sustainable development. Create infrastructure and an environment that is healthy and sustainable for future generations to come.

6.6 Assumptions, Uncertainties and Gaps in Knowledge Relating to the Assessment and Mitigation Measures Proposed as Per Section 3(o)

The information in this report is based on findings of the Aquatic & Wetland Assessment, Ecological & Faunal Assessment, Vegetation Assessment and Cultural Impact Assessment. The design drawings and typical cross sections over the Mhlathuzana River, have been provided to the EAP by the engineer. Multiple site visits to the site have been conducted by the EAP and therefore the EAP is therefore satisfied that there are no gaps in knowledge relating to this assessment.

6.7 Period for Which Authorization is Required, Proposed Monitoring & Auditing and Post Construction Requirement's

Environmental authorisation is required for the construction of the sewage reticulation towards the end of 2017 / beginning of 2018. It is therefore recommended that the authorization be valid for a period of five years, within which time construction would need to commence.

Given the nature of this project, it is recommended that **bi-monthly** (i.e. twice a month) ECO audits be carried out for the duration of the construction phase of this project. When work commences in the North Park Nature Reserve, a qualified ecologist is to monitor construction activities on a daily basis. One post construction audit should be conducted once construction is complete.

The EMPr details the post construction, rehabilitation and closure objectives, which will be monitored by the ECO and compliance authorities.

6.8 Financial Provisions as Per Section 3(s)

No upfront financial provision is required for this project. The applicant and contractor is, however responsible for and must ensure that the site has been rehabilitated in full before leaving the site.

6.9 EAP Opinion on Whether or Not to Authorize Activity and Recommendations & Conditions for Authorisation as Per Section 3(n) and (p)

Apart for the constant monitoring of alien vegetation within the construction footprint, all other impacts associated with the construction and operation of the pipeline have been rated as 'low' after mitigation (see Table 1 above) however the following conditions are recommended for inclusion in the authorisation:

Stakeholders, Properties & Services

- As standard construction practice the engineer and contractor should identify all existing services that may be affected prior to construction.
- It is suggested that any structures that need to be removed, should be replaced and any damage repaired.
- The route should run adjacent to existing roads and within existing servitudes and fence lines wherever feasible.

Traffic & Construction Vehicles

- Appropriate signage and trench demarcation must be used to cordon off construction areas.
- All construction vehicles should be fitted with the appropriate silencers and exhausts.
- Speed limits must be obeyed.
- Existing roads must be used with no ad hoc roads being created.

Housekeeping, waste management, storage and materials handling

- Littering must not be permitted on site.

- All hazardous materials and substances should be stored within a secured area in the construction camp. The storage area should be a hard surfaced, bunded and covered area.
- Cement mixing must be done on a hard surface that is protected from stormwater runoff.
- Appropriate and sufficient toilet facilities must be provided by the contractor.
- Toilet facilities must be provided by a registered company and all sewage must be disposed of at an appropriate facility. Safe disposal certificates must be kept on record.
- Toilet facilities must not be located within 32m of any watercourses.
- All material storage is to be located outside the 23m buffer associated with the watercourses and wetlands.

Dust and erosion control

- A water cart should be available to dampen dusty surfaces and suppress dust, if necessary.
- Exposed areas should be rehabilitated and re-vegetated as soon as possible during construction.
- Areas exposed to erosion must be protected through the use of sand bags, berms and efficient construction processes i.e.: limiting the extent (footprint) and duration period that areas are exposed.

Stormwater management and protection of watercourses

- The engineer/contractor must ensure that only clean stormwater runoff enters the environment. Any contaminated run off must be collected and disposed of.
- All watercourses must be identified and demarcated at the start of construction.
- No excavated material or fill material may be stored within or within 23m of the watercourses and wetlands.
- Heavy vehicles should avoid working near the watercourses as much as possible. Trenches to preferably be dug by hand.
- Once construction is complete, it must be ensured that no material whatsoever is left in the stream channels or near the banks where it may be washed into the watercourses in a high flood event. It is recommended this material be removed from site entirely if it is not used in the construction process.
- Where the reticulation pipeline runs down the side of the tributary (western boundary of the study area), soil from the excavated trench must be temporarily stockpiled on the eastern side of the trench (i.e. away from the tributary and associated wetland).

Watercourse crossings

- Work on the weir should preferably be carried out during winter when flow rates are lower.
- Pipework must span across the watercourses to ensure there is no construction activity in the watercourse channel.

Vegetation Clearing

- Only the area directly in the path of the trench may be cleared of vegetation.
- The ductile bulk pipeline is to be constructed above-ground to reduce clearing of under-growth.
- The contractor must ensure that alien invasive species do not gain a foothold along the cleared route until the indigenous vegetation has had time to re-establish itself.
- All rare, red listed and protected species are to be avoided in the North Park Nature Reserve.

Trenching

- Trenches must not remain open indefinitely.
- Trench work must be completed in sections and then closed once the pipe has been laid in that section.
- Cleared areas may not be left exposed for long periods of time and must be re-vegetated at each stage of pipework is completed.
- Trenches must not remain open during building shut down periods i.e. over Christmas and Easter.
- Soil in the trenches must be compacted effectively to the same level or higher than the surrounding land to prevent settling which could create depressions for water to travel along, creating erosion funnels and exposing the pipeline.
- Indigenous grasses must be replanted after the soil has been compacted and that this vegetation has taken successfully before contractors leave the site.
- Trench rehabilitation must be effectively carried out before contractors leave the site, especially where approaching the watercourse crossings and on steeper hills.

Fauna

- A trained herpetologist / ecologist must be present full time during construction activities in the North Park Nature Reserve to monitor the presence of the Spotted Ground Thrush as well as for engagement with I & APs.
- The full time ECO is to perform a chameleon & frog search along the pipeline route within the North Park Nature Reserve at the beginning of each day to ensure no species are disturbed by construction activities.

Protection of Heritage Resources

- Attention is drawn to the South African Heritage Resources Act, 1999 and the KZN Heritage Act which, requires that operations that expose archaeological or historical remains should cease immediately, pending evaluation by the provincial heritage agency.

Appendix A: Engineering Drawings & Maps

Appendix B: Specialist Reports

Appendix C: Proof of Placement of Notice Board

Appendix D: Proof of Notification

Appendix E: Advert

Appendix F: Registered I &Aps

Appendix G: Comments and Response Table and Comments Received

Appendix H: Impacts Scoring Matrix

Appendix I: EAP declaration and Curriculum Vitae

Appendix J: Environmental Management Program