DRAFT BASIC ASSESSMENT REPORT: PROPOSED CONSTRUCTION OF THE NORTHERN BULK STORMWATER CHANNEL AND DISCHARGE THEREOF FROM THE AQUADENE HOUSING DEVELOPMENT, RICHARDS BAY, KWAZULU-NATAL

J37061

20 November 2017

Draft Report for Public Review

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1 INTRODUCTION

Over the past few years, the City of uMhlathuze (uMhlatuze) has initiated approval processes for an extension to the existing Aquadene suburb to provide affordable government housing. The development, once complete, will make a significant contribution to alleviating the current low to middle income housing backlog experienced within the boundaries of uMhlathuze.

The proposed Aquadene housing development is located approximately 10 km from the Richards Bay CBD, along the MR231 and will expand north westerly towards the N2-Nseleni interchange. Environmental Impact Assessment (EIA) approval for internal services and top structures was obtained in 2015, and did not include bulk services in the scope.

The stormwater designs have now been finalized by Ilifa Africa Engineers (Pty) Ltd and prior to the construction thereof, EIA and Water Use Licence Application (WULA) approvals are required as the stormwater infrastructure traverses wetlands.

GIBB (Pty) Ltd were appointed as the independent Environmental Assessment Practitioner (EAP) by uMhlatuze to undertake a Basic Assessment (BA), WULA and associated specialist studies for the proposed construction of the northern bulk stormwater channel and discharge thereof from the Aquadene Housing Development, Richards Bay.

The KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN EDTEA, as the competent authority for the project, confirmed that the proposed project triggers 'listed activities' in Government Notice R327 (GNR 327), and as such a BA, in terms of the National Environmental Management Act, 1998 (No.107 of 1998) [NEMA]), will be required before activities can commence. The BA Report will be prepared in accordance with the requirements for Government Notice R 326, Environmental Impact Assessment (EIA) Regulations, 2014 as amended.

This Draft Basic Assessment Report therefore presents the findings of the Basic Environmental Assessment and associated specialist studies (Wetland and Ecological).

1.1 Details of the Applicant

The City of uMhlatuze is the Applicant for the proposed project. The details of the Applicant can be found in **Table 1** below.

Table 1: Details of the Applicant

Project Applicant:	Hitachi Ltd
Contact Person:	Ms Nontsundu Ndonga
Physical Address:	Civic Centre Central Business District, 5 Mark Strasse, Richards

	Bay, 3900		
Postal Address:	Private Bag X1004 Richards Bay		
Postal code:	3900	Fax:	035 907 5000
Telephone:	035 - 907 5174	Cell:	-
E-mail:	NdongaN@umhlathuze.gov.za creg@umhlatuze.gov.za		

1.2 Details of the Environmental Assessment Practitioner and Specialists

GIBB is an integrated group of scientists, project managers, engineers and architects providing cost-effective solutions and specialist services in a wide range of disciplines. The multi-disciplinary consulting, management and design approach allows for the execution of projects in a holistic way, as this is believed to be the best approach to fully meet the needs of our Clients.

The GIBB Environmental Services Division has a formidable track record and comprises highly qualified and experienced technical staff *viz*, Environmental Scientists and Specialists, which collectively form the National Environmental Team. The team members have broad experience in terms of working on a range of environmental projects within the public and private sector across South Africa.

The tables below provide a summary of the EAP, Technical Reviewer and Specialists involved in the BA process. Please refer to **Appendix H** for relevant experience of the EAP.

Table 2: Details and Expertise of the EAP

Project EAP:	**GIBB (Pty) Ltd**		
Contact Person:	Mrs. Katherine Wiles		
Qualifications	Bachelor of Science (Honours), SACNASP Certificated Natural Scientist (300205/15), IAIAsa KZN Member (3127), Vice Chair and incoming KZN Branch Chair 2019 - 2021		
Role in Project:	Project leader Project management and coordination Process management Specialist team management Public presentations and liaisons Report Compilation		
Physical Address:	2nd Floor, 54 Norfolk Terrace, Norfolk House, Westville, 3630		
Postal Address:	P.O. Box 1365, Westville, 3630		
Postal code:	3630	**Fax:**	031 266 3310
Telephone:	031 267 8560	**Cell:**	-
Email:	kwiles@gibb.co.za		
Expertise to conduct	**Ms. Katherine Wiles** (née de Jong) is a Senior Environmental Scientist with eight		

EIR:	years of experience in the environmental field. Katherine has a background in environmental management and in 2009 and 2010 she assisted her Senior Lecturers in lecturing environmental courses (Biophysical Environments, Environmental Impact Assessment and Soil Erosion & Land Degradation) at the University of KwaZulu-Natal. Over the last seven years, Katherine has gained consulting experience through her involvement in environmental processes such as Environmental Impact Assessments, Integrated Waste Management Plans (IWMPs), Integrated Water Use Licenses and Environmental Compliance Auditing. Katherine has diverse project experience in the environmental field and has worked in Swaziland and extensively in South Africa, particularly in KwaZulu-Natal, Gauteng and Mpumalanga. Katherine is currently involved in assisting industries and Government, particularly in KZN and Richards Bay, in obtaining various Environmental Licensing requirements, namely Environmental Impact Assessments, Preparation of Environmental Management Plans or Programmes, Public Participation Processes, Waste Management Licences, Air Emissions Licences and Water Use Licenses. As a Senior Environmental Scientist, Katherine is involved in project co-ordination and management for various environmental, water and waste projects on a client representative and consulting basis. Her responsibilities include project quality and financial administration, the development and compilation of reports, planning and co-ordination of public participation, co-ordination and interpretation of specialist studies, and tendering and proposal work. Through her co-ordination and management of the Durban projects, she has gained valuable insight (Technical, Financial and Quality) into a number of her projects.

Table 3: Technical Reviewer Details

Project Role	Name	Experience
Technical Peer Review of Reports to ensure that they meet legal requirements	Ms. Elisabeth Nortje	Elisabeth Nortje is a scientist with 16 years' experience and is the Unit Manager for Environmental Licensing & Technical Peer Review within the GIBB Environmental Services Division. She specialises in project management, compilation and technical review of Environmental Impact Assessments (EIAs) and related documents and processes in the energy and infrastructure markets. She is currently working on the EIA for the construction and operation of the Nuclear-1 Power Station and is the EAP for the project. She has also been involved in the management and compilation of Strategic Environmental Assessments for Master Planning purposes, Environmental Management Programmes (EMPRs), Water Use License Applications (WULAs), environmental input into engineering design and geological sensitivity assessments. Her key experience includes: - Technical Peer Review of documents in terms of relevant legislation; - Management of Environmental Impact Assessment Practitioners; - Manage, review, write and give technical and advisory input into large scale EIAs and environmental processes; - Environmental Management Planning; - Management of specialist teams; - Public Participation Processes and consultation, including coordinating, facilitating and managing such processes; and - Mentoring of junior team members.

Table 4: Details of the Specialists

Name of specialist and Field of Expertise	Section/ s contributed to	Title of specialist report/ s as attached in Appendix D
Wetland		
Johannes Maree (Wetland)	Section 2.1.7, Section 2.5.2 and Section 6.2	Wetland Impact Assessment for the proposed construction of bulk stormwater infrastructure and discharge from the Aquadene Housing Development, Richard's Bay, Kwazulu-Natal
Moses Kgopana (Wetland)	Section 2.1.7, Section 2.5.2 and Section 6.2	Wetland Impact Assessment for the proposed construction of bulk stormwater infrastructure and discharge from the Aquadene Housing Development, Richard's Bay, Kwazulu-Natal
Ecological		
Robyn Phillips (Ecological)	Section 3.1, Section 5 and Section 6.2	Aquadene Residential Stormwater Infrastructure, Richards Bay KwaZulu-Natal: Ecological Assessment
Thembela Mshengu (Ecological)	Section 3.1, Section 5 and Section 6.2	Aquadene Residential Stormwater Infrastructure, Richards Bay KwaZulu-Natal: Ecological Assessment
Dr Hylton Adie (Ecological)	Section 3.1, Section 5 and Section 6.2	Aquadene Residential Stormwater Infrastructure, Richards Bay KwaZulu-Natal: Ecological Assessment
Heritage		
Len Van Schalkwyk (Heritage)	Section 3.2.2, Section 5.3 and Section 6.2	Heritage Scoping Report: Bulk storm water and discharge infrastructure - Proposed housing development extension of Aquadene suburb, Richards Bay uMhlatuze LM, King Cetshwayo DM, KwaZulu-Natal

1.3 Details of Competent/Relevant Authority

The KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN EDTEA) is the Competent Authority (CA) for this application.

Table 5: Details of the Competent Authority

Competent Authority:	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN EDTEA)		
Case Officer: District Manager	Mr Muzi Mdamba		
Address:	1st Floor, Block D Cnr of Via Verbena and Aloe Loop Street Opposite uMhlathuze Sports Complex Veldenvlei, Richards Bay		
Postal code:	3900	**Fax:**	086 730 7163
Telephone:	035 780 0313	**Cell:**	--

2 ACTIVITY INFORMATION

2.1 Description of Project

2.1.1 Project Title

Proposed construction of Aquadene Phase 2 Development: Bulk Stormwater Northern Outfall Drainage Channel.

2.1.2 Site Description and Locality

The proposed site is situated within the suburb of Aquadene in Richards Bay, uMhlathuze Local Municipality within the King Cetshwayo District Municipality, KwaZulu-Natal Province (Refer to **Figure 1** below).

The stormwater system site is situated north of Aquadene and is approximately 1.860m long. The proposed Northern Stormwater Channel is plotted as follows:

Table 6: Co-ordinates of the Northern Stormwater Channel

	Latitude /Longitude	Degrees	Minutes	Seconds
Start1	South	28°	42’	22.71”
	East	32°	1’	36.17”
Start 2	South	28°	42’	24.59”
	East	32°	2’	15.43”
Middle	South	28°	42’	27.64”
	East	32°	1’	57.18”
End	South	28°	41’	57.67”
	East	32°	2’	28.52”

The study area includes the following:

- Aquadene (existing development);
- Aquadene Phase 2 Development; and
- Sappi and Mondi forestry land located to the north of the proposed development.

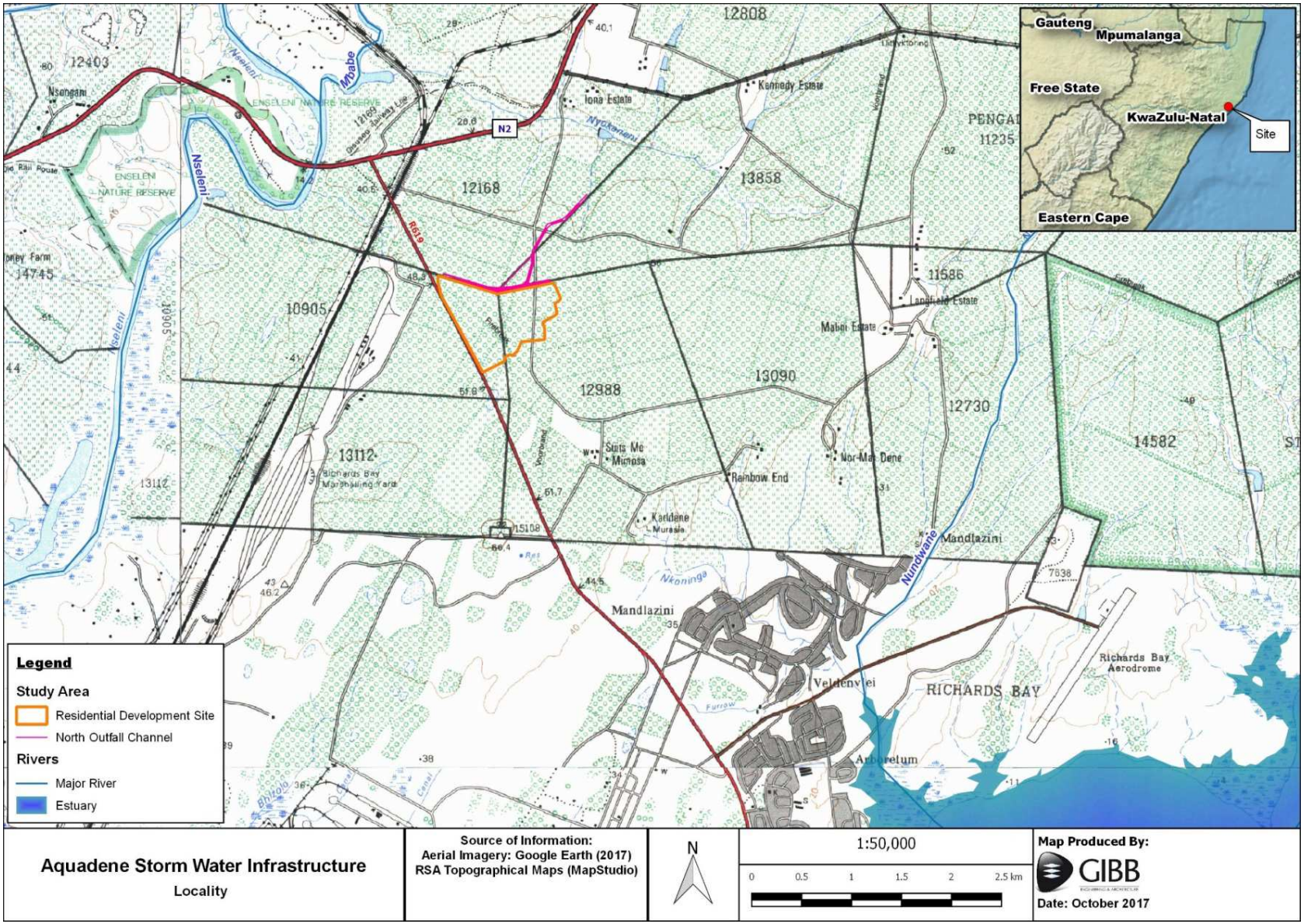

Figure 1:Showing the proposed location of the Northern Stormwater Channel

2.1.3 Project Description

The proposed project consists of a bulk stormwater channel and discharge system, namely:

- The Aquadene Phase 2 Development: Bulk Stormwater. Northern Outfall Drainage Channel (1,860m)

The Northern Outfall Drainage Channel allows for partial drainage of the proposed Aquadene Phase 2 development towards the north of the site via the Sappi and Mondi forestry area and finally discharging into the existing natural drainage path. The Northern Outfall Drainage Channel will consist of the following features:

- A trapezoidal channel with maximum side slopes of 1:2.5 (Refer to **Figure 2** below):
- Lined sections of channel for areas with high velocity. The section of channel will be lined with gabion structures: and
- Un-lined / earth channel sections for areas with acceptable low velocities. The channel will be grassed / vegetated with gabion structures every 25m for 2m to provide structural integrity to the channel dimensions.

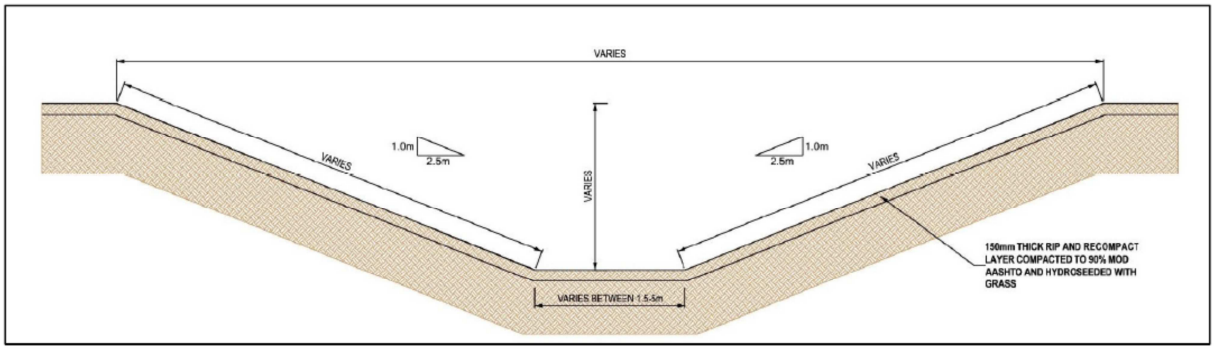

Figure 2: The typical cross section of the trapezoidal channel with side slopes of 1:2.5.

The channel will be a combination of earth and lined channel. The section where the channel is unlined will allow for ingress of stormwater run-off as well as recharge of underground water resources. This will reduce the total run-off volume due to the allowance for ingress along sections of the channel. Vegetation within the unlined channel sections allows for:

- Protection against erosion of channel and banks;
- Natural silt trap;
- Reducing the velocity of the run-off;
- Promotes ingress of stormwater run-off (lower run-off volumes); and
- Improved water quality due to aerated flow.

An earth channel is preferred for sections with velocities lower than 1.2m/s. Sections with high velocities will be lined by means of gabion structures. The purpose of the gabion is to reduce sediment transportation by reducing the velocity of the run-off and ensuring the integrity of the channel.

As previously mentioned, the channel discharges into a natural drainage path. The channel leading up to the discharge point has a steep slope of approximately 1% which results in higher velocities. High velocities must be reduced through a construction of a discharge chute. The factors which will reduce high velocities are additional roughness to the channel and allowing for the dissipation of energy. The channel discharge chute will be a lined outlet structure (gabion) and allow for energy dissipation through stepped elevation loss and gabions acting as energy breakers closer to the discharge point. The discharge chute is wider than the preceding channel to allow for a wider flow disbursement at the discharge point (less concentrated flow) (Ilifa, 2016).

Figure 3: The current condition of the discharge point

2.1.4 Property Details

Province	KwaZulu-Natal
District Municipality	King Cetshwayo District Municipality
Local Municipality	City of uMhlatuze Local Municipality
Township	Aquadene Phase 2
Ward Number(s)	26
Affected Landowners	Mondi and SAPPI Forestry
Farm name and number	1. Mondi Erf 11472 is T8727/ 1987 , 30/04/1987 • REM 11472 2. Sappi Erf 11471 is T10741/2009 , 27/03/2009 • REM 11471 (SAPPI FOREST).
SG Codes	N0GV04210001147200000 N0GV04210001147100000

2.1.5 Site Access

Access to the site will be via existing roads where possible. The majority of the development is accessed off the R619 and the rest of the channel via existing sand tracks or haulage roads used by Mondi and SAPPI (Refer to **Figure 1** above).

2.1.6 Affected Landowners/Business

Numerous consultations have been held with the affected landowners (namely Mondi and SAPPI). Due to the fact that this is a linear project, GIBB sent out landowner notifications on 15 November 2017. The City of uMhlatuze has also held consultations with the relevant landowners (23 November 2016) (Refer to **Appendix E5.1** for proof of consultations). In agreement, allowance needs to be made for existing haulage roads which will be affected by the Northern Outfall Drainage Channel. The recommendation is that standard box culverts be installed at the required crossings. The culvert design allows for concrete wing walls as well as concrete base for the culvert section. Gabion mattresses will be placed at both the entry and exit points of the box culvert to reduce velocity and prevent erosion at the two points.

2.1.7 Solid waste management

The solid waste generated on site during the construction phase will be stored in skips by the appointed contractor. An appointed waste contractor will thereafter remove the waste to the closest registered land fill site (uThungulu DM Landfill site). Small amounts of hazardous waste will be generated during the construction phase (e.g. oily rags etc.); these will be disposed of in marked bins and moved to a registered landfill.

During the operational phase, the stormwater may carry litter and any other potential pollution from the new Aquadene residential area into the Wetland Area 1 (shown in **Figure 4** below). This may include garbage, grey water, hydrocarbons from the roads, and sewerage should there be a leak. This could result in the contamination of the drainage lines as well as watercourses further downstream. Careful management of waste during operation has therefore been addressed in the EMPr (**Appendix F**).

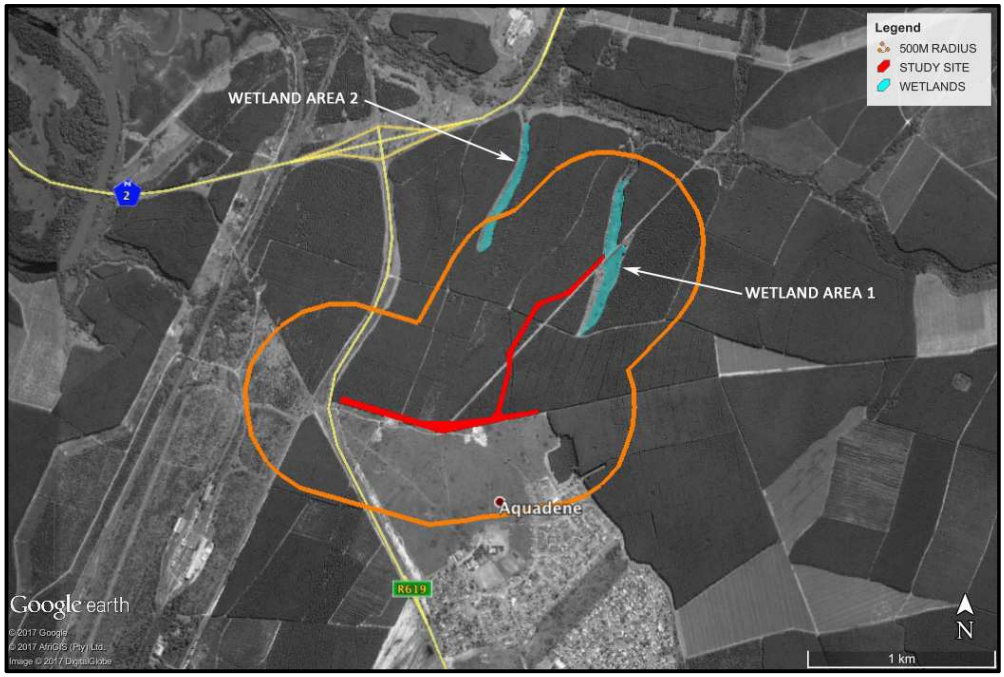

Figure 4: Delineated Wetlands (Sativa, 2017).

2.1.8 Liquid effluent

The activity will not produce effluent, other than normal sewage from construction workers using temporary toilet facilities. This will be disposed of in a municipal sewage system as stipulated in the EMPr (**Appendix F**).

2.1.9 Emissions into the atmosphere

Dust and vehicle emissions will be generated during the construction phase as a result of trucks transporting construction material and other earth moving machinery. The emissions will, however, have short term impacts on the immediate surrounding areas and thus the authorisation of such emissions will not be required.

There will be no emissions generated during the operation phase other than from regular maintenance activities.

2.1.10 Generation of noise

Noise will result from the movement of vehicles, trucks and other associated machinery used during the construction phase. However, the noise associated with construction activities will be of short term, localised and will only last during the construction phase of the project.

There will be no noise generated during the operational phase, other than from maintenance activities.

2.1.11 Material requirements

- Gabions: Material to comply with SANS 1580;
- Geotextile: Type 4A bidem non-woven needle pinched to be used. Manufacturing and testing of material to comply with all SANS standards;
- Culverts: Standard culvert sizes applies and to be according to SANS 986 specification and standards; and
- Hydro seeding: Seeding to be used must be indigenous / endemic / native to the area. Growth and cover to be as per COLTO Section 5800: Landscaping and Planting Plants specification.

2.1.12 Water Use

The construction contractors will be responsible for the sustainable use of water. No water will be used from wetlands and watercourses on site. Contractors will be required to dedicate and demarcate on-site “No-go” areas and off-site “No-go” areas that are at risk by suitable means (e.g. sensitive receptors such as wetlands in the medium-high and high zones as depicted in **Figure 5** below).

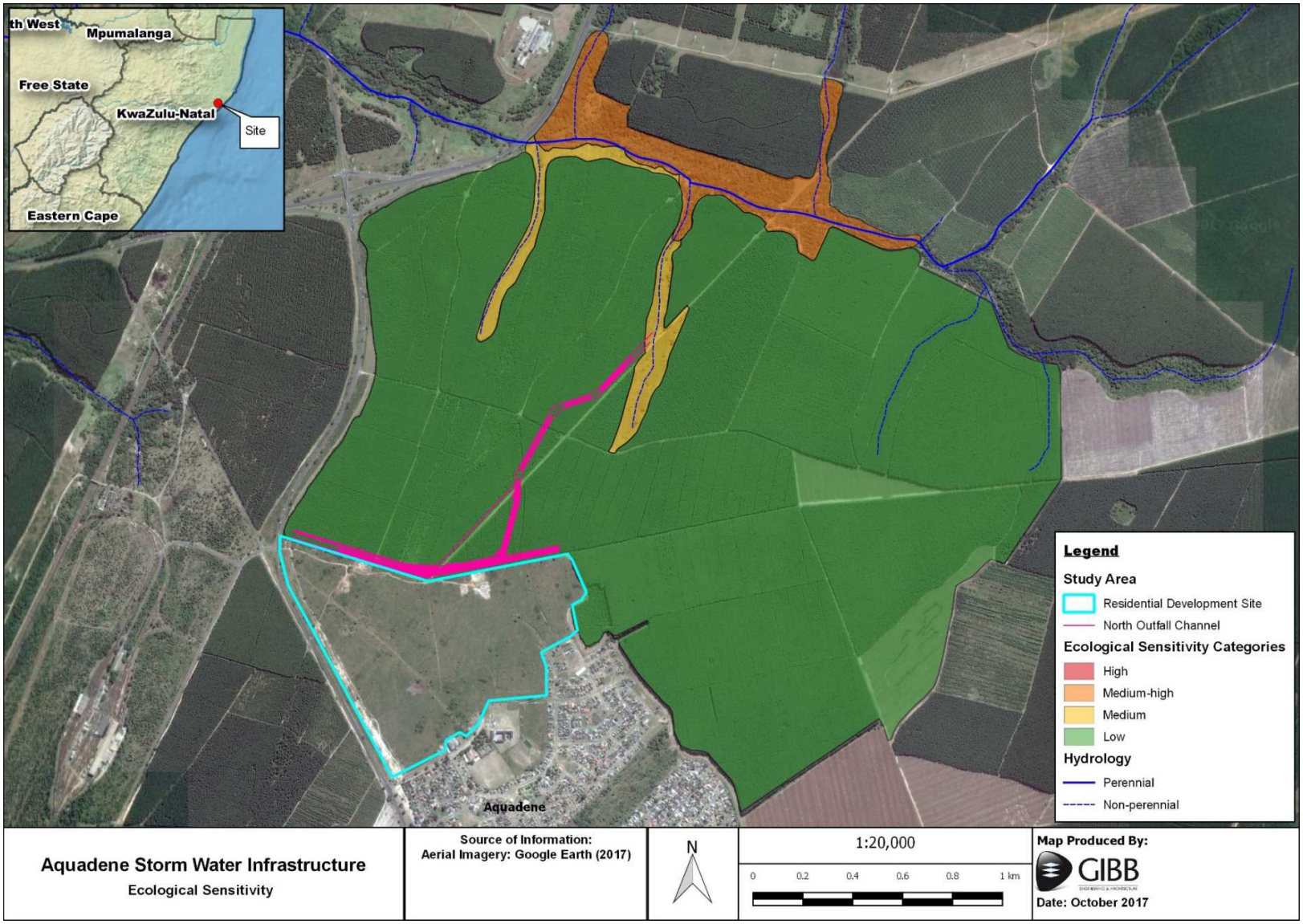

Figure 5: Ecological Sensitivity Map

2.2 Project Motivation

The City of uMhlathuze proposes an extension to the existing Aquadene suburb to provide affordable government housing. The development will make a significant contribution to alleviating the current low to middle income housing backlog experienced within the boundaries of the uMhlathuze.

The proposed site is currently undeveloped with no existing stormwater infrastructure installed to service the proposed Aquadene Phase 2 development draining northwards into the Wetland Area 2. The existing Aquadene Phase 1 development does have existing stormwater infrastructure, however the infrastructure drains west, east and southwards. The area towards the north of the proposed Aquadene Phase 2 development is currently Mondi and Sappi Forestry owned land with existing natural drainage paths and no formal infrastructure.

With no formal stormwater drainage the development will not comply with municipal design standards and regulations and the development will not be approved for implementation. This will result in numerous grievances by the community for lack of provision of further housing in the Aquadene suburb.

Therefore in order to service the needs of the Phase 2 development stormwater needs to be managed efficiently and this project has been implemented to address this need.

2.3 Economic and Social Analysis

2.3.1 Socio-economic values (as included in original application form)

Anticipated CAPEX value of the project on completion	**R 25mil**
What is the expected annual turnover to be generated by or as a result of the project?	**R 25mil (once off)**
New skilled employment opportunities created in the construction phase of the project	**10 to 20**
New skilled employment opportunities created in the operational phase of the project	**2 to 4**
New un-skilled employment opportunities created in the construction phase of the project	**75 to 100**
New un-skilled employment opportunities created in the operational phase of the project	**5 to 10**
What is the expected value of the employment opportunities during the operational and construction phase?	**R 2.5-4mil**

2.3.2 Social and socio economic opportunities

The labour requirements during construction are estimated at 50 workers for 8 months.

2.3.3 Training

Training to be provided for the following skills:

- Concrete work;
- Construction management
- Quality control; and
- Life skills

Total training days: 250
Value of training: R 100,000

2.4 Feasible and Reasonable Alternatives

In terms of the EIA regulations, attention needs to be given to all possible alternatives. The assessment of alternatives allows different approaches and ways of meeting the need, purpose and objectives of a proposed activity. Alternatives may include location or route alternatives, site alternatives design/layout alternatives, activity alternatives and processes or technology alternatives, etc.

Table 7: Project Alternatives

Type of Alternative	Description
Route Alternatives	The applicant identified two alternatives for the Northern Outfall Drainage Channel. The applicant then conducted site visits of the proposed routes and held meetings with the affected landowners (Mondi and SAPPI). On further consultation with Mondi, it was found that the Northern Outfall Drainage Channel passed through one of the manmade structures on the Mondi land. An alternative route was then plotted and re-directed around the mandmade structure as shown in **Figure 6** below.
Material Alternatives	The preferred option for the lining of the stormwater channel is the use of Gabion Structures. Sections with high velocities will be lined by means of gabion structures (which is preferred). The purpose of the gabion is structure is to reduce sediment transportation by reducing the velocity of the run-off and ensuring the integrity of the channel. Other construction materials were also considered but due to the cost and high velocities, amorflex and concrete channel were not considered to be favourable and were therefore not further assessed. The earth channel sections will allow for grassing by means of hydro seeding as well as gabions placed at 25m intervals for 2m. Refer to summary below of the Pros and Cons.
Technology Alternatives	No alternatives have been investigated, but the most appropriate materials will be used during construction and the best practicable equipment will be sourced for use in the designs of the stormwater channel.

No-Go Option	The "no-go" alternative is the option of not establishing the Northern Outfall Drainage Channel. The proposed site is currently undeveloped with no existing stormwater infrastructure installed to service the proposed Aquadene Phase 2 development draining northwards. The existing Aquadene Phase 1 development does have existing stormwater infrastructure, however the infrastructure drains west, east and southwards. The area towards the north of the proposed Aquadene Phase 2 development is currently Mondi and Sappi Forestry land with existing natural drainage paths and no formal infrastructure. In order to service the needs of the Phase 2 development stormwater needs to be managed efficiently and this project has been implemented to address this need. Should the authorities decline the application, the 'No-Go' option will be followed and the status quo of the site remain with no formal stormwater drainage the development will then not comply with municipal design standards and regulations and the development will not be approved for implementation.

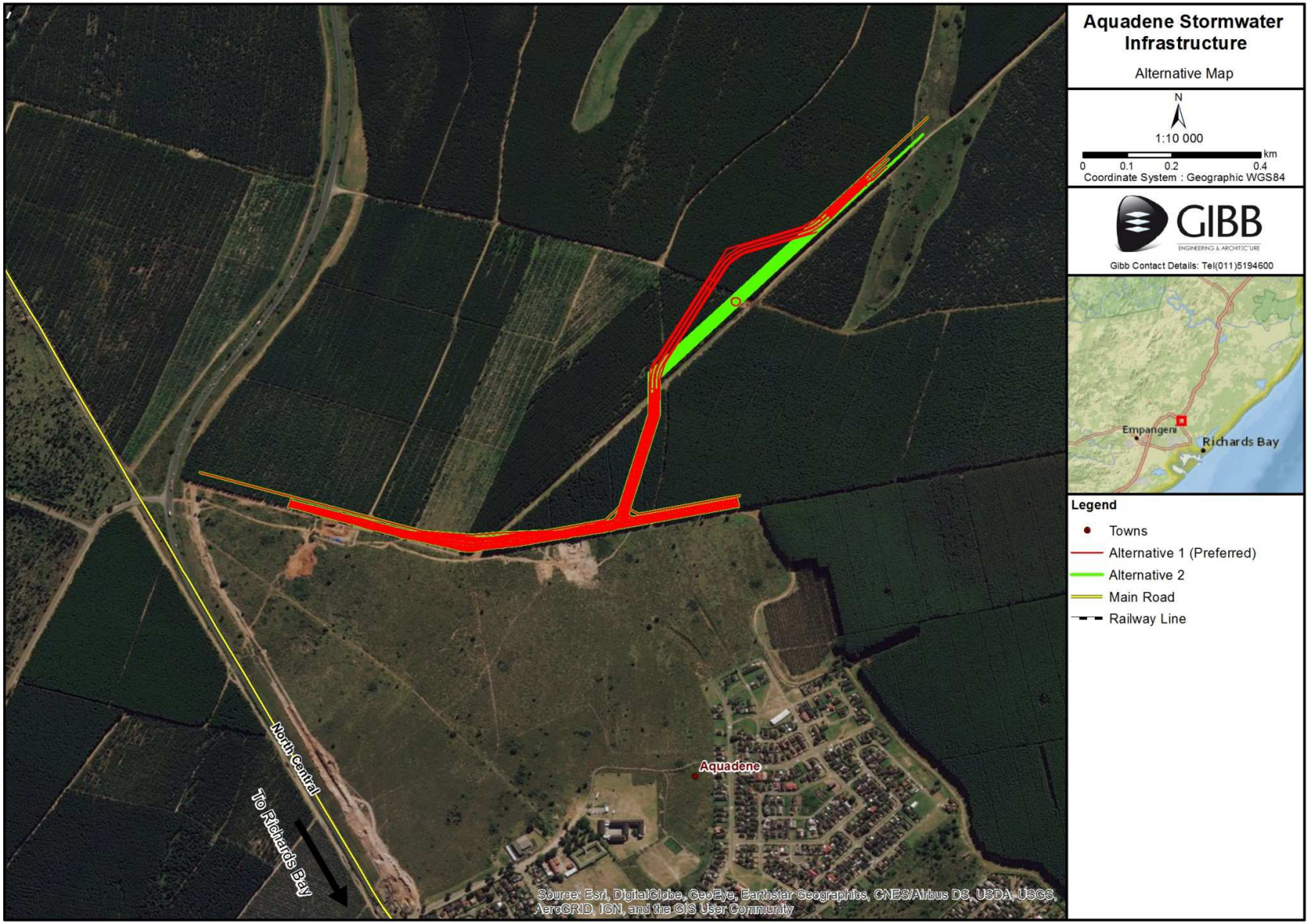

Figure 6:Showing the proposed Route Alternatives

Table 8: Assessment of lining Alternatives (adapted from Ilifa Africa Engineers, 2016)

Gabions Channel		Concrete Channel		Armorflex Channel	
Pros	**Cons**	**Pros**	**Cons**	**Pros**	**Cons**
Labour intensive	Damage boxes	Medium Labour intensive	No peak reduction	Medium labour intensive	Skilled labour required
Lower Velocity	Skilled labour	Medium structural integrity	Medium costs	High ingress	Not adequate for high velocities
Acts as silt trap	Medium costs	Known method	Does not allow for ingress	Reduces peak	High cost
Low maintenance	-	-	High velocities	Vegetation growth	-
High structural integrity	-	-	-	Low velocities	-
Reduces peak	-	-	-	-	-
Known method	-	-	-	-	-

2.5 Environmental Legal Requirements

2.5.1 Environmental Impact Assessment

In terms of NEMA and the associated EIA Regulations 2014, as amended, environmental authorisation must be obtained from the relevant decision-making authority, the KZN EDTEA. This must be done prior to the commencement of certain listed activities that may result in potential negative impacts on the environment. The proposed project involves the following listed activities, as per Government Notice No. R. 327 and 324.

Table 9: Listed Activities

Number and date of the relevant notice:	Activity No(s) and description (in terms of the relevant notice) :	Describe each listed activity as per the project description (and not as per wording of the relevant Government Notice):
Listing Notice 1: GNR. No. 327 (dated 7 April 2017)	Activity 9: The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area	The proposed project involves the construction of bulk stormwater infrastructure exceeding 1000m (1,860m) outside an urban area.
Listing Notice 1: GNR. No. 327 (dated 7 April 2017)	Activity 12: The development of: (ii) infrastructure or structures with a physical footprint of 100 square metres or more; Where such development occurs- (a) Within a watercourse.	The proposed project involves the construction of bulk stormwater infrastructure exceeding 1000m (1,860m) within or near watercourses/wetlands.
Listing Notice 1: GNR. No. 327 (dated 7 April 2017)	Activity 19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 10 cubic metres from a watercourse.	The proposed bulk stormwater infrastructure will involve the removal of soil more than 10 cubic metres within or near watercourses/wetlands for the development of the gabion structures.
Listing Notice 3: GNR. No. 324 (dated 7 April 2017)	Activity 14: The development of: (ii) infrastructure or structures with a physical footprint of 10 square metres or more; Where such development occurs- Within a watercourse. d. KwaZulu-Natal vii. Critical Biodiversity Area or ecological support areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	According to the KZN Biodiversity Sector Plan, the majority of the study area does not fall within any defined area (i.e. mostly transformed). However the stormwater channel will drain into a sensitive natural drainage area which could be considered as sensitive areas in terms of the EMF.

2.5.2 Water Use Licence

There are a few wetland areas in the area, most of which have been totally or partially destroyed, mainly by the afforestation (plantations) in the area. There are no streams in the area of the North stormwater system, but the system will discharge into an area that is a natural channel for water flow due to the gradient. This area is therefore viewed as a wetland area, due to the flat (low) gradient (Wetland Area 2). Refer to **Appendix D2** for further details.

In terms of the National Water Act (Act No 36 of 1998) [NWA], a Water Use License Application (WULA) may be required, this is a legislative process governed by the Department of Water and Sanitation (DWS) for the authorisation of all water uses defined in section 21 of the NWA (Refer to **Table 10** below for the associated triggers).

Table 10: Water Uses triggered in terms of Section 21 of the National Water Act

Activity No	Description
Section 21 (c)	Impeding and diverting the flow of water in a watercourse
Section 21 (i)	Altering the bed, bank, course or characteristics of a watercourse
Section 21 (f)	Discharging waste or water containing waste into a water resource through a canal, or other conduit

2.5.3 Applicable Legislation, Policies and/or Guidelines

LEGISLATION	APPLICABILITY TO THE PROJECT
The Constitution of the Republic of South Africa, Section 24 and 26 (Environmental Right):	1) Everyone has the right a) to an environment that is not harmful to their health or well-being; and b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: i) prevent pollution and ecological degradation; ii) promote conservation; and iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In terms of section 26 of the Constitution of the Republic of South Africa of 1996, "everyone has a right of access to adequate housing". Furthermore, in terms of section 26(2), the state must take reasonable legislative and other measures within its available resources to realize this progressive right. The provisions of the constitution need to be supported. By undertaking an EA for the proposed project, these provisions will be addressed.
National Environmental	NEMA is the key environmental management legislation and

LEGISLATION	APPLICABILITY TO THE PROJECT
Management Act, 1998 (Act no. 107 of 1998) (NEMA)) and EIA Regulations, 2014.	states in section 2(4)(k) that "the environment is held in public trust for the people, the beneficial use of resources must serve the public interest and the environment must be protected as the people's common heritage" thereby paving the way for an EIA process to assess developments that may have a harmful impact on the environment. Section 28 of NEMA ensures that environmental screening is incorporated into each activity, although it is not formally termed as such. Section 28 (1) imposes a duty which requires that: "Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment". The EIA regulations describe the EIA process to be followed including the public participation process, and the listed activities that may have a harmful impact on the environment and must be assessed. For the purpose of this project a BA and associated specialist studies will be undertaken.
National Environmental Management: Waste Act, 2008 (Act no. 59 of 2008) (NEM:WA)	This Act provides for regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. Also to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities. Although none of the proposed activities are likely to trigger activities in terms of the Waste Act, waste will still be generated on site and needs to be managed accordingly. By undertaking this BA and associated EMPr, certain mitigation measures will be implemented to reduce potential impacts of waste generation in all its forms.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004); (NEM:AQA)	Crucially, in terms of section 21 of the NEM: AQA the relevant authority may promulgate a list of activities which result in atmospheric emissions which are reasonably believed to have a significant detrimental effect on the environment. No person may conduct an activity so listed without a provisional atmospheric emission licence (AEL).

LEGISLATION	APPLICABILITY TO THE PROJECT
	An AEL will not be required for the project.
National Water Act, 1998 (Act no. 36 of 1998) (NWA)	This Act provides for the protection and management of water resources. A Water Use License Application (WULA) is made to authorise water use activities pertaining to the altering of the bed, bank, course and characteristics of the watercourse and for impeding and diverting the flow of water in a watercourse (where applicable). A WULA will need to be commissioned for the project.
National Heritage Resources Act, 1999 (Act No. 25 of 1999); (NHRA)	The NHRA serves to introduce an integrated and interactive system for the identification, assessment and management of the heritage resources of South Africa. The NHRA promotes good governance and the empowerment of civil society to preserve their heritage for future generations, and states the principles of heritage resource management while making provision for legislation protecting national heritage. The potential impact to heritage resources through implementation of the proposed Project is very low considering the majority of the site is under plantation already.
National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) (NEM:BA)	The Biodiversity Act provides for the management and protection of the country's biodiversity within the framework established by NEMA. It provides for the protection of species and ecosystems in need of protection, sustainable use of indigenous biological resources, and equity in bio-prospecting.
Occupational Health and Safety Act, 1993 (Act no. 85 of 1993) (OHSA)	While consideration for management of health and safety falls outside the purpose of this document, there are a number of overlaps and synergies that are relevant in terms of environmental management. The OHS Act imposes various duties on employers to ensure the health and safety of their employees, including taking steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the health and safety of their employees, providing the necessary information, instructions, training and supervision, as well as not permitting any employee to do any work or to produce, process, use, store, handle or transport any article or substance or to operate any plant or machinery unless the precautionary measures have been taken. In addition, there is a veritable myriad of regulations promulgated under the OHS Act which may have relevance to the depot project, in regard to safe working conditions in that context. They include the General Administrative Regulations, General Safety

LEGISLATION	APPLICABILITY TO THE PROJECT
	Regulations, Construction Regulations and the Environmental Regulations for Workplaces. City of uMhlatuze needs to consider general duties of employers to their employees with regards to Health and Safety on site during construction. City of uMhlatuze also needs to consider general duties of employers and self-employed persons to persons other than their employees.
Municipal Bylaws	The City of uMhlatuze may have certain requirements in terms of bylaws and trade permits, and a few of these may be applicable to this project, namely the following: • Disaster Management Bylaws • Electricity Supply Bylaws • Environmental Health • Flammable Liquid Substances • Lease of Halls and Conference Facilities • Nuisances • Outdoor Advertising • Public Amenities • Public Libraries Bylaws • Solid Waste Bylaws • Storm water Management Bylaws • Water services bylaws The proposed project needs to consider the above during the implementation of the project.

3 DESCRIPTION OF THE RECEIVING ENVIRONMENT

3.1 Biophysical Environment

3.1.1 Climate

According to Mucina and Rutherford (2006), the study area receives about 41.6% of its annual rainfall in winter therefore is said to have marginally unseasonal rainfall. The mean annual precipitation in the Aquadene vicinity is 1,132mm The rainfall data was obtained from Design Rainfall Estimation in South Africa, computer software that provides rainfall data from the nearest rainfall station to the required site, based on geographic coordinates (Ilifa, 2016). However the winter rains around this region are associated with frontal systems from the South.

According to Sativa, 2017: "The monthly distribution of average daily maximum temperatures reveals that the average midday temperatures for Richard's Bay ranges from 23°C in June to 29°C in January. The region is the coldest during July with low temperatures of 12°C on average during the night. The area is not prone to frost at all and is a sub-tropical climate.

The study site is within the Sub-Tropical Coastal climatic zone of South Africa (Refer to **Figure 7**).

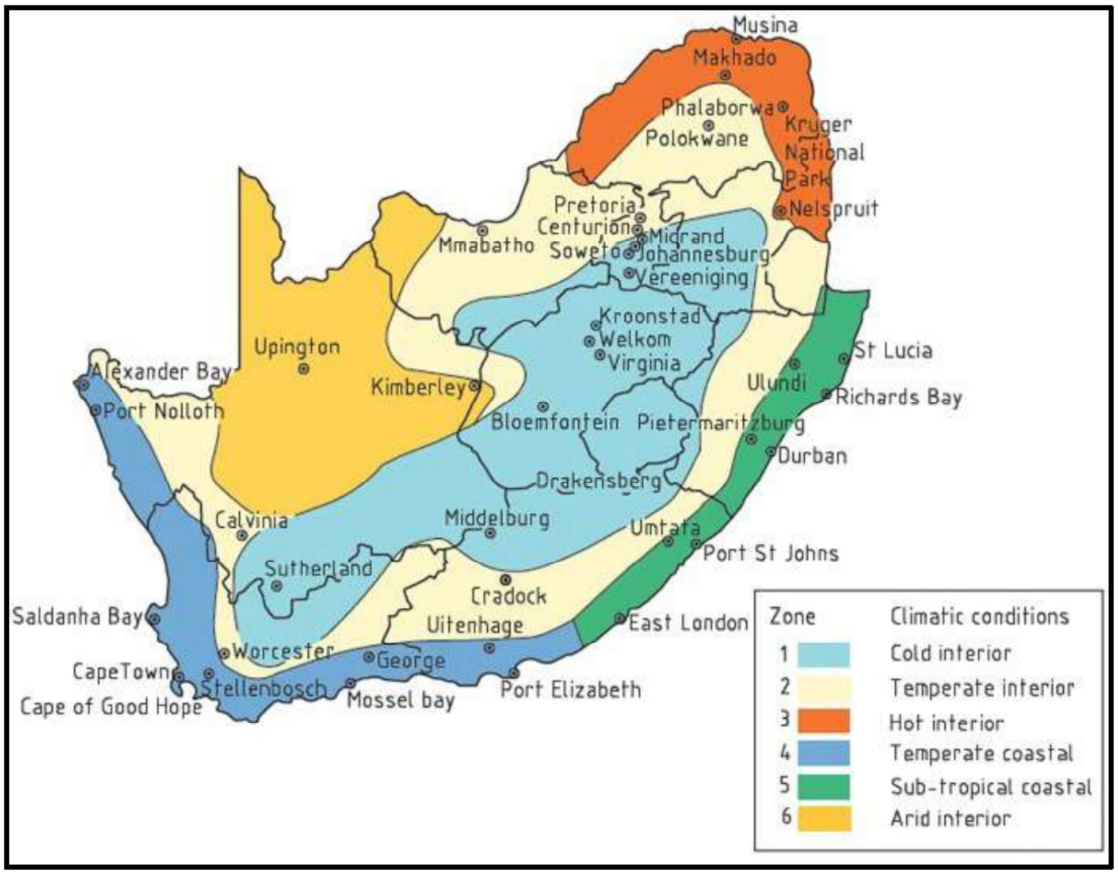

Figure 7: Climatic Zones of South Africa (Sativa, 2017).

3.1.2 Topography and Landuse

The topography of the study site and immediate surrounding area is that of flat to very flat plains with little relief or undulation and no ridges, ravines, hills or rocky outcrops. The average height above sea level across the study area is approximately 40m (Sativa, 2017).

The study area is within the Sappi and Mondi Forestry area. It is therefore within patches of Eucalyptus plantations, forestry haulage roads and grassy patches in between. A Transnet train station and railway siding is situated adjacent to the site on the south west side. Enseleni Nature Reserve occurs 1.6km to the north west.

3.1.3 Regional Vegetation

The study site is located within the Indian Ocean Coastal Belt Biome (Rutherford and Westfall, 1994), which covers the seaboard of KwaZulu-Natal and the Eastern Cape (Mucina and Rutherford, 2006). The tropical appearance of the vegetation associated with the Indian Ocean Coastal Belt is the result of a mixture of growth forms such as trees, lianas, and epiphytes, while grass plays a subordinate role in this biome (Mucina and Rutherford, 2006). The land use in this biome is primarily sugarcane farming in KwaZulu-Natal. Therefore, grass being "subordinate" may be attributable to the fact that vast areas were planted to cane. Historically, forest was rare to non-existent and grassland would dominate where the topography is undulating (due to natural processes such as fire) (Finch and Hill, 2008).

The biomes in southern Africa are divided into smaller units known as vegetation types. Both Mucina and Rutherford (2012) on a national scale (**Figure 8**), and Scott-Shaw and Escott (2011) in KwaZulu-Natal (**Figure 9**), place the study area mainly within **Maputaland Wooded Grassland** and **Maputaland Coastal Belt** vegetation types. Parts of the study area also occur near **Northern Coastal Forest** (Mucina and Rutherford, 2012).

Maputaland Coastal Belt: According to Mucina and Rutherford (2006), this vegetation type covers a strip up to 35km in breadth along the coast of the Indian Ocean stretching from the Mozambique border to south of Mtunzini, and varies in altitude from 20-120m. Historically, the coastal plain was likely dominated by dry grasslands (which include palm veld where special conditions prevail), hygrophilous grasslands and thicket groups interspersed locally with forest patches. Today the vegetation landscape is composed of pockets of various forest types (separated into different vegetation units), thickets, primary and secondary grasslands, extensive timber plantations and cane fields.

Maputaland Wooded Grassland: According to Mucina and Rutherford (2006), the Maputaland Wooded Grassland is another vegetation unit embedded within the geographical extent of the Maputaland Coastal Belt. This is a generally flat landscape of the Maputaland coastal plain supporting coastal sandy grasslands rich in geoxylic suffrutices, dwarf shrubs, small trees and a rich herbaceous flora. Excluded from this unit are the many inter-dune depression wetlands and hygrophilous grasslands neighbouring the wooded grasslands, which is where the study site is located.

Northern Coastal Forest: Mucina and Rutherford (2012) classified this as **Northern Coastal Forest** whilst Scott-Shaw and Escott (2011) defined it as **KwaZulu-Natal Coastal Forests: Maputaland Moist Coastal Lowlands Forest**. Patches of coastal forest extend along the Indian Ocean seaboard from KwaZulu-Natal to the Eastern Cape Province at low altitudes (10-150 m). The forests are usually situated on coastal plains or stabilised coastal dunes. Common tree species include the indigenous *Drypetes natalensis* and *Englerophytum natalense*, whilst tropical shrubs dominate the species rich understorey. Listed as Critically Endangered, all species within the vegetation type are of high conservation significance.

According to the KZN BSP, the study area does not fall within any area identified as important, i.e. the site is mostly transformed.

Refer to **Appendix D1** for further details.

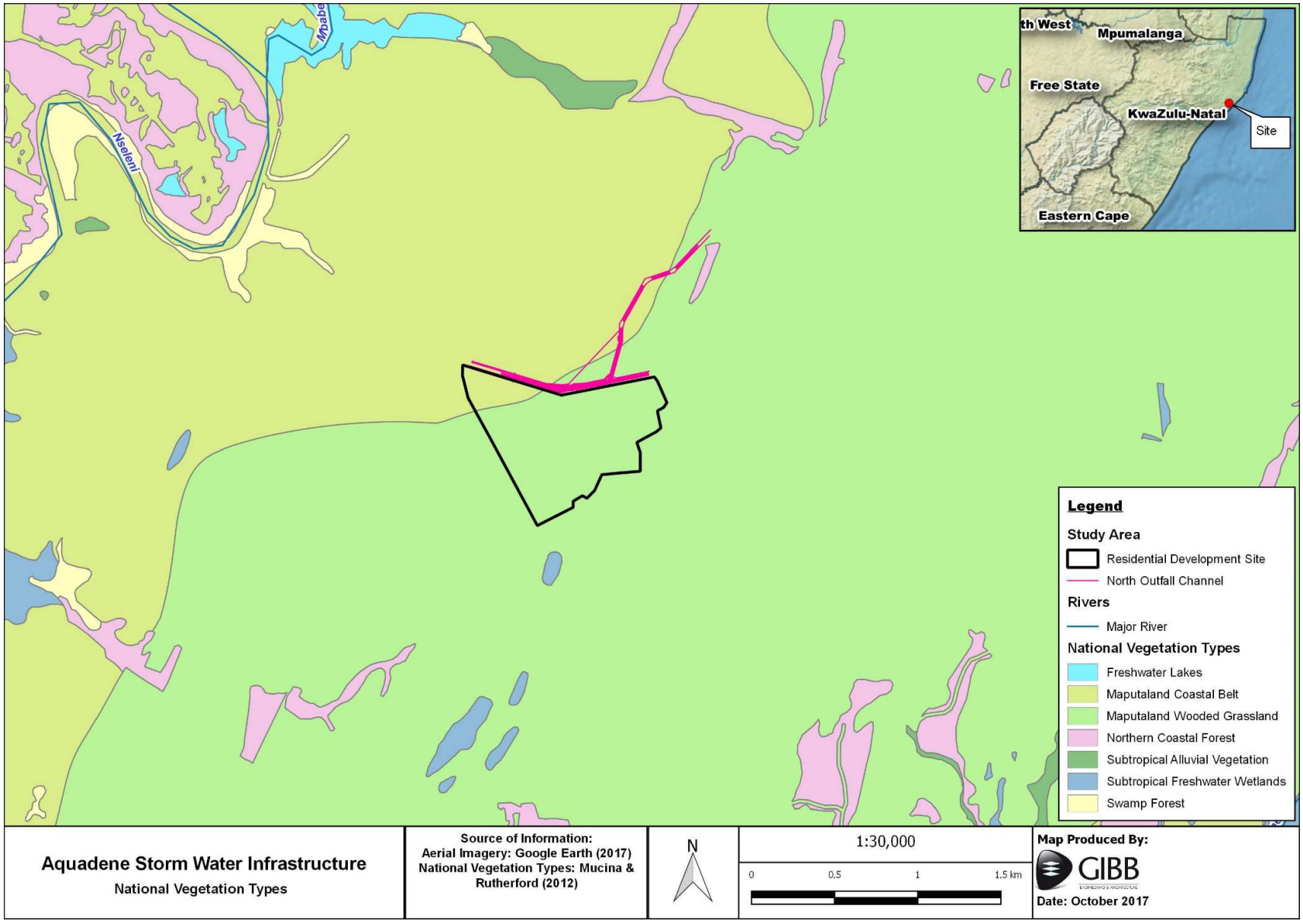

Figure 8: The study area in relation to national vegetation types

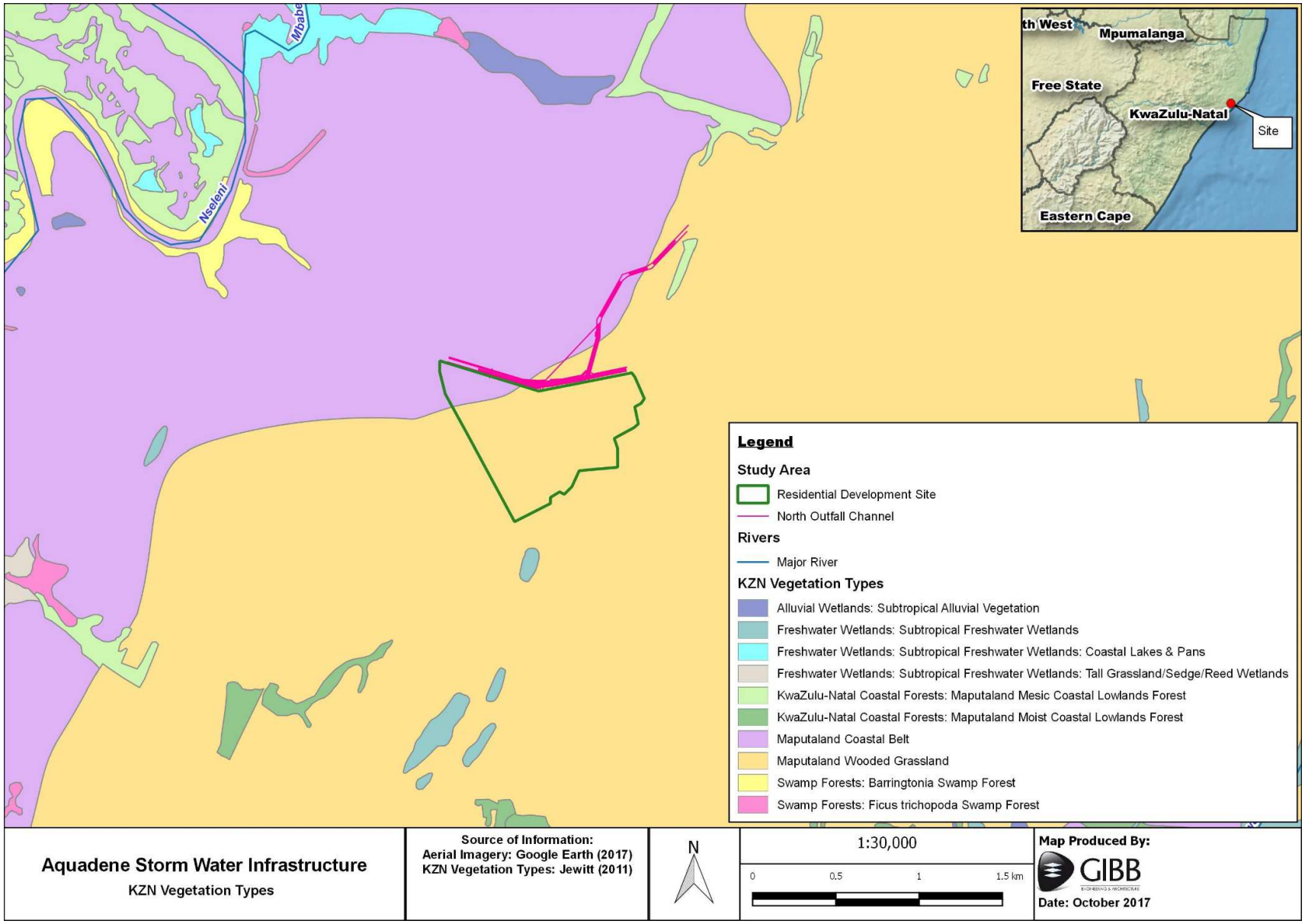

Figure 9: The study area in relation to KZN vegetation types

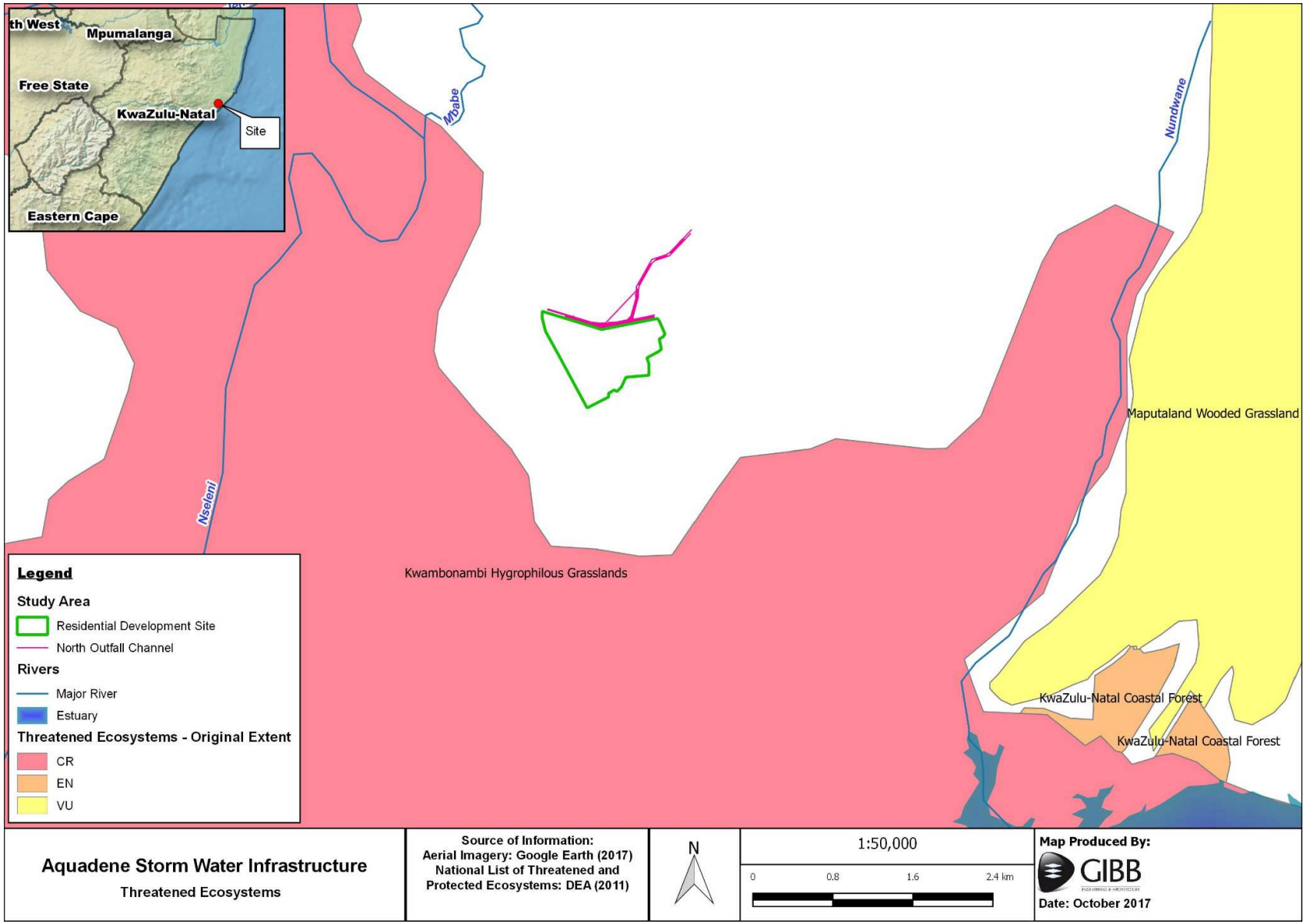

Figure 10: The study area in relation to national threatened ecosystems

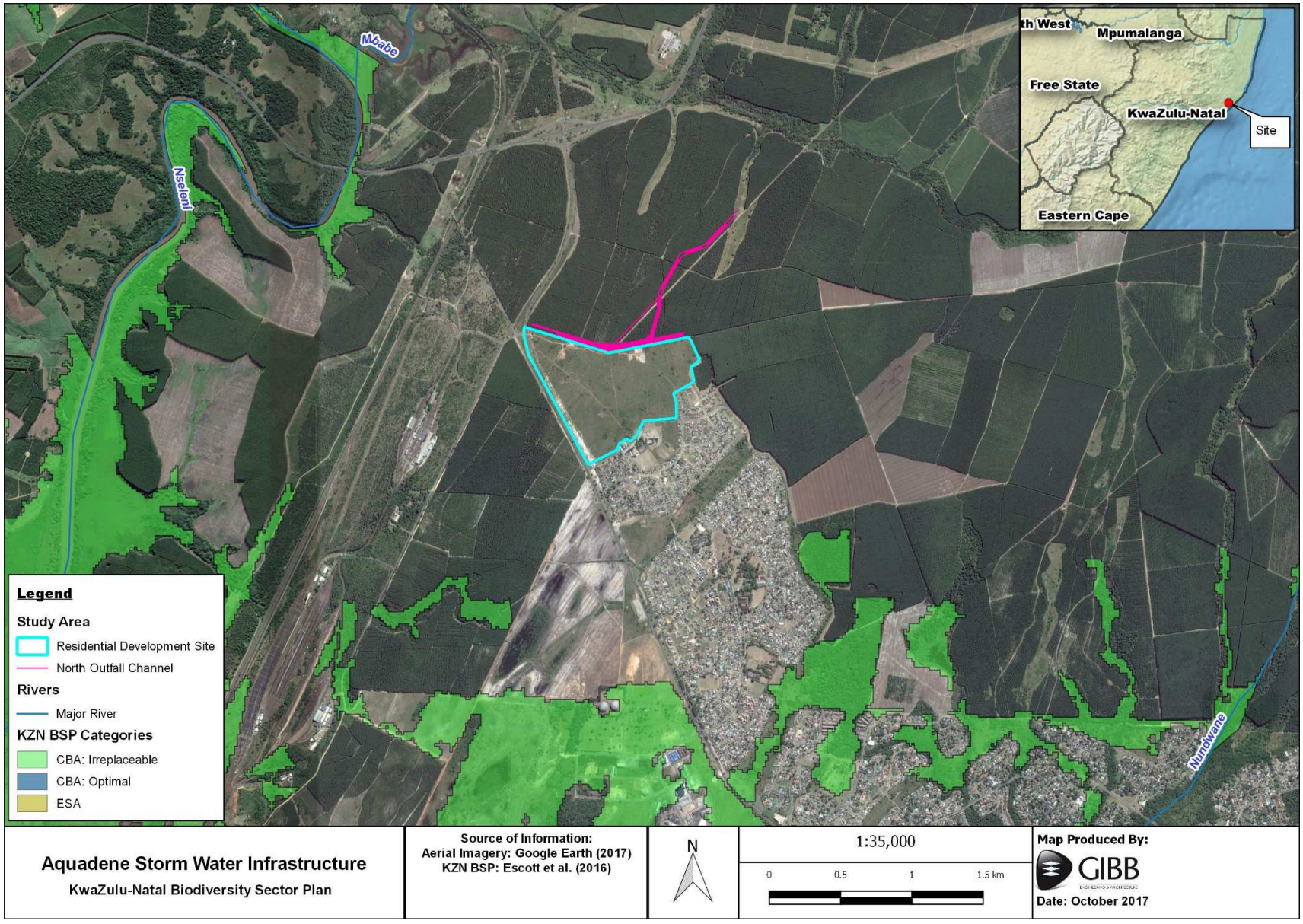

Figure 11: The study area in relation to terrestrial CBAs according to the KZN BSP

3.1.4 Watercourses in the Study Area

According to the Wetland Assessment in **Appendix D2**: "There are no large perennial rivers in the study area of either bulk stormwater system. The closest large rivers are the Nseleni River (to the west); Nundwane River (to the east); and the Mbabe River (to the north). Refer to **Figure 12** below. There are a few wetland areas in the area, most of which have been totally or partially destroyed, mainly by the afforestation (plantations) in the area. There are no streams in the area of the North stormwater system, but the system will discharge into an area that is a natural channel for water flow due to the gradient and nowadays due to the total encroachment of plantations. This area is viewed as a wetland area, due to the flat (low) gradient. Water flowing into the area will tend to stagnate and/or move very slowly north, creating wetland areas. It is not certain to what extent the wetland areas are natural. It is more than likely that they have formed over the years due to topographic alterations and other negative impacts from the plantations in the immediate area. There are also manmade stormwater drainage lines that have been dug along the northern boundary of the Brackenham suburb as well as west of the suburb and road (R619) these are not wetland areas or even watercourses."

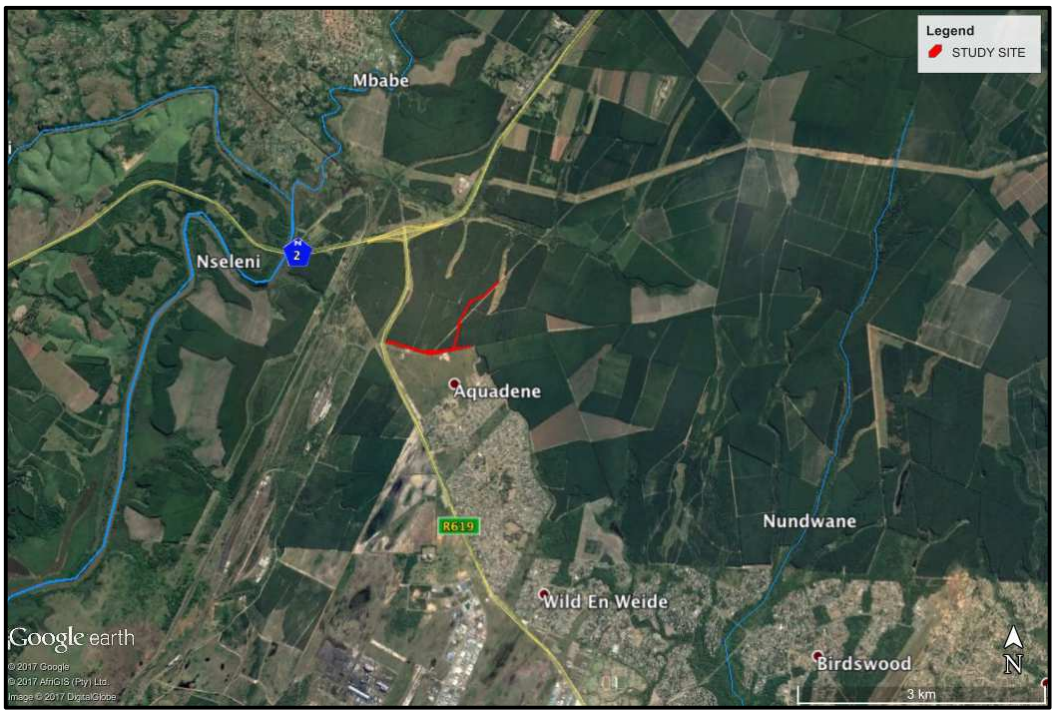

Figure 12: Watercourses in the study area (Sativa, 2017).

3.1.5 Drainage Areas

The study area is situated in the Primary Drainage Area (PDA) of W and the Quaternary Drainage Area (QDA) of W12H. It is also within the Pongola-Mtamvuna Water Management Area (WMA 4) (previously under the Usuthu to Mhlatuze WMA) and under the jurisdiction of the Pongola-Mtamvuna Catchment Management Agency (CMA 4).The Sub-Water Management Area, in which the study site is situated, is the Mhlatuze Sub-WMA.

3.1.6 National priority areas

Priority areas include formal and informal protected areas (nature reserves); important bird areas (IBAs); RAMSAR sites; National fresh water ecosystem priority areas (NFEPA) (which include wetlands) and National protected areas expansion strategy (NPAES) focus areas. The study site is not within any priority areas, including NFEPA wetland areas. According to the datasets of the South African National Biodiversity Institute (SANBI) and Department Water and Sanitation (DWS), there are a few wetlands in the region, but none are within 500m of the study area. The closest wetland area to the study site (according to NFEPA wetlands, DWS, SANBI and the KZN BSP (2014)) is situated between Aquadene and Brackenham, across the R619. The wetland in question is pointed out by the black arrow in the figure below (**Figure 13**).

However, during field investigations by the Wetland Specialist (**Appendix D3**), it was evident that there is no wetlands in this area. The area and surrounding sites have been transformed by active plantations (afforestation) over a period of many years. It is possible that historically a small wetland was present in this area, but years of tree plantations and ploughing of the soils, construction of a road right through the middle of it, and suburbs, have killed the wetland and totally transformed the environment. Even the demarcated wetland areas south of the wetland in question are dysfunctional and have been seriously modified by afforestation. This group of wetlands is however, outside of a 500m radius of the study site (Sativa, 2017).

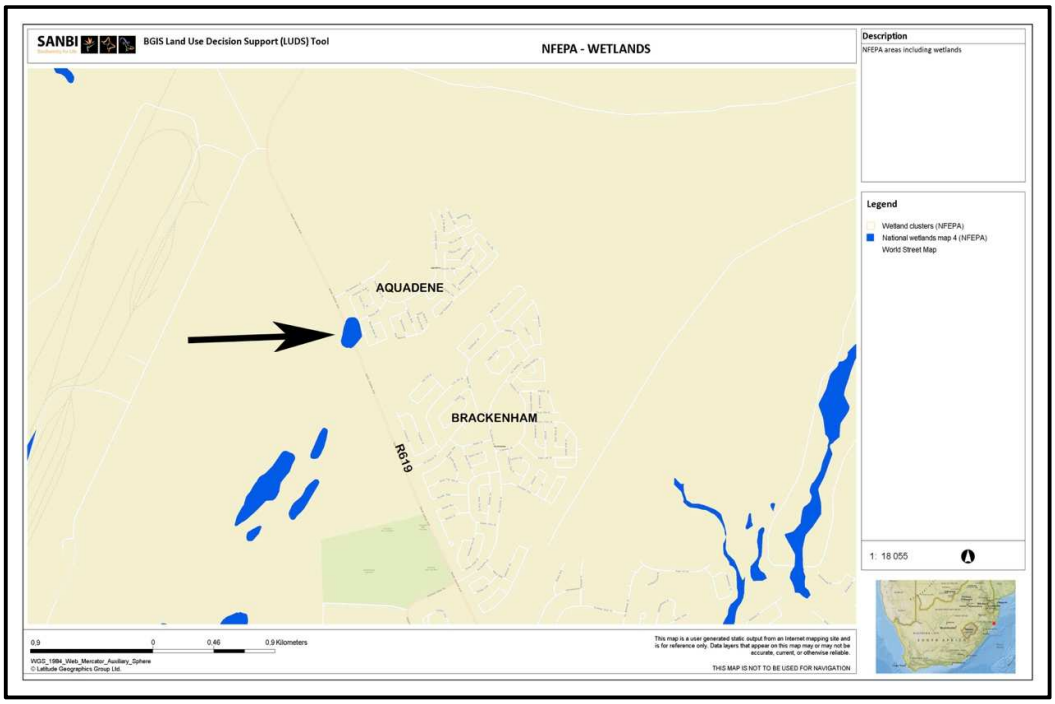

Figure 13: Wetland areas (Sativa, 2017).

3.1.7 Delineation of watercourses in the study area

The length of the bulk stormwater servitude / corridor does not impact on any watercourses within its servitudes, except at the end where there is discharge into existing watercourses.

These watercourses, along with nearby watercourses were delineated during field investigations. This includes any wetlands, natural drainage lines and even manmade impoundments (farm dams). Wetlands within a 500m radius of the stormwater servitude were also delineated as shown below (**Figure 14**).

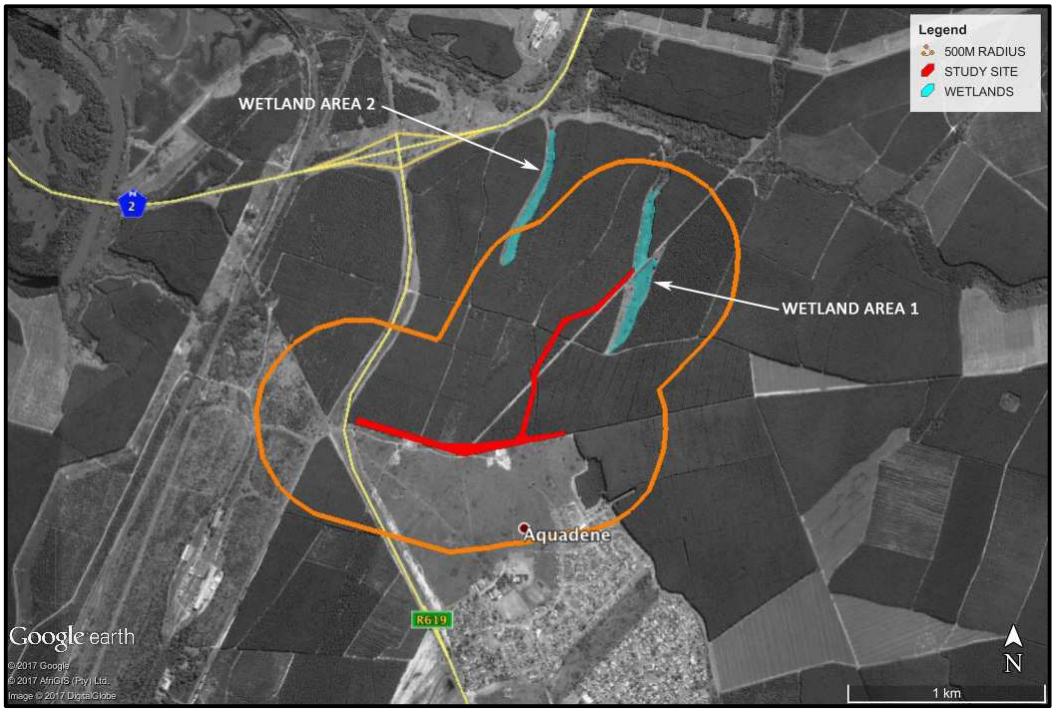

Figure 14: Delineated Wetland areas (Sativa, 2017).

3.2 Social Environment

3.2.1 Demographics

(a) Level of unemployment:

The following is taken from the uMhlathuze Local Municipality Integrated Development Plan (IDP) 2012-2017: In South Africa, with a National unemployment rate of 25% and provincially of 22.6% with the uMhlatuze district is estimated at 40%. Even though the economic performance of the local area is good, it is noted that unemployment remains high. The unemployment problem in uMhlathuze is compounded by the lack of skills in individuals.

(b) Economic profile of local municipality:

The following is taken from the uMhlathuze Local Municipality IDP 2012-2017: Richards Bay lies within the fastest growing provincial economies at an average rate of 4,3% per annum. The Port of Richards Bay is one of the two largest and busiest Ports in Africa creating a drive for the area to be one of the major industrial investment opportunities. The Port plays an important economic role not only for this province but for the whole of South Africa (SA). Whilst the municipality is presently export oriented, the potential for import prospects are being contemplated. The City also functions as a district node and a dominant commercial

centre in the uThungulu District providing greater economic opportunities for the town and hinterland. The key feature of uMhlathuze Municipality is the N2 Development Corridor, eThekwini-Ilembe-uMhlathuze Corridor. The Dube Trade Port, (King Shaka Airport), is approximately 145km away from the City which again makes it an added advantage to the area in terms of investment attraction.

The area is the third most important in KZN in terms of economic production, contributing 16.7% to national Gross Domestic Product (GDP) whilst also the third most important primary manufacturing area in KwaZulu-Natal (KZN) in terms of economic production. Manufacturing is highly specialised export orientated, largely concentrated on basic iron and steel, paper and printing as well as food and beverages. The sector characterized by highly sophisticated manufacturing processes. The large scale industrial strengths of the uMhlathuze centre comprise of a varied industrial base of coal terminals and aluminium smelters, coupled with an impressive number of industries including mining companies and paper mills, forestry, production of materials handling equipment, as well as fertiliser and special chemicals production. The City of uMhlathuze is rich in mineral resources. The mining of these minerals meets all of South Africa‘s demand for titanium dioxide, zircon and almost all of the country‘s pig iron requirements. Most of the industrial and commercial activities are vested in Richards Bay, Empangeni and Felixton (specifically the industrial development nodes of the City of uMhlathuze). The manufacturing sector employs the majority of population. Manufacturing contributes 29% of the national GDP. The advent of the Richards Bay Industrial Development Zone (RBIDZ) within the vicinity of Richards Bay harbour serves to boost economic activity and to attract international investors wishing to take advantage of the advantage on offer. Other natural advantages are the diverse and intensifying agriculture production, including the rich land of sugarcane and forestry. The cane and forestry sectors have been at the forefront of assisting emerging farmers. The agricultural sector is a dual economy, consisting of commercial agriculture on one hand and traditional agriculture on the other. Agricultural activity is more concentrated in the former Lower Umfolozi magisterial area. Traditional agriculture is practiced on most of the Traditional Council lands in the district. The development of this sector is hindered by a low skills base and a lack of organised bodies to provide financial assistance; access to markets and market channels. An Agricultural Development Plan has been prepared for the uThungulu District Municipality. This plan identifies specific programmes and projects to address rural poverty. The City of uMhlathuze meanwhile participating in this initiative, has concurrently been implementing its Local Economic Development Strategy 2007-2011. This programme has assisted many community members with programmes such as agricultural support, community skills development, and informal trading administration tourism development. The City is still to develop its LED Strategy for the years 2012-2017.

(c) Level of education:

The following is taken from the uMhlathuze Local Municipality IDP 2012-2017: The following is a reflection of the number of individuals that participated in the education system: Most pupils reached secondary schooling. There is then a drop in the system of people that complete Grade 12. It is after Grade 12 that the community is unable to continue with their

studies. The percentage of the population that was older than 20 years with higher education was 8.45%. The above could be attributed to immigration of skilled workers into the area. The percentage of people with a level of education less than Grade 12 was very high at 52.4%.

Education levels have shown a decrease while demand for skills has increased. Provincial government has budgeted R3 billion for equalisation of subsidies to no fee schools and for the expansion of access to Grade R. In order for the City to develop we should make education one of the most far-reaching requirements for development, alleviating poverty, improving health outcomes and quality of life, reducing gender and social disparities, and enhancing economic productivity.

Education is a contributor to economic growth and societal stability through developing individuals equipped with cognitive and life skills necessary for sustaining the livelihood, and contributing to the productive sector. We have to ensure that suitable infrastructure services are provided to the schools for future capacity building and empowerment of our younger generation. The municipality has recently signed a Memorandum of Agreement between uMhlathuze Municipality and Umfolozi FET College. It is intended to give the youth opportunities through skills acquisition to provide training and job opportunities to the youth. Through this partnership, 150 learners will be trained in various skills through internship programmes wherein they will be mentored by qualified expect in engineering and other technical fields. This is intended to reduce skills shortage and contribute to a skilled workforce in accordance with the 12 government outcomes.

3.2.2 Cultural Heritage

The proposed development site comprises a hugely modified landscape in terms of heritage significance due to extensive are under forestry and plantations.

According to the Heritage Report in **Appenidx D3**, “the fundamental transformation to the local landscape by afforestation, particularly the practice of episodic de-stumping, would have caused any archaeological residues present to be moved out of their primary context; rendering them, even if observed, to be of little further scientific value. This has been attested to in other recent heritage studies in the immediate Richards Bay area. The discharge channel is further aligned into an extant natural drainage line which would have been eschewed for habitation in the historical past. Consequently, no graves should be expected in the immediate precinct of the planned upgrade and associated infrastructure and services proposed.”

Accordingly, the specialist further requested that Amafa allow the proposed infrastructural upgrades to proceed with no further heritage resource mitigation suffice that the protocols in Appendix 1 of **Appendix D3** are made binding to any Environmental Authorisations issued. If any items or artefacts deemed to have any significant importance are uncovered during the construction phase of the project, the necessary actions as outlined within the Environmental Management Programme (EMPr) for this project must be implemented. (Refer to **Appendix F** for the EMPr).

4 BASIC ASSESSMENT PROCESS

4.1 Approach to the BA Process

A Basic Assessment (BA) is an effective environmental planning tool. It identifies the environmental impacts of a proposed project and assists in ensuring that a project will be environmentally acceptable and integrated into the surrounding environment in a sustainable way.

The BA process for this project complies with the requirements of the National Environmental Management Act, 1998 (Act 107 of 1998) [NEMA] and the NEMA EIA Regulations, 2014 (as amended). The guiding principles of a BA Process are listed below.

4.2 Guiding Principles for a BA Process

The BA Process must take an open participatory approach throughout. This means that there should be no hidden agendas, no restrictions on the information collected during the process and an open-door policy by the proponent. Technical information must be communicated to stakeholders in a way that is understood by them and that enables them to meaningfully comment on the project.

There should be ongoing consultation with Interested and Affected Parties (I&APs) representing all walks of life. Sufficient time for comment must be allowed. The opportunity for comment should be announced on an on-going basis. There should finally be opportunities for input by specialists and members of the public. Their contributions and issues should be considered when technical specialist studies are conducted and when decisions are made.

The eight guiding principles that govern the entire process of BA Process are as follows:

- **Participation**: An appropriate and timely access to the process for all interested parties.
- **Transparency:** All assessment decisions and their basis should be open and accessible.
- **Certainty:** The process and timing of the assessment should be agreed in advanced and followed by all participants.
- **Accountability:** The decision-makers are responsible to all parties for their action and decisions under the assessment process.
- **Credibility:** Assessment is undertaken with professionalism and objectivity.
- **Cost-effectiveness:** The assessment process and its outcomes will ensure environmental protection at the least cost to the society.
- **Flexibility:** The assessment process should be able to adapt to deal efficiently with any proposal and decision making situation.
- **Practicality:** The information and outputs provided by the assessment process are readily usable in decision making and planning.

A BA process is considered as a project management tool for collecting and analysing information on the environmental effects of a project. As such, it is used to:

- Identify potential environmental impacts;
- Examine the significance of environmental implications;
- Assess whether impacts can be mitigated;
- Recommend preventive and corrective mitigating measures;
- Inform decision makers and concerned parties about the environmental implications; and
- Advise whether development should go ahead.

The Public Participation Process forms an integral part of the Basic Assessment Process and is discussed in greater detail in **Section 4.4** of this BAR (below).

4.3 BA Technical Process

This section provides a summary of the technical process that has been followed to date for this BA process.

4.3.1 Application for Authorisation

The EIA application form was submitted to the KZN EDTEA on **Thursday 16 November 2017**. Refer to **Appendix G** for the Application Form.

4.3.2 Information Gathering

Early in the BA process, the technical specialists identified the information that would be required for the impact assessment and the relevant data was obtained. In addition, the specialists sourced available information about the receiving environment from reliable sources, I&APs and previous documented studies in the area.

4.3.3 Specialist Studies

The following specialist studies have been undertaken for the BA process:

- Wetland Impact Assessment;
- Ecological Assessment ; and
- Heritage Assessment.

4.4 Public Participation Process

The principles of NEMA govern many aspects of the BA process, including consultation with I&APs. These principles include the provision of sufficient and transparent information to I&APs on an ongoing basis, to allow them to comment; and ensuring the participation of historically disadvantaged individuals, including women, the disabled and the youth.

The principal objective of public participation is thus to inform and enrich decision-making.

4.4.1 Identification of Interested and Affected Parties

I&APs representing the following sectors of society have been identified (see **Appendix E1** for a complete preliminary I&AP distribution list):

- Provincial Authorities;
- Local Authorities;
- Ward Councillors; and
- Adjacent Landowners.

The following will be taken into consideration during the execution of the construction phase:

- Servitudes must be registered and in place in time;
- Way leaves to cross services must be obtained timeously;
- Effective communication with landowners and notification of disruptions are essential;
- Efficient material and quality control required; and
- Accurate as-built data to be kept and work measured before final commissioning.

4.4.2 Public Announcement of the Project

I&APs have been informed of the project and have been requested to register and send their comments to GIBB in the following manner (see **Appendix E** for public announcement documentation):

- Publication of media advertisement in the Zululand Observer;
- On-site notices detailing the proposed development, the BA process and invitation to register and comment, were placed on and around the site; and
- Distribution of letters by email to I&APs identified in **Section 4.4.1** above.

4.4.3 Database of Registered and Affected Parties

A preliminary database was compiled for this project and will be updated as the public participation process progresses. All I&APs who register will be included within this database (refer to **Appendix E1**).

4.4.4 Basic Assessment Report (BAR) for Public Review

A period of 30 calendar days **20 November 2017 – 11 January 2018 (to account for the no go public participation period of 15 December 2017 to January 2018**) is allowed to the State Departments, and the general public for the review and commenting phase of the Draft BAR. The availability of the Draft BAR will be announced by means of public notice (refer to **Section 4.4.2** above) and personal letters to all identified stakeholders on the distribution list. Comments that will be received during public review of the Draft BAR, will be captured in a Comments & Response Report and will be attached to the Final BAR in **Appendix E5**.

5 IMPACT ASSESSMENT

5.1 Impact Identification and Assessment Methodology

All key issues associated with this project, as identified during the Basic Assessment, have been investigated by the specialist team and categorised in terms of their biophysical and socio-economic parameters (please refer to **Appendix D** for their specialist reports). All the impacts have accordingly been assessed and their significance have been summarised in
Table 11 and **Table 12** below.

Table 11: Potential Impacts for Alternative 1 (preferred)

Alternative 1 (Preferred)		
Impact	***Significance before mitigation***	***Significance after mitigation***
Construction Phase		
Increased potential of invasion by alien vegetation from the construction of the stormwater channel	moderate - negative	very low negative
Destruction and loss of vegetation habitat and wetland habitat as result of site clearance	moderate - negative	very low negative
Increased soil erosion as a result of earthworks required for the Stormwater channel	low - negative	very low negative
Impact on Wetland Area 1 as a result of construction in the wetland	low - negative	very low negative
Impact on cultural heritage from the construction of the stormwater channel	very low negative	very low negative

Pollution of downstream watercourses	moderate - negative	very low negative
Increased noise generation due to construction activities and the movement of construction vehicles	very low negative	very low negative
Effect of temporary workers on social dynamics as a result of migration during construction	very low negative	very low negative
Waged Labour/Employment creation and decrease in unemployment as a result of available job/business oppurtunities for local people	low positive	moderate positive
Disturbance of land-owners and users alongside the site	low - negative	low - negative
Operational Phase		
Modification of flow dynamics and flow patterns resulting in increased velocity of surface water into wetland system flows	moderate - negative	low - negative
Increased area of inundation and flooding of vegetation	low - negative	very low negative
Pollution of downstream watercourses	moderate - negative	very low negative
Decomissiong		
Same as for Construction		

Table 12: Potential Impacts for Alternative 2

Alternative 2		
Impact	***Significance before mitigation***	***Significance after mitigation***
Construction Phase		

'Disturbance of land-owners and users alongside the site	moderate negative	low negative

5.2 Impact Assessment Methodology

GIBB, subsequent to the assessment conducted by the specialist team, have reviewed the impacts identified and assessed the inherent and residual risk posed to the receiving environment pre and post the application of mitigation measures. The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise as a result of the proposed development.

For each of the main project phases the existing and potential future impacts and benefits (associated only with the proposed development) were described using the criteria listed in **Table 13** below. This was done in accordance with Government Notice R.326, promulgated in terms of Section 24 of the NEMA and the criteria drawn from the IEM Guidelines Series, Guideline 5: Assessment of Alternatives and Impacts, published by the DEAT (April 1998).

The assignment of ratings has been undertaken based on past experience of the EIA team, as well as through research. Subsequently, mitigation measures have been identified and considered for each impact and the assessment repeated in order to determine the significance of the residual impacts (the impact remaining after the mitigation measure has been implemented).

Table 13: Proposed Criteria and rating Scales which were used in the Assessment of the Potential Impacts

Criteria	Rating Scales	Notes
Nature	Positive	An evaluation of the effect of the impact related to the proposed development.
	Negative	
Extent	Footprint	The impact only affects the area in which the proposed activity will occur.
	Site	The impact will affect only the development area.
	Local	The impact affects the development area and adjacent properties.
	Regional	The effect of the impact extends beyond municipal boundaries.
	National	The effect of the impact extends beyond more than 2 regional/ provincial boundaries.
	International	The effect of the impact extends beyond country borders.

Criteria	Rating Scales	Notes
Duration	Temporary	The duration of the activity associated with the impact will last 0-6 months.
	Short term	The duration of the activity associated with the impact will last 6-18 months.
	Medium term	The duration of the activity associated with the impact will last 18 months-5 years.
	Long term	The duration of the activity associated with the impact will last more than 5 years.
Severity	High negative	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.
	Moderate negative	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected
	Low negative	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected
	Low positive	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved
	Moderate positive	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a

Criteria	Rating Scales	Notes
		modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected
	High positive	The severity of the impact is rated as High positive as the natural, cultural or social functions and processes are altered to the extent that valued, important, sensitive or vulnerable systems or communities are substantially positively affected.
Potential for impact on irreplaceable resources	No	No irreplaceable resources will be impacted.
	Yes	Irreplaceable resources will be impacted.
Consequence	Extremely detrimental	A combination of extent, duration, intensity and the potential for impact on irreplaceable resources.
	Highly detrimental	
	Moderately detrimental	
	Slightly detrimental	
	Negligible	
	Slightly beneficial	
	Moderately beneficial	
	Highly beneficial	
	Extremely beneficial	
Probability (the likelihood of the impact occurring)	Unlikely	It is highly unlikely or less than 50 % likely that an impact will occur.
	Likely	It is between 50 and 75 % certain that the impact will occur.
	Definite	It is more than 75 % certain that the impact will occur or it is definite that the impact will occur.
Significance	Very high - negative	A function of Consequence and Probability.
	High - negative	
	Moderate - negative	
	Low - negative	
	Very low	
	Low - positive	
	Moderate - positive	
	High - positive	
	Very high - positive	

Table 14: Explanation of Assessment Criteria

Criteria	Explanation
Nature	This is an evaluation of the type of effect the construction, operation and management of the proposed development would have on the affected environment. Will the impact change in the environment be positive, negative or neutral?
Extent or Scale	This refers to the spatial scale at which the impact will occur. Extent of the impact is described as: footprint (affecting only the footprint of the development), site (limited to the site) and regional (limited to the immediate surroundings and closest towns to the site). Extent or scale refers to the actual physical footprint of the impact, not to the spatial significance. It is acknowledged that some impacts, even though they may be of small extent, are of very high importance, e.g. impacts on species of very restricted range. In order to avoid "double counting, specialists have been requested to indicate spatial significance under "intensity" or "impact on irreplaceable resources" but not under "extent" as well.
Duration	The lifespan of the impact is indicated as temporary, short, medium and long term.
Severity	This is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Does the activity destroy the impacted environment, alter its functioning, or render it slightly altered?
Impact on irreplaceable resources	This refers to the potential for an environmental resource to be replaced, should it be impacted. A resource could possibly be replaced by natural processes (e.g. by natural colonisation from surrounding areas), through artificial means (e.g. by reseeding disturbed areas or replanting rescued species) or by providing a substitute resource, in certain cases. In natural systems, providing substitute resources is usually not possible, but in social systems substitutes are often possible (e.g. by constructing new social facilities for those that are lost). Should it not be possible to replace a resource, the resource is essentially irreplaceable e.g. red data species that are restricted to a particular site or habitat of very limited extent.
Consequence	The consequence of the potential impacts is a summation of above criteria, namely the extent, duration, intensity and impact on irreplaceable resources.
Probability of occurrence	The probability of the impact actually occurring based on professional experience of the specialist with environments of a similar nature to the site and/or with similar projects. It is important to distinguish between probability of the impact occurring and probability that the activity causing a potential

Criteria	Explanation
	impact will occur. Probability is defined as the probability of the impact occurring, not as the probability of the activities that may result in the impact.
Significance	Impact significance is defined to be a combination of the consequence (as described below) and probability of the impact occurring. The relationship between consequence and probability highlights that the risk (or impact significance) must be evaluated in terms of the seriousness (consequence) of the impact, weighted by the probability of the impact actually occurring. In simple terms, if the consequence and probability of an impact is high, then the impact will have a high significance. The significance defines the level to which the impact will influence the proposed development and/or environment. It determines whether mitigation measures need to be identified and implemented and whether the impact is important for decision-making.
Degree of confidence in predictions	Specialists and the EIR team were required to provide an indication of the degree of confidence (low, medium or high) that there is in the predictions made for each impact, based on the available information and their level of knowledge and expertise. Degree of confidence is not taken into account in the determination of consequence or probability.
Mitigation measures	Mitigation measures are designed to reduce the consequence or probability of an impact, or to reduce both consequence and probability. The significance of impacts has been assessed both with mitigation and without mitigation.

Table 15: Impact Assessment Criteria and Rating Scales

Duration		Extent		Irreplaceable Resources		Severity	Consequence = (Duration+Extent+Irr) x Severity		Likelihood		Significance		Confidence
1	Temporary	1	Footprint	1	Yes	-3	High - negative	-25 to -33	Extremely detrimental	1	Unlikely	-73 to -99	Very high - negative	Low
2	Short term	2	Site	0	No	-2	Moderate - negative	-19 to -24	Highly detrimental	2	Likely	-55 to -72	High - negative	Medium
3	Medium term	3	Local			-1	Low -negative	-13 to -18	Moderately detrimental	3	Definite	-37 to -54	Moderate - negative	High
4	Long term	4	Regional					-7 to -12	Slightly detrimental			-19 to -36	Low - negative	
		5	National			1	Low -positive	0 to -6	Negligible			0 to -18	Very low - negative	
		6	International			2	Moderate - positive							
						3	High - positive	0 to 6	Negligible			0 to 18	Very Low - positive	
								7 to 12	Slightly beneficial			19 to 36	Low - positive	
								13 to 18	Moderately beneficial			37 to 54	Moderate - positive	
								19 to 24	Highly beneficial			55 to 72	High - positive	
								25 to 33	Extremely beneficial			73 to 99	Very high - positive	

5.2.1 Ascribing Significance for Decision-Making

The best way of expressing the environmental costs/impacts and the inherent benefit implications for decision-making is to present them as risks. Risk is defined as the consequence (implication) of an event multiplied by the probability (likelihood)[1] of that event. Many risks are accepted or tolerated on a daily basis because even if the consequence of the event is serious, the likelihood that the event will occur is low. A practical example is the consequence of a parachute not opening, is potentially death but the likelihood of such an event happening is so low that parachutists are prepared to take that risk and hurl themselves out of an airplane. The risk is low because the likelihood of the consequence is low even if the consequence is potentially severe.

It is also necessary to distinguish between the event itself (as the cause) and the consequence. Again using the parachute example, the consequence of concern in the event that the parachute does not open is serious injury or death, but it does not necessarily follow that if a parachute does not open that the parachutist will die.

Various contingencies are provided to minimise the likelihood of the consequence (serious injury or death) in the event of the parachute not opening, such as a reserve parachute. In risk terms this means distinguishing between the inherent risk (the risk that a parachutist will die if the parachute does not open) and the residual risk (the risk that the parachutist will die if the parachute does not open but with the contingency of a reserve parachute) i.e. the risk before and after mitigation.

5.2.2 Consequence

The ascription of significance for decision-making becomes then relatively simple. It requires the consequences to be ranked and likelihood to be defined of that consequence. In**Table 16** below a scoring system for consequence ranking is shown. Two important features should be noted in the table, namely that the scoring doubles as the risk increases and that there is no equivalent 'high' score in respect of benefits as there is for the costs. This high negative score serves to give expression to the potential for a fatal flaw where a fatal flaw would be defined as an impact that cannot be mitigated effectively and where the associated risk is accordingly untenable. Stated differently, the high score on the costs, which is not matched on the benefits side, highlights that such a fatal flaw cannot be 'traded off' by a benefit and would render the proposed project to be unacceptable.

[1] Because 'probability' has a specific mathematical/empirical connotation the term 'likelihood' is preferred in a qualitative application and is accordingly the term used in this document.

Table 16: Ranking of Consequence

Environmental Cost	Inherent risk
Human health – morbidity / mortality, loss of species	High
Material reductions in faunal populations, loss of livelihoods, individual economic loss	Moderate – high
Material reductions in environmental quality – air, soil, water. Loss of habitat, loss of heritage, amenity	Moderate
Nuisance	Moderate – low
Negative change – with no other consequences	Low
Environmental Benefits	**Inherent benefit**
Net improvement in human welfare	Moderate – high
Improved environmental quality – air, soil, water. Improved individual livelihoods	Moderate
Economic Development	Moderate – Low
Positive change – with no other consequences	Low

5.2.3 Likelihood

Although the principle is one of probability, the term 'likelihood' is used to give expression to a qualitative rather than quantitative assessment, because the term 'probability' tends to denote a mathematical/empirical expression. A set of likelihood descriptors that can be used to characterise the likelihood of the costs and benefits occurring, is presented in **Table 17.**

Table 17: Likelihood categories and definitions

Likelihood Descriptors	Definitions
Highly unlikely	The possibility of the consequence occurring is negligible
Unlikely but possible	The possibility of the consequence occurring is low but cannot be discounted entirely
Likely	The consequence may not occur but a balance of probability suggests it will
Highly likely	The consequence may still not occur but it is most likely that it will
Definite	The consequence will definitely occur

It is very important to recognise that the likelihood question is asked twice. The first time the question is asked is the likelihood of the cause and the second as to the likelihood of the consequence. In the tables that follow the likelihood is presented of the cause and then the likelihood of the consequence is presented. A high likelihood of a cause does not necessarily translate into a high likelihood of the consequence. As such the likelihood of the consequence is not a mathematical or statistical 'average' of the causes but rather a qualitative estimate in its own right.

5.2.4 Residual Risk

The residual risk is then determined by the consequence and the likelihood of that consequence. The residual risk categories are shown in **Table 18** where consequence scoring is shown in the rows and likelihood in the columns. The implications for decision-making of the different residual risk categories are shown in **Table 19.**

Table 18: Residual risk categories

		Residual risk				
Consequence	High	Moderate	High	High	Fatally flawed	
	Moderate – high	Low	Moderate	High	High	High
	Moderate	Low	Moderate	Moderate	Moderate	Moderate
	Moderate – low	Low	Low	Low	Low	Moderate
	Low	Low	Low	Low	Low	Low
		Highly unlikely	Unlikely but possible	Likely	Highly likely	Definite
		Likelihood				

Table 19: Implications for decision-making of the different residual risk categories

Rating	Nature of implication for Decision – Making
Low	Project can be authorised with low risk of environmental degradation
Moderate	Project can be authorised but with conditions and routine inspections
High	Project can be authorised but with strict conditions and high levels of compliance and enforcement
Fatally Flawed	The project cannot be authorised

5.3 Impact Assessment: Alternative 1 (Northern Channel) (Preferred)

All potential impacts associated with both the route alternatives have been categorised according to the respective phases (pre-construction, construction, operational, decommissioning) during which they will occur. Impacts associated with each alternative has been outlined below and discussed in terms of their anticipated duration, extent, severity, probability and significance both prior and post mitigation measures being implemented.

5.3.1 Pre-Construction Phase

The impacts anticipated for the Pre-construction Phase will be minimal and negligible. The site set up and demarcations for the site will be done in conjunction with an appointed independent Environmental Control Officer.

Prior to the construction phase, preference should be given to sourcing local skilled and unskilled labour. Recruitment of labour should be guided by the City of uMhlatuze's recruitment policies which should promote the employment of local labour by any appointed contractors.

5.3.2 Construction Phase

(a) Increased potential of invasion by alien vegetation from the construction of the stormwater channel

During construction, disturbance to the soil and indigenous vegetation will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape due to propagules being released into downstream watercourses by the stormwater. This significant impact may be mitigated easily, if done correctly and thoroughly.

Table 20: Impact ratings for increased potential of invasion by alien vegetation from the construction of the stormwater channel

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Increased potential of invasion by alien vegetation from the construction of the stormwater channel*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*3*	*The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term*	*-21*	*2*
EXTENT	*4*	*The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries*		
SEVERITY	*-3*	*The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.*	***Highly detrimental***	***Likely***

IMPACT ON IRREPLACEABLE RECOURSES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-42***	***moderate - negative***		
PROPOSED MITIGATION MEASURES				
• An independent Ecological Control Officer (ECO) should be appointed to oversee construction.				
• The removal of indigenous vegetation must be limited.				
• Following construction, all remaining areas that have been cleared of indigenous vegetation must be rehabilitated with appropriate indigenous plant species found in the area.				
• A site specific rehabilitation plan must be compiled by a suitable qualified ecologist and implemented by a suitably qualified rehabilitation specialist.				
• An alien invasive species removal and management plan must be compiled by a suitably qualified ecologist.				
• All alien seedlings and saplings must be removed as they become evident for the duration of construction.				
• Unless chemical control is necessary, manual or mechanical removal is preferred to chemical control.				
• All construction vehicles and equipment, as well as construction material must be free of plant material. Equipment and vehicles must be thoroughly cleaned prior to access on to the construction site, especially close to the natural drainage lines.				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-5*	*2*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	-1	*The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*	***Negligible***	***Likely***
IMPACT ON IRREPLACEABLE RESOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-10**	**very low negative**		
CONFIDENCE LEVEL				
High				

(b) *Destruction and loss of vegetation habitat and wetland habitat as result of site clearance*

As previously mentioned, the channel discharges into a natural drainage path. The channel leading up to the discharge point has a steep slope of approximately 1% which results in higher velocities. High velocities must be reduced through a construction of a discharge chute. The factors which will reduce high velocities are additional roughness to the channel and allowing for the dissipation of energy. The channel discharge chute will be a lined outlet

structure (gabion) and allow for energy dissipation through stepped elevation loss and gabions acting as energy breakers closer to the discharge point. The discharge chute is wider than the preceding channel to allow for a wider flow disbursement at the discharge point (less concentrated flow) (Ilifa, 2016).

Table 21: Impact ratings for Destruction and loss of vegetation habitat and wetland habitat as result of site clearance

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Destruction and loss of vegetation habitat and wetland habitat as result of site clearance*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*3*	*The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term*	*-21*	*2*
EXTENT	*4*	*The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries*		
SEVERITY	*-3*	*The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.*	***Highly detrimental***	***Likely***
IMPACT ON IRREPLACEABLE RECOURSES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-42***	***moderate - negative***		
PROPOSED MITIGATION MEASURES				
1. Limit the removal of vegetation to the construction footprint. Remove all invasive species on site.				
2. Ensure employees have been educated in minimizing environmental impacts.				
3. Avoid removal of indigenous vegetation where possible.				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-5*	*2*

EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	-1	*The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*	***Negligible***	***Likely***
IMPACT ON IRREPLACEABLE RESOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-10**	**very low negative**		
CONFIDENCE LEVEL				
High				

(c) Increased soil erosion as a result of earthworks required for the Stormwater channel

During construction of the outfall channel, exposed soil will be susceptible to erosion especially if indigenous vegetation is cleared. During operation the hardened surfaces will increase surface run-off and erosion potential in the terminal drainage line will increase significantly.

Table 22: Impact ratings for increased soil erosion as a result of earthworks required for the Stormwater channel

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Increased soil erosion as a result of earthworks required for the Stormwater channel*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*4*	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-14*	*2*
EXTENT	*3*	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		

SEVERITY	*-2*	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Moderately Detrimental***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-28***	***low - negative***		
PROPOSED MITIGATION MEASURES				
• A Water Use License (or General Authorisation) will be required from the Department of Water and Sanitation (DWS) for construction within 500m of a watercourse.				
• The amount of vegetation removed must be limited to the least amount possible.				
• Following construction, all remaining areas that have been cleared of indigenous vegetation must be rehabilitated with appropriate indigenous plant species found in the area. Grass species are recommended to limit erosion potential.				
• Steep slopes must be stabilised using the most appropriate approved method and technology.				
• The ECO may identify additional cut and fill areas in need of protection and should specify a solution in terms of the most appropriate approved method and technology.				
• The impact may be reduced if construction takes place in the winter months or outside of the rainy season.				
• During operation the proposed design of the channels, i.e. a trapezoidal channel with maximum side slopes of 1:2.5, with 2-m gabion structures positioned every 25 m that will be vegetated, will help to dissipate the flow of storm water. This proposed design must be adhered to.				
• Gabion structures must be placed in the natural drainage line at the point where the stormwater will enter. This will help to dissipate the flow of water into the drainage line.				
POST-MITIGATION				
DURATION	4	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-7*	*1*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	-1	*The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*	***Slightly Detrimental***	***Unlikely***
IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		

SIGNIFICANCE	-7 very low negative
CONFIDENCE LEVEL	
Medium	

(d) Impact on Wetland Area 1 as a result of construction in the wetland

The length of the bulk stormwater servitude / corridor does not impact on any watercourses within its servitudes, except at the end where there is discharge into existing watercourses (Wetland Area 1 as depicted in **Figure 4** above). These watercourses, along with nearby watercourses were delineated during field investigations. This includes any wetlands, natural drainage lines and even manmade impoundments (farm dams). Wetlands within a 500m radius of the stormwater servitude was also delineated and only two Wetland Units were identified. The project will have no impacts on Wetland Area 2. Only Wetland Area 1 that will be impacted on or on which there will be measurable impacts has been further assessed below.

Table 23: Impact ratings for Impact on Wetland Area 1 as a result of construction in the wetland

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Impact on Wetland Area 1 as a result of construction in the wetland*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*4*	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-14*	*2*
EXTENT	*3*	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	*-2*	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Moderately Detrimental***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	*0*	*No irreplaceable resources will be impacted.*		

SIGNIFICANCE	***-28***	***low - negative***		
PROPOSED MITIGATION MEASURES				
Any temporary storage or accommodation facilities to be setup in existing built-up areas or disturbed areas only.				
No temporary facilities to be set up within 100m of the edge of any watercourse.				
Ensure small footprint during construction phase.				
No movement of construction vehicles allowed through delineated wetland areas.				
No movement of construction vehicles allowed across or in the stream or riparian zone, except in immediate area of stormwater servitude. Any new river crossings can trigger the need for a WUL.				
All excess materials brought onto site for construction to be removed after construction.				
No open trenches or mounds of soils to be left.				
Rehabilitation plan for disturbed areas to be compiled and implemented.				
Re-seeding of bare areas with local indigenous grasses to be part of the rehabilitation plan. No exotic species to be used for rehabilitation.				
Any access roads to be rehabilitated after construction.				
POST-MITIGATION				
DURATION	3	*The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term*	*-5*	*2*
EXTENT	2	*The extent of the impact is rated as site as it will affect only the development area*		
SEVERITY	-1	*The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*	***Negligible***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-10**	**very low negative**		
CONFIDENCE LEVEL				
Medium				

(e) Impact on cultural heritage from the construction of the stormwater channel

The proposed development site comprises a hugely modified landscape in terms of heritage significance due to extensive are under forestry and plantations.

If any items or artefacts deemed to have any significant importance are uncovered during the construction phase of the project, the necessary actions will be implemented.

Table 24: Impact ratings for Impact on cultural heritage from the construction of the stormwater channel

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Impact on cultural heritage from the construction of the stormwater channel*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*3*	*The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term*	*-12*	*1*
EXTENT	*2*	*The extent of the impact is rated as site as it will affect only the development area*		
SEVERITY	*-2*	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Slightly Detrimental***	***Unlikely***
IMPACT ON IRREPLACEBLE REOURCES	*1*	*Irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-12***	***very low negative***		
PROPOSED MITIGATION MEASURES				
Any identified grave sites should ideally be left with a twenty metre (20m) buffer from construction activities and be fenced pending engagement with the relevant Authorities and any identified family members having an association or interest in the grave. In the event of unintentional exposure of a grave or a request from a family for exhumation and re-interment the ECO shall immediately contact the Provincial Heritage Resources Agency to obtain the necessary protocols and procedures for the management of such human remains.				
Cease all construction within a radius of at least 20m of any heritage features or artefacts that are found during construction.				
Mark this area using clearly visible means, such as barrier tape or similar, and all personnel should be informed that it is a no-go area.				
Appoint a guard to enforce this no-go area if there is any possibility that it could be violated, whether intentionally or inadvertently, by construction staff or members of the public.				

No measures should be taken to cover up the suspected heritage resource with soil, or to collect any remains such as bone or stone.				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-4*	*1*
EXTENT	2	*The extent of the impact is rated as site as it will affect only the development area*		
SEVERITY	-1	*The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*	***Negligible***	***Unlikely***
IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-4**	**very low negative**		
CONFIDENCE LEVEL				
Medium				

(f) Pollution of downstream watercourses from construction activities

Solid waste will be generated by the construction and may include, but will possibly not be limited to, concrete rubble, soils and other surplus construction and other materials including litter. If not properly managed and contained, these items will find their way into the drainage lines as well as watercourses further downstream, including the Nseleni River.

Table 25: Impact ratings for Pollution of downstream watercourses

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	--			
INDIRECT IMPACT	*Pollution of downstream watercourses*			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*4*	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-24*	*2*
EXTENT	*4*	*The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries*		

SEVERITY	*-3*	*The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.*	***Highly detrimental***	***Likely***
IMPACT ON IRREPLACEABLE RESOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-48***	***moderate - negative***		
PROPOSED MITIGATION MEASURES				
• The municipality must ensure that the new Aquadene residential area receives adequate and efficient garbage removal services.				
• The municipality should implement an education / information campaign in all residential areas that informs the public about natural resources, and to not discard litter in or pollute natural areas. This may be achieved through eye-catching and thought-provoking posters that can be placed in public areas.				
• The stormwater channel must be fitted with litter traps, or litter screens at the kerb inlet, which must be inspected and cleared on a regular basis. After storm events the receiving drainage line must be inspected and cleared of all litter that will accumulate there.				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-10*	*1*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	-2	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Slightly Detrimental***	***Unlikely***
IMPACT ON IRREPLACEABLE RESOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-10**	**very low negative**		
CONFIDENCE LEVEL				
Medium				

(g) Increased noise generation due to construction activities and the movement of construction vehicles

Noise will result from the movement of vehicles, trucks and other associated machinery used during the construction phase. However, the noise associated with construction activities will be of short term, localised and will only last during the construction phase of the project.

There will be no noise generated during the operational phase, other than from maintenance activities.

Table 26: Impact ratings for Increased noise generation due to construction activities and the movement of construction vehicles

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Increased noise generation due to construction activities and the movement of construction vehicles*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*2*	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-8*	*2*
EXTENT	*2*	*The extent of the impact is rated as site as it will affect only the development area*		
SEVERITY	*-2*	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Slightly Detrimental***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-16***	***very low negative***		
PROPOSED MITIGATION MEASURES				
Where reasonable and feasible, the proponent will apply best practice noise mitigation measures including: *1) Minimising consecutive works in the same locality.* *2) Orienting equipment away from noise sensitive receptors.*				
As far as reasonably practicable, sources of significant noise should be enclosed. The extent to which this can be done depends on the nature of the machines to be enclosed and their ventilations requirements;				
Minimise reversing of equipment to prevent nuisance caused by reversing alarms;				

Driver practices when approaching and leaving the site should minimise noise emissions created through activities such as unnecessary acceleration and breaking squeal, especially on the access road to the construction site;				
Site inductions should cover the importance of noise control and available noise reduction measures;				
Construction contractors should be required to use equipment that is in good working order and that meets current best practice noise emission levels. This should be achieved by making it a component of contractual agreements with the construction contracts;				
Community liaison would form a critical element in the management of the impacts. If provided with adequate warning, affected NSRs are sometimes willing to accept excessive noise for a short period of time. Designation of a community liaison officer who will be able to deal with the concerns of residents and establishment of a complaint response programme can enable the identification and resolution of any noise related concerns at an early stage;				
Electrically-powered equipment instead of pneumatic or internal combustion powered equipment shall be used, where feasible;				
Material stockpiles and mobile equipment staging, parking, and maintenance areas shall be located as far as practicable from NSRs;				
Construction site and haul-road speed limits shall be established and enforced during the construction period;				
The use of noise-producing signals, including horns, whistles, alarms, and bells shall be for safety warning purposes only;				
The on-site construction supervisor shall have the responsibility and authority to receive and resolve noise complaints. A clear appeal process to the Owner shall be established prior to construction commencement that will allow for resolution of noise problems that cannot be immediately solved by the site supervisor.				
Stockpile areas will be decided and approved by the Project Manager and appointed ECO before construction commences on site.				
Construction vehicles, plant and machinery maintained and fitted with silencers.				
Regular maintenance on vehicle and equipment to be done.				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-4*	*2*
EXTENT	2	*The extent of the impact is rated as site as it will affect only the development area*		
SEVERITY	-1	*The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*	***Negligible***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-8**	**very low negative**		
CONFIDENCE LEVEL				
Medium				

(h) Effect of temporary workers on social dynamics as a result of migration during construction

Even though it is not expected that the presence of temporary workers will have a major impact on the social dynamics of the area, it is worth looking at the proposed impact.

In most cases, the potential in-migration of workers is likely to result in other cumulative impacts, such as conflict with existing community members, social inconveniences and/or problems and pressures on existing infrastructure. Among recent years, South Africa has seen xenophobic attracts on "outsiders" due to competition for business opportunities, scarce resources such as jobs or land, or due to other conflicts. These types of attacks, although it can be viewed as isolated incidences, should serve as a reminder of the very volatile situation of most low-income residential areas. This process of potential in-migration is anticipated to have a low effect on the communities in close proximity to the proposed project, mostly due to the location of the site.

Should these impacts take place, it is only anticipated to most likely occur during the construction phase of the project. It is therefore advised that construction workers who are already housed within the Social Impact area of the proposed site, be employed as opposed to establishing temporary housing for workers.

Table 27: Impact ratings for Effect of temporary workers on social dynamics as a result of migration during construction

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Effect of temporary workers on social dynamics as a result of migration during construction*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*2*	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*0*	*3*
EXTENT	*4*	*The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries*		
SEVERITY	*0*	*Negligible*	***Negligible***	***Definite***
IMPACT ON IRREPLACEBLE REOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***0***	***very low negative***		
PROPOSED MITIGATION MEASURES				
Employ local labour as far as possible				
Avoid the establishment of camps, hostels or temporary accommodation for workers.				
Accommodation should be provided at suitable locations in and surrounding the area;				

Ensure that during the project construction process and the operational phase of the project, employees receive adequate (I.e. meet the minimum requirements of the OHS Act) health support from the project team for work-related health problems;				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*0*	*2*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	0	*Negligible*	***Negligible***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***0***	**very low negative**		
CONFIDENCE LEVEL				
Medium				

(i) Waged Labour/Employment creation and decrease in unemployment as a result of available job/business opportunities for local people

Waged labour can be defined by an impact that changes the number of available jobs in an area. Development directly influences changes in employment and income opportunities in communities. Such changes may be more or less temporary (e.g., construction projects, or seasonal employment) or may constitute a permanent change in the employment and income profile of the community should the development project bring long-term job opportunities for residents.

In order to ensure that this impact leads to maximum benefit, it is important to ensure that employment opportunities created will lead to employment of local residents as far as possible. Emerging employment opportunities should be targeted at local residents as well as people from the surrounding areas (Social Impact Zone). This will ensure a reduced dependency on temporary employment in addition to enhancing the living standards of local residents.

Table 28: Impact ratings for Employment creation and decrease in unemployment as a result of available job/business opportunities for local people

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Waged Labour/Employment creation and decrease in unemployment as a result of available job/business opportunities for local people*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**

PRE-MITIGATION				
DURATION	*2*	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*12*	*2*
EXTENT	*4*	*The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries*		
SEVERITY	*2*	*The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected*	***Slightly Beneficial***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***24***	***low positive***		
PROPOSED MITIGATION MEASURES				
Unskilled and unemployed labour should be sourced from the surrounding local communities as far as possible;				
Skills development opportunities should be granted to community members and local job seekers, where needed;				
Project contracts between City of Umhlatuze and the appointed sub-contractors should stipulate the use of local labour for unskilled and semi-skilled positions and tasks;				
Ensure that local businesses, especially those of HDI, women and of SMMEs get allocated an appropriate share of project related business opportunities; and				
Ensure that the Labour Relations Amendment Act, 2002 (Act No. 12 of 2002) as well as the necessary policies and procedures are taken into consideration to ensure the correct procurement procedures.				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*18*	*3*
EXTENT	4	*The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries*		
SEVERITY	3	*The severity of the impact is rated as High positive as the natural, cultural or social functions and processes are altered to the extent that valued, important, sensitive or vulnerable systems or communities are substantially positively affected.*	***Moderately Beneficial***	***Definite***

IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**54**	**moderate positive**		
CONFIDENCE LEVEL				
Medium				

(j) Impact of disturbance of land owners and users alongside the site

Numerous consultations have been held with the affected landowners (namely Mondi and SAPPI) this includes negotiations on compensations for the removal of trees during construction. Allowance needs to be made for existing haulage roads which will be affected by the Northern Outfall Drainage Channel. The recommendation is that standard box culverts be installed at the required crossings. The culvert design allows for concrete wing walls as well as concrete base for the culvert section. Gabion mattresses will be placed at both the entry and exit points of the box culvert to reduce velocity and prevent erosion at the two points.

Table 29: Impact ratings for disturbance of land owners and users alongside the site

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Disturbance of land-owners and users alongside the site*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*3*	*The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term*	*-12*	*3*
EXTENT	*3*	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	*-2*	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Slightly Detrimental***	***Definite***
IMPACT ON IRREPLACEBLE REOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-36***	***low - negative***		

PROPOSED MITIGATION MEASURES				
Project programme to be provided to all landowners				
Implement Construction EMP recommendations.				
Allowance needs to be made for existing haulage roads which will be affected by the Northern Outfall Drainage Channel				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-10*	*2*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	-2	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Slightly Detrimental***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-20**	**low - negative**		
CONFIDENCE LEVEL				
Medium				

5.3.3 Operation Phase

(a) Modification of flow dynamics and flow patterns resulting in increased velocity of surface water into wetland system flows

Increasing flow velocities of run-off into a watercourse may result in modification of flow during the operational phase. The channel discharges into a natural drainage path (Wetland Area 1 as depicted in **Figure 4**). The channel leading up to the discharge point has a steep slope of approximately 1% which results in higher velocities. High velocities must be reduced through a construction of a discharge chute. The factors which will reduce high velocities are additional roughness to the channel and allowing for the dissipation of energy. The channel discharge chute will be a lined outlet structure (gabion) and allow for energy dissipation through stepped elevation loss and gabions acting as energy breakers closer to the discharge point. The discharge chute is wider than the preceding channel to allow for a wider flow disbursement at the discharge point (less concentrated flow) (Ilifa, 2016).

Table 30: Impacts for Modification of flow dynamics and flow patterns resulting in increased velocity of surface water into wetland system flows

PROJECT PHASE	*Operation Phase*			
DIRECT IMPACT	*Modification of flow dynamics and flow patterns resulting in increased velocity of surface water into wetland system flows*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*3*	*The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term*	*-21*	*2*
EXTENT	*4*	*The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries*		
SEVERITY	*-3*	*The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.*	***Highly detrimental***	***Likely***
IMPACT ON IRREPLACEABLE RECOURSES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-42***	***moderate - negative***		
PROPOSED MITIGATION MEASURES				
• During operation the proposed design of the channels, i.e. a trapezoidal channel with maximum side slopes of 1:2.5, with 2-m gabion structures positioned every 25 m that will be vegetated, will help to dissipate the flow of storm water. This proposed design must be adhered to.				
• Gabion structures must be placed in the natural drainage line at the point where the stormwater will enter. This will help to dissipate the flow of water into the drainage line.				
As a matter of procedure, stormwater management plans are designed by them project Engineer prior to construction commencing, to manage increased water volumes and velocities (hydrological impacts).				
Storm-water design should follow natural drainage patterns as far as is possible i.e. drainage towards streams, and must ensure surface water flow velocities are reduced before draining into any of the watercourses (wetlands and streams).				
Correct siting of these energy dissipation structures should manage flows prior to draining into the streams and wetlands, to prevent erosion and to maintain natural base flows within the streams; and maintaining the hydrological regime (water quantity and quality).				
POST-MITIGATION				

DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-10*	*2*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	-2	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Slightly Detrimental***	***Likely***
IMPACT ON IRREPLACEABLE RESOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-20**	**low - negative**		
CONFIDENCE LEVEL				
High				

(b) Increased area of inundation and flooding of vegetation

During the operational phase, the natural topography of the drainage line receiving stormwater flow will allow for effective stormwater dissipation under normal rainfall events. However, during high rainfall / flooding events, high volumes of stormwater will increase the area of inundation and thus cause additional flooding of indigenous vegetation and faunal habitat.

Table 31: Impacts for Increased area of inundation and flooding of vegetation

PROJECT PHASE	*Operation Phase*			
DIRECT IMPACT	*Increased area of inundation and flooding of vegetation*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*4*	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-14*	*2*
EXTENT	*3*	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		

SEVERITY	*-2*	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Moderately Detrimental***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-28***	***low - negative***		
PROPOSED MITIGATION MEASURES				
• The proposed design of the channels, i.e. a trapezoidal channel with maximum side slopes of 1:2.5, with 2-m gabion structures positioned every 25 m that will be vegetated, will help to dissipate the flow of storm water. This proposed design must be adhered to.				
• Gabion structures must be placed in the natural drainage line at the point where the stormwater will enter. This will help to dissipate the flow of water into the drainage line.				
POST-MITIGATION				
DURATION	4	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-7*	*1*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	-1	*The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*	***Slightly Detrimental***	***Unlikely***
IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-7**	**very low negative**		
CONFIDENCE LEVEL				
Medium				

(c) Pollution of downstream watercourses from operational activities

During operation, the stormwater will carry litter and any other potential pollution from the new Aquadene residential area. This may include garbage, grey water, small amounts of hydrocarbons from the roads, and sewerage should there be a leak. This will result in the contamination of the drainage lines as well as watercourses further downstream, including the Nseleni River.

Table 32: Impacts for Pollution of downstream watercourses from operational activities

PROJECT PHASE	*Operation Phase*			
DIRECT IMPACT	--			
INDIRECT IMPACT	*Pollution of downstream watercourses*			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*4*	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-24*	*2*
EXTENT	*4*	*The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries*		
SEVERITY	*-3*	*The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.*	***Highly detrimental***	***Likely***
IMPACT ON IRREPLACEABLE RESOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-48***	***moderate - negative***		
PROPOSED MITIGATION MEASURES				
• The municipality must ensure that the new Aquadene residential area receives adequate and efficient garbage removal services.				
• The municipality should implement an education / information campaign in all residential areas that informs the public about natural resources, and to not discard litter in or pollute natural areas. This may be achieved through eye-catching and thought-provoking posters that can be placed in public areas.				
• The stormwater channel must be fitted with litter traps, or litter screens at the kerb inlet, which must be inspected and cleared on a regular basis. After storm events the receiving drainage line must be inspected and cleared of all litter that will accumulate there.				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-10*	*1*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		

SEVERITY	-2	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Slightly Detrimental***	***Unlikely***
IMPACT ON IRREPLACEABLE RESOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-10**	**very low negative**		
CONFIDENCE LEVEL				
Medium				

5.3.4 Decommissioning Phase

With regard to the decommissioning phase, this was not assessed in detail as the impacts would remain the same as that shown in the construction phase. This is due to the lack of irreversibility of the impacts due to the nature of the soils, topography and vegetation having a high rehabilitation potential.

5.4 Impact Assessment: Alternative 2

The impacts associated with Alternative 2 are the same as those outlined for Alternative 1 (preferred), with the slight exception of the following:

5.4.1 Construction Phase

(a) Impact of disturbance of land owners and users alongside the site

The applicant identified two stormwater channel routes for the Northern Outfall Drainage Channel. They conducted site visits of the proposed routes and meetings were held with affected landowners. On further consultation with Mondi (an affected landowner) it was requested to redirect the northern route around a manmade structure on Mondi land. The impact of this alternative is therefore much higher compared to Alternative 1 (preferred. Refer to **Figure 6** in the Alternatives **Section2.4**.

Table 33: Impact ratings for disturbance of land owners and users alongside the site

PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Disturbance of land-owners and users alongside the site*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**

PRE-MITIGATION				
DURATION	*4*	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-14*	*3*
EXTENT	*3*	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	*-2*	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Moderately Detrimental***	***Definite***
IMPACT ON IRREPLACEBLE REOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-42***	***moderate - negative***		
PROPOSED MITIGATION MEASURES				
Project programme to be provided to all landowners				
Implement Construction EMP recommendations.				
Allowance needs to be made for existing haulage roads which will be affected by the Northern Outfall Drainage Channel				
POST-MITIGATION				
DURATION	2	*The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term*	*-10*	*2*
EXTENT	3	*The extent of the impact is rated as Local as it affects the development area and adjacent properties*		
SEVERITY	-2	*The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*	***Slightly Detrimental***	***Likely***
IMPACT ON IRREPLACEBLE REOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-20**	**low - negative**		
CONFIDENCE LEVEL				

High

5.5 Cumulative Impacts

The disturbance caused by the construction of the project may add to the existing impact of alien and invasive plant species prevalent in the landscape. This may be mitigated easily by following all recommendations and suggested mitigation measures.

5.6 Consequences identified

5.6.1 Defining the Implications of the Impacts for Decision-Making

In the specialist studies, impacts were defined as a potential change to the environment as a result of the construction or operation of the proposed Northern Outfall Drainage Channel Project. From two specialist studies as well as EAP identifications conducted for the EIA some 13 different potential impacts were identified and significance ascribed to each of those impacts, as the EIA regulations require.

In order to provide simplification, it is necessary to recognise that many of the impacts presented above, are in fact a series of changes that result in one overarching consequence. For example increased alien vegetation, increased soil erosion and pollution of watercourses are all presented as separate impacts but the consequence of all the impacts is to potentially result in a material reduction of the environmental quality. It is this consequence that is central to the decision making process.

As such the approach has been to interrogate the specialist studies and identify and describe the collective implications of all the impacts presented. In the process a distinction is then made between the collective implication of the various impacts (e.g. material reduction of environmental quality) and the causes of the implication (e.g. increased alien vegetation, increased soil erosion and pollution of watercourses etc.). These implications have then been presented as either potential environmental costs (where the implications are negative) or as potential environmental benefits (where the implications are positive).

5.6.2 Potential Environmental Costs

The following potential environmental costs have been identified from the specialist studies that were conducted for the EIA on the proposed Project:

- Social Reductions/deteriorations
    - Nuisance (Noise, Disruptions etc.); and
    - Loss of Heritage.
- Biophysical reductions deteriorations:
    - Material Reductions in Environmental Quality.

5.6.3 Potential Environmental Benefits

The following potential benefits have been identified for the Project:

- Social Improvements:
    - Human welfare and livelihoods.

5.6.4 Nuisance

Nuisance was determined to be a ***MODERATE LOW*** inherent risk. The most significant causes of irritation and nuisance to surrounding residents are listed as follows:

- Noise;
- Disturbance to landowners, businesses and users of the site; and
- Influx of temporary workers and their impact on local community.

(a) Noise

Noise will result from the movement of vehicles, trucks and other associated machinery used during the construction phase. However, the noise associated with construction activities will be of short term, localised and will only last during the construction phase of the project.

There will be no noise generated during the operational phase, other than from maintenance activities. (therefore unlikely but possible).

(b) Disturbance to landowners, businesses and users of the site

Allowance needs to be made for existing haulage roads which will be affected by the Northern Outfall Drainage Channel. The recommendation is that standard box culverts be installed at the required crossings. The culvert design allows for concrete wing walls as well as concrete base for the culvert section. Gabion mattresses will be placed at both the entry and exit points of the box culvert to reduce velocity and prevent erosion at the two points.

In addition, the applicant identified two stormwater channel routes for the Northern Outfall Drainage Channel. They conducted site visits of the proposed routes and meetings were held with affected landowners. On further consultation with Mondi (an affected landowner) it was requested to redirect the northern route around a manmade structure on Mondi land.

The preferred alternative is therefore the diversion around this structure which will result in a lower impact on the Mondi landowners. The Likelihood of the cause for Alternative 1 (preferred) is rated as likely due to the fact that some trees will still need to be cleared for the proposed project. The likelihood of the cause is rated as definite for Alternative 2 as this involves the route going right through the Mondi manmade structure as well as some tree clearance. Numerous consultations have been held with the affected landowners (namely Mondi and SAPPI) this includes negotiations on compensations for the removal of trees during construction.

(c) Influx of temporary workers and their impact on local community

There is a small likelihood of job seekers moving into the study area. Even though it is not expected that the presence of temporary workers will have a major impact on the social dynamics of the area, it is worth looking at the proposed impact.

Based on all of the causes above, the likelihood of Nuisances occurring was determined to be Likely for Alternative 1 (Preferred) resulting in a Low residual risk and definite for the Alternative 2 resulting in a Moderate residual risk.

Table 34: The residual risk of Nuisance due to risk sources associated with the proposed project

Potential Environmental Cost	Nuisance	
Inherent risk	**MODERATE-LOW**	
Causes of risk	**Likelihood of causes**	
	Alternative 1 (preferred)	**Alternative 2**
Noise	Unlikely but possible	Unlikely but possible
Disruptions to landowners and users of the site	Likely	Definite
Influx of temporary workers	Likely	Likely
Likelihood of consequence	**Likely**	**Definite**
Residual risk	**Low**	**Moderate**

5.6.5 Heritage Resources

The environmental cost of a loss of Heritage Resources is a ***MODERATE*** inherent risk.

The proposed development site comprises a hugely modified landscape in terms of heritage significance due to extensive are under forestry and plantations.

If any items or artefacts deemed to have any significant importance are uncovered during the construction phase of the project, the necessary actions as outlined within this report must be implemented.

Therefore the likelihood of this consequence was considered to be **unlikely but possible** resulting in a **Moderate Residual Risk.**

Table 35: The residual risk of loss of heritage resources due to the various risk sources associated with the proposed project

Potential Environmental Cost	Loss of Heritage Resources	
Inherent risk	**MODERATE**	
Causes of risk	**Likelihood of causes**	
	Alternative 1 (preferred)	**Alternative 2**
Excavation for the stormwater structures	Unlikely but possible	Unlikely but possible
Likelihood of consequence	**Unlikely but possible**	**Unlikely but possible**
Residual risk	**Moderate**	**Moderate**

5.6.6 Material Reductions in Environmental Quality

Material reductions in Environmental Quality are a ***MODERATE*** inherent risk.
The following causes of this risk may result in material reductions in Environmental Quality:

- Increased alien vegetation;
- Increased soil erosion;
- Pollution of watercourses; and
- Destruction of Wetland and Vegetation Habitat.

(a) Increased alien vegetation

During construction, disturbance to the soil and indigenous vegetation will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape due to propagules being released into downstream watercourses by the stormwater. This significant impact may be mitigated easily, if done correctly and thoroughly. The likelihood is likely for both alternatives given the extent of earthworks and mixing of soils etc.

(b) Increased soil erosion

During construction of the outfall channel, exposed soil will be susceptible to erosion especially if indigenous vegetation is cleared. During operation the hardened surfaces will increase surface run-off and erosion potential in the terminal drainage line will increase significantly. The likelihood is likely for both alternatives given the sandy soils in the area.

(c) Pollution of watercourses

During construction there is possibility for litter to enter watercourse. During operation, the stormwater will carry litter and any other potential pollution from the new Aquadene residential area. This may include garbage, grey water, hydrocarbons from the roads, and sewerage should there be a leak. This will result in the contamination of the drainage lines as well as watercourses further downstream, including the Nseleni River. Due to the fact that the stormwater will discharge into a natural area, the likelihood is likely for both alternatives.

(d) Destruction of Wetland and Vegetation Habitat

As previously mentioned, the channel discharges into a natural drainage path. The channel leading up to the discharge point has a steep slope of approximately 1% which results in higher velocities. High velocities must be reduced through a construction of a discharge chute. The factors which will reduce high velocities are additional roughness to the channel and allowing for the dissipation of energy. The channel discharge chute will be a lined outlet structure (gabion) and allow for energy dissipation through stepped elevation loss and gabions acting as energy breakers closer to the discharge point. The discharge chute is wider

than the preceding channel to allow for a wider flow disbursement at the discharge point (less concentrated flow) (Ilifa, 2016).

The above impacts will however will result in a consequence of material reductions in Environmental Quality and it's likely that these causes will occur, and even with the stipulated mitigation measures the residual risk is ranked as **MODERATE**.

Table 36: The residual risk of Material reduction in Marine Biota due to the various risk sources associated with the proposed project

Potential Environmental Cost	Material Reduction in Environmental Quality	
Inherent risk	**MODERATE**	
Causes of risk	**Likelihood of causes**	
	Alternative 1 (preferred)	**Alternative 2**
Increased alien vegetation	Likely	Likely
Increased soil erosion	Likely	Likely
Pollution of watercourses	Likely	Likely
Destruction of Wetland and Vegetation Habitat	Likely	Likely
Likelihood of consequence	**Likely**	**Likely**
Residual risk	**Moderate**	**Moderate**

5.6.7 Improved Human Welfare

As with all projects, we can't ignore the benefits to society. Through this impact assessment, the following will result in an overall improved human welfare:'

- Employment creation and decrease in unemployment.

Overall there would be positive benefits to the precinct and the Municipality converting to a ***HIGH*** residual benefit.

Table 37: The inherent benefit of improved human welfare due to the various risk sources associated with the proposed project

Potential Environmental Benefit	Improvement of Human Welfare	
Inherent benefit	**MODERATE-HIGH**	
Causes of benefit	**Likelihood of causes**	
	Alternative 1 (preferred)	**Alternative 2**
Employment creation and decrease in unemployment	Definite	Definite
Likelihood of consequence	**Definite**	**Definite**
Residual Benefit	**High**	**High**

5.7 Environmental Impact Summary

An impact summary of the identified and assessed impacts associated with the proposed activity and its alternatives after the management and mitigation of impacts have been provided below.

Table 38: Alternative 1 (Preferred) Significance after mitigation

Alternative 1 (Preferred)	
Impact	***Significance after mitigation***
Construction Phase	
Increased potential of invasion by alien vegetation from the construction of the stormwater channel	very low negative
Destruction and loss of vegetation habitat and wetland habitat as result of site clearance	very low negative
Increased soil erosion as a result of earthworks required for the Stormwater channel	very low negative
Impact on Wetland Area 1 as a result of construction in the wetland	very low negative
Impact on cultural heritage from the construction of the stormwater channel	very low negative
Pollution of downstream watercourses	very low negative
Increased noise generation due to construction activities and the movement of construction vehicles	very low negative
Effect of temporary workers on social dynamics as a result of migration during construction	very low negative
Waged Labour/Employment creation and decrease in unemployment as a result of available job/business opportunities for local people	moderate positive
Disturbance of land-owners and users alongside the site	low - negative
Operational Phase	
Modification of flow dynamics and flow patterns resulting in increased velocity of surface water into wetland system flows	low - negative
Increased area of inundation and flooding of vegetation	very low negative
Pollution of downstream watercourses	very low negative

Decommissioning
Same as for Construction

Table 39: Alternative 2 Significance after mitigation

The same as the above with one difference as below:

Alternative 2	
Impact	***Significance after mitigation***
Construction Phase	
'Disturbance of land-owners and users alongside the site	low negative

These impacts assessed above can be grouped into four (4) consequences and residual risks as summarised below in **Table 40**. This implies that should the KZN EDTEA authorise the project the Department chooses to accept the following residual risks/benefits:

Table 40: Summary of Residual Risks and Benefits

Residual Risk	**Alternative 1 (preferred)**	**Alternative 2**
Nuisance	**Low**	**Moderate**
Loss of Heritage Resources	**Moderate**	**Moderate**
Material Reduction in Environmental Quality	**Moderate**	**Moderate**

Residual Benefit	**Alternative 1 (preferred)**	**Alternative 2**
Improvement of Human Welfare	**High**	**High**

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Environmental Impact Statement

It has been illustrated that with the implementation of the mitigation measures and Environmental Management Programme, all the identified impacts can be mitigated to acceptable levels. As such, environmental impacts associated with the alternatives can be successfully mitigated to acceptable levels if the recommended mitigation measures in the EMPr are adhered to.

Through the identified consequences, we can see that the majority of them are a Moderate rating.

With a Moderate rating, the KZN EDTEA must consider that the Project can be authorised but with conditions and routine inspections.

In summary and based on this detailed assessment and the various specialist studies, it is the EAP's opinion that the proposed project with Alternative 1 (preferred 1) be authorised with conditions and routine inspections stipulated within the authorisation. This will ensure that all impacts are monitored efficiently.

6.1.1 No-Go Alternative

The principle of the "No go" alternative, is, at its simplest, that the benefits of the proposed activity will not be realised with the status quo remaining and neither will the associated negative impacts/risks. This alternative would imply that the current status quo, without the proposed Northern Outfall Drainage Channel would remain.

Should the status quo of the site remain with no formal stormwater drainage the development will then not comply with municipal design standards and regulations and the development will not be approved for implementation.

The "no–go" alternative is therefore not considered to be the preferred alternative.

6.2 Recommendations

6.2.1 Environmental Assessment Practitioner Recommendations

- A project-specific Draft Environmental Management Programme (EMPr) has been compiled according to (but not limited to) the impacts and mitigation measures included in this assessment. A more detailed EMPr must be submitted prior to the tender stage, including conditions of the EA to the KZN EDTEA for approval;
- The EMPr is a legally binding document and the mitigation measures stipulated within the document and Basic Assessment Report will be implemented by the appointed contractor;
- An independent Environmental Control Officer (ECO) will need to be appointed to manage the implementation of the EMPr during the construction phase;
- The need and desirability of the project is driven by the fact that formal stormwater drainage is required for the development, without this project, it will then not comply with municipal design standards and regulations and the development will not be approved for implementation;
- The proposed development will also contribute to provide various employment opportunities to the local people during the construction phase; and
- A Water Use Licence will also be undertaken for impeding and diverting the watercourses (wetlands) during the construction. The Water Use Licence Application (WULA) will need to be submitted to DWS in the KZN Region for approval prior to the commencement of construction.

6.2.2 Ecological Specialist Recommendations

- The study area was largely transformed with most of the land surrounding the site cultivated with *Eucalyptus* spp. The majority of the study site consisted of *Eucalyptus* tree plantations; however the proposed Northern Outfall Channel drains into a natural but largely modified grassy drainage line that was considered of medium ecological sensitivity, due to the level of disturbance and alien invasion;
- Although highly disturbed, this grassy drainage line was considered relatively important habitat for fauna in the study area and provided a corridor for movement to other drainage lines in the surrounding landscape;
- Most of the proposed project occurs within transformed areas, therefore the construction phase is deemed to have a relatively low impact on the surrounding vegetation; and
- However, the more sensitive habitats into which the stormwater will flow will experience higher impacts and indirect impacts are possible. Mitigation measures will need to be applied in these instances.

6.2.3 Wetland Specialist Recommendations

- The study site is within highly transformed and degraded areas, due mainly to plantations;
- There are two wetland areas within a 500m radius of the stormwater system;

- There are a few wetland areas outside of the 500m radius. Most of these are highly degraded and are mostly dysfunctional;
- The study site is not situated within any priority areas;
- The study site is not within or adjacent to any CBA and ESA areas;
- There are no 'fatal flaws', in terms of the water environment;
- A Water Use Licence Application (WULA) process or General Authorisation (GA) process will be required due mainly to discharge of stormwater into watercourses, including a wetland area;
- Negative impacts on the water environment will be low; and
- Mitigating measures have been recommended.

6.2.4 Heritage Recommendations

- No further palaeontological mitigation is required
- Accordingly, we request that Amafa allow the proposed infrastructural upgrades to proceed with no further heritage resource mitigation suffice that the protocols in Appendix 1 of Appendix D3 are made binding to any Environmental Authorisations issued.

Katherine Wiles

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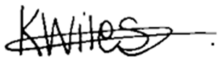
NAME OF EAP



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SIGNATURE OF EAP DATE

Appendix A: Site Maps

Appendix B: Photographs

Appendix C: Facility Illustration(s)

Appendix D: Specialist Reports

Appendix E: Public Participation

Appendix F: Environmental Management Programme (EMPr)

Appendix G: Other Information

Appendix H: Details of the EAP

DOCUMENT CONTROL

FORM IP180_B

CLIENT	:	City of uMhlatuze Local Municipality			
PROJECT NAME	:	Aquadene Northern Outfall Drainage Channel	**PROJECT No.**	:	J37061
TITLE OF DOCUMENT	:	Draft Basic Assessment Report for the Northern Outfall Drainage Channel			
ELECTRONIC LOCATION	:	P:\3230 - Environmental\J37061 - Aquadene Bulk Stormwater Infrastructure BA and WULA\Reports\DBAR\Aquadene Stormwater Infrastructure Project_Draft BAR_Final for PUblic Review_2017 11 20.docx			

	Approved By	**Reviewed By**	**Prepared By**
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DATE **20 November 2017**	SIGNATURE	SIGNATURE	SIGNATURE

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