

LOWER UMKHOMAZI BULK WATER SUPPLY SYSTEM – PROPOSED NGWADINI WEIR, ABSTRACTION WORKS AND PIPELINE IN KWAZULU- NATAL

BASIC ASSESSMENT REPORT

FEBRUARY 2018

DRAFT

PREPARED FOR: UMGENI WATER



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Amendments Page

Date:	Nature of Amendment	Amendment Number:
19 February 2018	Draft BAR for Public and Authority Review	01

Executive Summary

INTRODUCTION

Nemai Consulting was appointed by Umgeni Water to undertake the Basic Assessment process for the proposed Ngwadini weir, abstraction works and pipeline in accordance with the National Environmental Management Act (Act No. 107 of 1998) and the 2014 Environmental Impact Assessment Regulations, as amended (07 April 2017).

BASIC ASSESSMENT PROCESS

The proposed Ngwadini weir, abstraction works and pipeline entails certain activities that require authorisation in terms of National Environmental Management Act (Act No. 107 of 1998). The process for seeking authorisation is undertaken in accordance with the 2014 Environmental Impact Assessment Regulations (Government Notice No. R. 982, R. 983, R. 984 and R. 985), as amended (07 April 2017), promulgated in terms of Chapter 5 of National Environmental Management Act (Act No. 107 of 1998).

Based on the types of activities involved which include activities listed in Government Notice No. R. 983 and R. 985 of the 2014 Environmental Impact Assessment Regulations, as amended (07 April 2017); the requisite environmental assessment for the project is a **Basic Assessment Process**.

PROJECT OVERVIEW

The current water resources supplying the South Coast of KwaZulu-Natal are insufficient to meet the projected water demands. The Lower uMkhomazi Bulk Water Supply System is the recommended augmentation option for the existing Upper and Middle South Coast Supply area. Therefore, Umgeni Water proposed to construct the Lower uMkhomazi Bulk Water Supply System in order to increase the assurance of water supply.

The overall Lower uMkhomazi Bulk Water Supply System consists of the following proposed components:

- The Ngwadini Weir and abstraction works to fill the Ngwadini Off-channel Storage Dam during summer periods of excess flow;
- The Ngwadini Off-channel Storage Dam, with a capacity of 10 million m³, and outlet infrastructure to release water back into the river and augment low flow periods;
- A second abstraction downstream at the Goodenough Weir site to abstract the raw water for delivery to the Water Treatment Plant;
- A pump station to pump water from the Goodenough abstraction to the Water Treatment Plant via;
- A short rising main and 7km gravity main with;

- A break pressure tank that also serves as a raw water storage reservoir;
- Hydrocyclones before the pump station and Water Treatment Plant to remove sediments during periods of higher turbidity river flows and reduce the Water Treatment Plant residual (“sludge”);
- A 100 Ml/d Water Treatment Plant in the town of Craigieburn; and
- A potable gravity water pipeline from the Water Treatment Plant to Quarry Reservoir, the potable water delivery and tie-in point on the South Coast Pipeline.

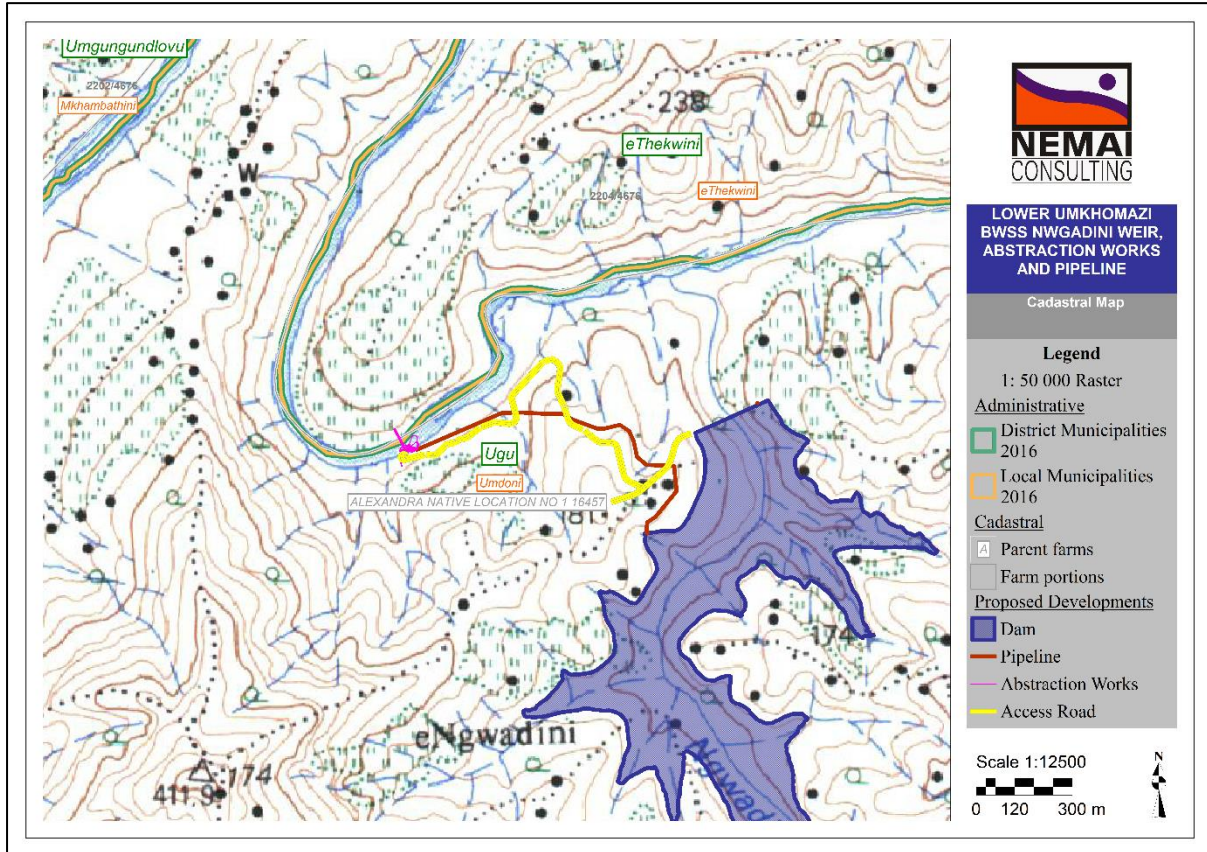
The requirements in terms of the National Environmental Management Act (Act No. 107 of 1998) for the Lower uMkhomazi Bulk Water Supply System project components are detailed below. The focus of this report is the Ngwadini weir, abstraction works and associated pipeline.

Lower uMkhomazi Bulk Water Supply System Components and National Environmental Management Act (Act No. 107 of 1998) Requirements

No.	Project Component		NEMA Requirements
1	Water Resource Development	Ngwadini weir, abstraction works and pipeline to fill the Ngwadini Off-channel Storage Dam during summer periods of excess flow.	Authorisation previously received in terms of the Environment Conservation Act (Act No. 73 of 1989). However, confirmed in consultation with KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs that a new Basic Assessment process would need to be conducted due to changes in location and design. <i>This is the focus of this application.</i>
2		Ngwadini Off-channel Storage Dam, with a capacity of 10 million m ³ , and outlet infrastructure to release water back into the river and augment low flow periods.	Authorisation previously received in terms of Environment Conservation Act. However, confirmed in consultation with KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs that an amendment to the authorisation would need to be applied for due to slight changes in design. Separate Amendment Application to be submitted to KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs.
3	Water Supply Scheme – weir, abstraction works, conveyance infrastructure and Water Treatment Plant.		A Scoping and Environmental Impact Assessment process needs to be conducted. Separate Application to be submitted to Department of Environmental Affairs.

The Lower uMkhomazi Bulk Water Supply System Ngwadini project components are primarily located within the Umdoni Local Municipality and the Ugu District Municipality, in KwaZulu-Natal. The weir structure ties into the left bank of the uMkhomazi River, which is in the

eThekweni Metropolitan Municipality. The study area falls within land that is administered by the Ingonyama Trust Board. The project area is approximately 20km north west of Scottburgh. The Ngwadini Weir and abstraction works will be built on the uMkhomazi River.



Locality Map

SPECIALIST STUDIES

The following Specialist Studies were as part of the Basic Assessment Process:

1. Terrestrial Ecological Assessment Report;
2. Aquatic and Wetland Baseline and Impact Assessment; and
3. Phase 1 Heritage Impact Assessment.

Summaries of these specialist studies are included in the Basic Assessment Report.

IMPACT ASSESSMENT

This Basic Assessment Report focuses on the pertinent environmental impacts that could potentially be caused by the proposed Ngwadini weir, abstraction works and pipeline during the pre-construction, construction and operational phases of the project.

The impacts and the proposed management measures are discussed on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts. The assessment considered impacts

before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

The proposed mitigation of the impacts associated with the project includes specific measures identified by the technical team and environmental specialists, stipulations of environmental authorities and environmental best practices. The Environmental Management Programme provides a comprehensive list of mitigation measures for specific elements of the project, which extends beyond the impacts evaluated in the body of the Basic Assessment Report.

PUBLIC PARTICIPATION

The Basic Assessment Report provides a full account of the public participation process that was followed for the proposed project.

A 30-Day Authority and Public Review of the Draft Basic Assessment Report will take place from 19 February 2018 to 21 March 2018. A copy of the report will be placed at public venues within the study area, and a link on Dropbox containing the electronic Draft Basic Assessment Report will be available to all registered Interested and Affected Parties upon request. In addition, hardcopies of the report will be submitted to commenting and decision-making authorities.

ENVIRONMENTAL CONCLUSIONS AND RECOMMENDATIONS

Attention is drawn to specific sensitive environmental features (with an accompanying sensitivity map) for which mitigation measures are included in the Basic Assessment Report and Environmental Management Programme.

An Environmental Impact Statement is provided and critical environmental activities that need to be executed during the project lifecycle are also presented.

With the selection of the best practicable environmental option (Abstraction Works Layout Option 2), the adoption of the mitigation measures included in this report, and the dedicated implementation of the Environmental Management Programme, it is believed that the significant environmental aspects and impact associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions. In conclusion, it is recommended that the proposed development of the Ngwadini weir, abstraction works and associated pipeline should be authorised.

Table of Contents

1	PURPOSE OF THE DOCUMENT	- 1 -
2	DOCUMENT ROADMAP	- 2 -
3	PROJECT BACKGROUND AND MOTIVATION	- 5 -
3.1	Projected Water Requirements for the Middle and Upper South Coast	- 5 -
4	PROJECT LOCATION	- 10 -
5	PROJECT DESCRIPTION	- 12 -
5.1	Project Description	- 12 -
5.1.1	Ngwadini OCS Dam	- 13 -
5.1.2	Ngwadini Weir and Abstraction Works	- 14 -
5.1.3	Pipeline	- 15 -
5.1.4	Access Road	- 17 -
5.1.5	Associated Electrical Conveyance Infrastructure	- 18 -
5.2	Project Lifecycle	- 20 -
5.2.1	Pre-feasibility and Feasibility Phases	- 21 -
5.2.2	Pre-Construction Phase	- 21 -
5.2.3	Construction Phase	- 21 -
5.2.4	Operation Phase	- 25 -
5.2.5	Decommissioning Phase	- 25 -
5.3	Preliminary Implementation Programme	- 26 -
5.4	Resources Required for Construction and Operation	- 26 -
5.4.1	Water	- 26 -
5.4.2	Sanitation	- 27 -
5.4.3	Waste	- 27 -
5.4.4	Electricity	- 27 -
5.4.5	Construction Workers	- 27 -
5.4.6	Construction Site Camps	- 27 -
6	ALTERNATIVES	- 29 -
6.1	Introduction	- 29 -
6.2	Alternatives Screened during the Feasibility Phase	- 30 -

6.3	Ngwadini Weir and Abstraction Works Configuration Options	- 33 -
6.4	Preferred Ngwadini Weir and Abstraction Works Layout	- 37 -
6.5	No-go Alternative	- 38 -
7	ENVIRONMENTAL ASSESSMENT PRACTITIONER	- 39 -
8	LEGISLATION AND GUIDELINES CONSIDERED	- 40 -
8.1	Overview of Legislation	- 40 -
8.2	The Constitution (Act No. 108 of 1996)	- 42 -
8.3	The National Environmental Management Act (Act No. 107 of 1998)	- 42 -
8.4	The National Environmental Management: Waste Act (Act No. 59 of 2008)	- 44 -
8.5	The National Water Act (Act No. 36 of 1998)	- 45 -
8.6	The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)	- 46 -
8.7	National Environmental Management: Biodiversity Act (Act 10 of 2004)	- 47 -
8.8	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	- 47 -
8.9	National Forest Act (Act No. 84 of 1998)	- 47 -
8.10	National Heritage Resources Act (Act No. 25 of 1999)	- 47 -
8.11	The National Environmental Management: Air Quality Act (Act No. 39 of 2004)	- 48 -
8.12	The Occupational Health and Safety Act (Act No. 85 of 1993)	- 48 -
8.13	Policy, Programmes, Guidelines and Plans	- 49 -
8.13.1	Guidelines	- 49 -
8.13.2	Regional Plans	- 49 -
9	BASIC ASSESSMENT PROCESS	- 49 -
9.1	Environmental Assessment Triggers	- 49 -
9.2	Environmental Assessment Authorities	- 50 -
9.3	BA Process	- 50 -
9.3.1	Formal Process	- 50 -
9.3.2	Landowner Consent	- 51 -
9.3.3	Landowner Notification	- 51 -
9.3.4	Application Form	- 51 -
9.3.5	Public Participation and Review of BAR	- 51 -
10	ASSUMPTIONS AND LIMITATIONS	- 51 -
11	NEED AND DESIRABILITY	- 52 -

12	TIMEFRAMES	- 56 -
13	FINANCIAL PROVISIONS	- 56 -
14	RESOURCE USE AND PROCESS DETAILS	- 57 -
14.1	Waste, Effluent, Emission and Noise Management	- 57 -
14.1.1	Solid waste management	- 57 -
14.1.2	Liquid effluent (other than domestic sewage)	- 58 -
14.1.3	Liquid effluent (domestic sewage)	- 59 -
14.1.4	Emissions into the atmosphere	- 59 -
14.2	Water Use	- 59 -
14.3	Power Supply	- 60 -
14.4	Energy Efficiency	- 60 -
15	PUBLIC PARTICIPATION PROCESS	- 60 -
15.1	Public Participation	- 60 -
15.2	Pre-Application Consultation	- 61 -
15.3	Identification of IAPs and Compilation of IAP Database	- 61 -
15.4	Landowner Notification	- 61 -
15.5	Project Announcement	- 62 -
15.6	Review Process for the Draft BAR	- 63 -
15.6.1	30-Day Public Review Period	- 63 -
15.6.2	30-Day Authority Review Period	- 64 -
15.6.3	Public Meeting	- 64 -
15.6.4	Focus Group Meeting	- 64 -
15.6.5	Comments and Responses Report	- 64 -
16	ENVIRONMENTAL ATTRIBUTES	- 65 -
17	SUMMARY OF SPECIALIST STUDIES	- 65 -
17.1	Terrestrial Ecological Impact Assessment	- 66 -
17.1.1	Details of the Specialist	- 66 -
17.1.2	Main Findings	- 66 -
17.1.3	Conclusions and Recommendations	- 72 -
17.2	Aquatic and Wetland Baseline and Impact Assessment	- 73 -
17.2.1	Details of the Specialist	- 73 -
17.2.2	Main Findings	- 73 -
17.2.3	Conclusions and Recommendations	- 78 -

17.3	Phase 1 Heritage Impact Assessment	- 79 -
17.3.1	Details of the Specialist	- 79 -
17.3.2	Main Findings	- 79 -
17.3.3	Conclusions and Recommendations	- 82 -
18	IMPACT ASSESSMENT	- 82 -
18.1	Overview	- 82 -
18.2	Project Activities	- 83 -
18.3	Environmental Aspects	- 86 -
18.4	Potential Significant Environmental Impacts	- 89 -
18.5	Impact Assessment Methodology	- 91 -
19	IMPACT MANAGEMENT	- 95 -
19.1	Geology and Soil	- 95 -
19.1.1	Potential Impacts	- 95 -
19.1.2	Impact Assessment	- 95 -
19.2	Geohydrology	- 96 -
19.2.1	Potential Impacts	- 96 -
19.2.2	Impact Assessment	- 97 -
19.3	Surface Water	- 97 -
19.3.1	Potential Impacts	- 97 -
19.3.2	Impact Assessment	- 97 -
19.4	Terrestrial Ecology – Flora	- 107 -
19.4.1	Potential Impacts	- 107 -
19.4.2	Impact Assessment	- 107 -
19.5	Terrestrial Ecology – Fauna	- 112 -
19.5.1	Potential Impacts	- 112 -
19.5.2	Impact Assessment	- 113 -
19.6	Heritage Resources	- 115 -
19.6.1	Potential Impacts	- 115 -
19.6.2	Impact Assessment	- 116 -
19.7	Air Quality	- 116 -
19.7.1	Potential Impacts	- 116 -
19.7.2	Impact Assessment	- 117 -
19.8	Noise	- 117 -
19.8.1	Potential Impacts	- 117 -
19.8.2	Impact Assessment	- 118 -

19.9	Aesthetic Quality	- 118 -
19.9.1	Potential Impacts	- 118 -
19.9.2	Impact Assessment	- 118 -
19.10	Safety and Security	- 119 -
19.10.1	Potential Impacts	- 119 -
19.10.2	Impact Assessment	- 119 -
19.11	Waste Management	- 120 -
19.11.1	Potential Impacts	- 120 -
19.11.2	Impact Assessment	- 120 -
19.12	Traffic	- 121 -
19.12.1	Potential Impacts	- 121 -
19.12.2	Impact Assessment	- 121 -
19.13	Socio-Economic Environment	- 122 -
19.13.1	Potential Impacts	- 122 -
19.13.2	Impact Assessment	- 122 -
19.14	Cumulative Impacts	- 123 -
20	ANALYSIS OF ALTERNATIVES _____	- 124 -
20.1	No-go Alternative	- 125 -
20.2	Comparative Analysis of Alternatives based on Impact Assessment	- 125 -
20.3	Best Practicable Environmental Option (BPEO)	- 126 -
21	CONCLUSIONS AND RECOMMENDATIONS _____	- 126 -
21.1	Sensitive Environmental Features	- 126 -
21.2	Environmental Impact Statement	- 128 -
21.3	Recommendations	- 130 -
22	OATH OF ENVIRONMENTAL ASSESSMENT PRACTITIONER _____	- 133 -
23	REFERENCES _____	- 134 -

List of Tables

Table 1: Document Roadmap	- 2 -
Table 2: Property Details	- 11 -
Table 3: LUBWSS Components and NEMA Requirements	- 12 -

Table 4: Steel pipeline details	- 16 -
Table 5: Project Team Core Members	- 40 -
Table 6: Environmental statutory framework	- 40 -
Table 7: Listed activities triggered by the proposed project	- 43 -
Table 8: Explanation of the relevant NWA Section 21 Activities	- 46 -
Table 9: Need and Desirability	- 52 -
Table 10: Timeframes	- 56 -
Table 11: Location of Draft BAR for Review	- 64 -
Table 12: Desktop information for the U10M-4746	- 73 -
Table 13: NFEPA description for the FEPA sites within the study area	- 74 -
Table 14: Wetland classification as per SANBI guideline (Ollis et al. 2013)	- 76 -
Table 15: The PES results for the wetlands associated with the proposed project	- 76 -
Table 16: In situ water quality results for the September 2017 survey	- 77 -
Table 17: Present Ecological Status of the river reach assessed in the September 2017 survey	- 77 -
Table 18: Activities associated with the Pre-construction Phase	- 83 -
Table 19: Activities associated with the Construction Phase	- 84 -
Table 20: Activities associated with Operational Phase	- 85 -
Table 21: Environmental aspects associated with the Pre-Construction Phase	- 86 -
Table 22: Environmental aspects associated with the Construction Phase	- 87 -
Table 23: Environmental aspects associated with the Operational Phase	- 88 -
Table 24: Potential significant environmental impacts during Construction Phase	- 89 -
Table 25: Potential significant environmental impacts for Operational Phase	- 91 -
Table 26: Impact methodology table	- 92 -
Table 27: Ranking of overall impact score	- 95 -
Table 28: Activity and impact table for the proposed project	- 100 -
Table 29: DWS Risk Impact Matrix for the proposed project	- 101 -
Table 30: DWS Risk Impact Matrix for the proposed project	- 102 -
Table 31: Summary of the Specialists' preferred options	- 125 -

List of Figures

Figure 1: Map of the South Coast Water Supply area (AECOM, 2016a)	- 6 -
Figure 2: 30-year water demand projections and current water availability within the selected Upper and Middle South Coast supply area (AECOM, 2016a)	- 7 -
Figure 3: LUBWSS Layout	- 9 -
Figure 4: Locality Map	- 10 -
Figure 5: Google Earth map of the proposed project components	- 11 -
Figure 6: General Layout of the Ngwadini OCS Dam	- 14 -

Figure 7: Ngwadini Abstraction Works Layout	- 15 -
Figure 8: Pipeline route from Ngwadini Abstraction Works to the Ngwadini OCS Dam	- 16 -
Figure 9: Proposed typical river crossing concrete encasement	- 17 -
Figure 10: Proposed Access Road from the Ngwadini Abstraction Works to the Ngwadini OCS Dam	- 18 -
Figure 11: Bulk electrical supply points for the LUBWSS	- 19 -
Figure 12: Proposed electrical infrastructure	- 20 -
Figure 13: Typical trench excavation and pipe installation activities	- 23 -
Figure 14: Typical examples of chambers (left - during construction; right – completed)	- 23 -
Figure 15: Typical views of reinstated (left) and rehabilitated (right) pipeline routes	- 24 -
Figure 16: Typical river crossing showing concrete encased pipe section	- 25 -
Figure 17: Construction Camp Sites Section 1	- 28 -
Figure 18: Construction Camp Sites Section 2	- 29 -
Figure 19: Location options for the Ngwadini weir and abstraction works	- 31 -
Figure 20: Previously authorised and new proposed locations for the Ngwadini weir and abstraction works	- 31 -
Figure 21: Option 1 Layout Configuration	- 33 -
Figure 22: Ngwadini Weir and Abstraction Works Layout Option 1	- 34 -
Figure 23: Option 2 Layout Configuration	- 35 -
Figure 24: Ngwadini Weir and Abstraction Works Layout Option 1	- 36 -
Figure 25: Option 3 Layout Configuration	- 37 -
Figure 26: Ngwadini weir and abstraction works site	- 38 -
Figure 27: Projected number of failure months per year for a scenario with no Ngwadini Dam	- 39 -
Figure 28: BA Process	- 50 -
Figure 29: Site Notice Locations	- 63 -
Figure 30: The entire proposed development site falls within the KZN ESA	- 67 -
Figure 31: A Marula tree recorded within the project area	- 67 -
Figure 32: A Google Earth Map indicating where the Marula tree was recorded within the project area	- 68 -
Figure 33: Stapelia sp recorded within the project area	- 68 -
Figure 34: Hypoxis hemerocallidea recorded within the project area	- 69 -
Figure 35: Millettia grandis recorded within the project area	- 69 -
Figure 36: Distribution of the specially protected plant species within the project area	- 70 -
Figure 37: Scats of Cape Clawless Otter recorded along the uMkhomazi River	- 71 -
Figure 38: Terrestrial Ecological Analysis Map of proposed development area based on field assessment	- 72 -
Figure 39: Jackal Buzzard recorded in the proposed development site	- 72 -
Figure 40: The NFEPA wetlands associated with the Ngwadini project area	- 74 -
Figure 41: The project area wetland delineation	- 75 -
Figure 42: The HGM units identified for the study	- 75 -

Figure 43: Possible grave site with abandoned house in background	- 80 -
Figure 44: Remains of structure	- 80 -
Figure 45: Mbele grave	- 81 -
Figure 46: Fossil sensitivity of approximate project area as indicated with red circle	- 81 -
Figure 47: Mitigation hierarchy	- 92 -
Figure 48: Sensitivity Map for Layout Option 2	- 127 -

List of Appendices

- Appendix A** Maps
- Appendix B** Photographs
- Appendix C** Technical Drawings
- Appendix D** Specialist Studies
- Appendix E** Public Participation
- Appendix F** Curriculum Vitae
- Appendix G** EMPr
- Appendix H** Other

List of Abbreviations

BA	Basic Assessment
BAR	Basic Assessment Report
BID	Background Information Document
BPEO	Best Practicable Environmental Option
CBA	Critical Biodiversity Areas
CFRD	Concrete faced rockfill dam
CLO	Community Liaison Officer
DAFF	Department of Forestry and Fisheries
DEA	Department of Environmental Affairs
DM	District Municipality
D'MOSS	Durban Metropolitan Open Space System
DMR	Department of Mineral Resources
DoT	Department of Transport
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (Act No. 73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance & Sensitivity
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Areas
EWR	Ecological Water Requirements
FEPA	Freshwater Ecological Protection Area
FSL	Full Supply Line
FSA	Full supply water surface area
GN	Government Notice
HIA	Heritage Impact Assessment
IAPs	Interested and Affected Party
IDP	Integrated Development Plan
IUCN	International Union for Conservation of Nature
IWULA	Integrated Water Use License Application
KZN	KwaZulu-Natal
KZN EDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs

LM	Local Municipality
LUBWSS	Lower uMkhomazi Bulk Water Supply Scheme
LUBWSS – WSS	Lower uMkhomazi Bulk Water Supply Scheme – Water Supply System
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEMPA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEMA: WA	National Environmental Management Waste Act (Act No. 56 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NOC	Non Overspill Crest
NWA	National Water Act (Act No. 36 of 1998)
OCS	Off-channel Storage
OHS	Occupational Health and Safety
PES	Present Ecological Status
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SIP	Strategic Integrated Project
WRC	Water Research Commission
WTP	Water Treatment Plant
WUL	Water Use License
WULA	Water Use License Application

1 PURPOSE OF THE DOCUMENT

Nemai Consulting was appointed by Umgeni Water to undertake the Basic Assessment Process for the proposed Ngwadini weir, abstraction works and pipeline in KwaZulu-Natal in accordance with the National Environmental Management Act (Act No. 107 of 1998) (NEMA) 2014 Environmental Impact Assessment (EIA) Regulations, as amended (07 April 2017).

The document serves as the Draft Basic Assessment Report (BAR) for the proposed development of the Ngwadini weir, abstraction works and pipeline.

According to GN No. R. 982 of the 2014 EIA Regulations, as amended (07 April 2017), the objective of the BA Process is, through a consultative process:

- (a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- (b) identify the alternatives considered, including the activity, location, and technology alternatives;
- (c) describe the need and desirability of the proposed alternatives;
- (d) through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine–
 - (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
 - (ii) the degree to which these impacts–
 - (aa) can be reversed;
 - (bb) may cause irreplaceable loss of resources; and
 - (cc) can be avoided, managed or mitigated; and
- (e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to–
 - (i) identify and motivate a preferred site, activity and technology alternative;
 - (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and
 - (iii) identify residual risks that need to be managed and monitored.

The Draft BAR will be made available to IAPs for a 30-Day review period **from 19 February 2018 to 21 March 2018**. All comments that are received will be assessed in the Final BAR and will also be noted in the Comments and Response Report. The Final BAR will then be

submitted to the Department of Environmental Affairs (DEA), the Competent Authority in respect to this proposed development.

2 DOCUMENT ROADMAP

The BAR is intended to meet all requirements as stipulated in Appendix 1 of Government Notice (GN) No. R. 982 of the 2014 EIA Regulations, as amended (07 April 2017). In order to provide clarity to the reader, a document roadmap is provided in terms of the aforementioned regulatory requirements (**Table 1**).

Table 1: Document Roadmap

Chapter	Title	Correlation with GN No. 982 – Appendix 1	
1.	Purpose of the Document	–	–
2.	Document Roadmap	–	–
3.	Project Background and Motivation	3(1)(b, c and d)	(b) the location of the activity, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties; (c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or on land where the property has not been defined, the coordinates within which the activity is to be undertaken; (d) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for; and a description of the activities to be undertaken including associated structures and infrastructure;
4.	Project Location		
5.	Project Description		
6.	Alternatives		
7.	Environmental Assessment Practitioner	3(1)(a)	(a) Details of – (i) the EAP who prepared the EMP; and (ii) the expertise of that EAP to prepare an EMP, including curriculum vitae.
8.	Legislation and Guidelines Considered	3(1)(e)	(e) a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;

Chapter	Title	Correlation with GN No. 982 – Appendix 1	
9.	Basic Assessment Process	–	–
10.	Assumptions and Limitations	3(1)(o)	(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;
11.	Need and Desirability	3(1)(f)	(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;
12.	Timeframes	3(1)(q)	(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;
13.	Financial Provisions	3(1)(s)	(s) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;
14.	Resource Use and Process Details	-	-
15.	Public Participation Process	3(1)(h)	(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;
16.	Environmental Attributes	3(1)(h)	(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
17.	Summary of Specialist Studies	3(1)(k and m)	(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report; (m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;

Chapter	Title	Correlation with GN No. 982 – Appendix 1	
18.	Impact Assessment	3(1)(h, i and j)	<p>(h) a full description of the process followed to reach the proposed preferred alternative within the site, including:</p> <p>(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-</p> <p>(aa) can be reversed;</p> <p>(bb) may cause irreplaceable loss of resources; and</p> <p>(cc) can be avoided, managed or mitigated;</p> <p>(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;</p> <p>(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;</p> <p>(viii) the possible mitigation measures that could be applied and level of residual risk;</p> <p>(ix) the outcome of the site selection matrix;</p> <p>(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and</p> <p>(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;</p>
19.	Impact Management		<p>(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including-</p> <p>(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and</p> <p>(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;</p> <p>(j) an assessment of each identified potentially significant impact and risk, including-</p> <p>(i) cumulative impacts;</p> <p>(ii) the nature, significance and consequences of the impact and risk;</p> <p>(iii) the extent and duration of the impact and risk;</p> <p>(iv) the probability of the impact and risk occurring;</p> <p>(v) the degree to which the impact and risk can be reversed;</p> <p>(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and</p> <p>(vii) the degree to which the impact and risk can be avoided, managed or mitigated;</p>
20.	Analysis of Alternatives		3(1)(g, k, l, m, n, and p)

Chapter	Title	Correlation with GN No. 982 – Appendix 1	
21.	Conclusions and Recommendations		<p>infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and</p> <p>(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;</p> <p>(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;</p> <p>(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;</p>
22.	Oath of Environmental Assessment Practitioner	3(1)(r)	<p>(r) an undertaking under oath or affirmation by the EAP in relation to:</p> <p>(i) the correctness of the information provided in the reports;</p> <p>(ii) the inclusion of comments and inputs from stakeholders and I&APs;</p> <p>(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and</p> <p>(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties;</p>
N/A		3(1)(t)	Where applicable, any specific information required by the Competent Authority.
N/A		3(1)(u)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act.

3 PROJECT BACKGROUND AND MOTIVATION

3.1 Projected Water Requirements for the Middle and Upper South Coast

The information to follow was sourced from the Technical Feasibility Study (AECOM, 2016a).

The current water resources supplying the South Coast of KZN are insufficient to meet the projected water demands. The Upper and Middle South Coast are currently supplied by water from local rivers and dams, augmented by the Mgeni System. The Mgeni System is the main water source that supplies about six million people and industries in the eThekweni Municipality, uMgungundlovu District Municipality (DM), Msunduzi Local Municipality (LM), and a small portion of Ugu DM. These municipal areas comprise the economic powerhouse of the KZN.

Currently, Umgeni Water is pursuing the project further as a scheme for domestic water supply to the South Coast. Augmentation of the water resources supplying the South Coast is urgently needed to both relieve the load on the Umgeni Water supply system, and to meet growing water demands along the South Coast of KZN.

Recently, Ugu DM and the Department of Water and Sanitation (DWS) agreed on the Cwabeni Off-channel Storage (OCS) Dam as a solution for the Lower South Coast Area. As such, a

dedicated augmentation for the Upper and Middle South Coast supply area (Hibberdene to Amanzimtoti) is required. Two main options are being investigated at a feasibility level; namely Desalination of Seawater, and the LUBWSS.

The LUBWSS is the recommended augmentation option to be implemented to supplement potable water supply to the existing Upper and Middle South Coast supply area. To determine the size of the proposed LUBWSS, the supply area and current and future water requirements had to be defined. The supply area extends from Amanzimtoti in the north to Hibberdene in the south, and covers both eThekwini and Ugu Municipalities (**Figure 1**).

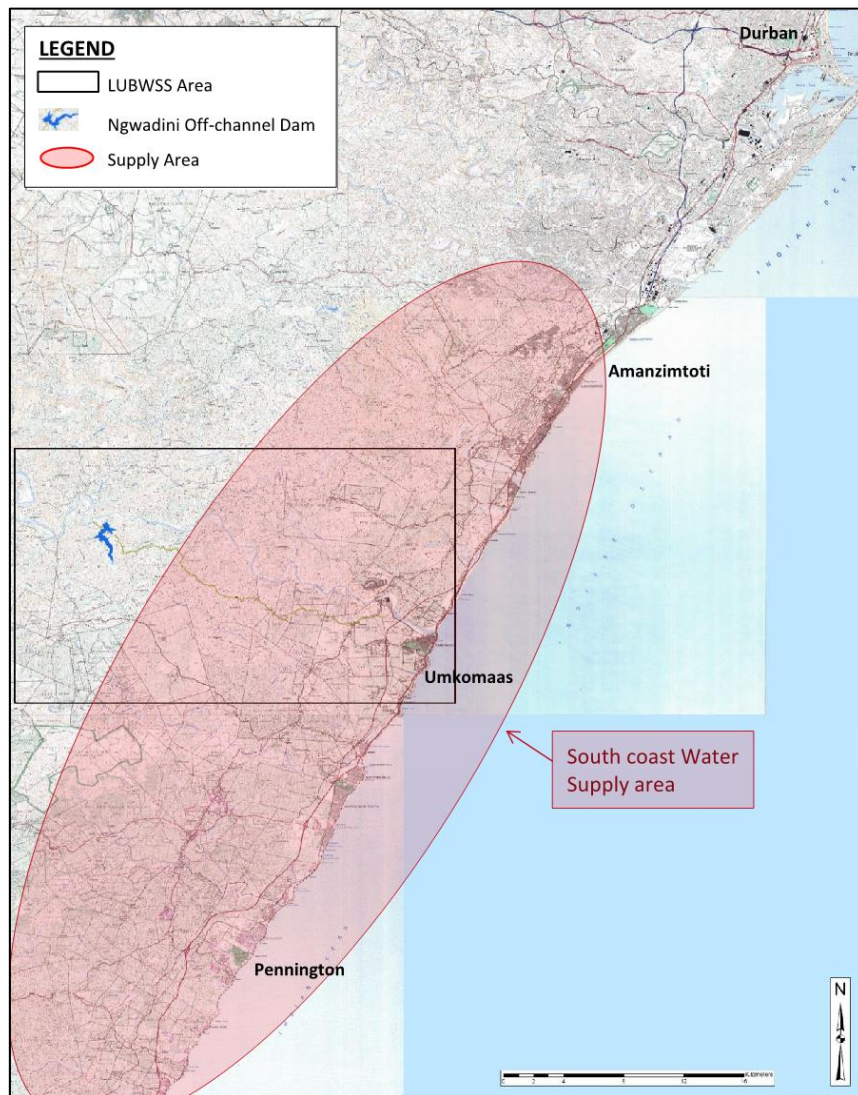


Figure 1: Map of the South Coast Water Supply area (AECOM, 2016a)

Water requirements for the Upper and Middle South Coast supply area in 2014 were 85MI/d on average, with peaks up to 110MI/d. This supply excludes an estimated 25MI/d suppressed demand in the supply area, due to infrastructure constraints. Water requirement projection scenarios, taking into account the growth and development plans by the municipalities as well as Water Conservation and Water Demand Management measures, determined that the 30

year water demand projection will be between 155 to 205MI/d for the supply area. The scenarios are as follows:

- **Scenario A (Low):** Growth projection with WC/WDM;
- **Scenario B (Medium):** WC/WDM and suppressed demands; and
- **Scenario C (High):** Suppressed demands and no WC/WDM savings.

Based on the medium growth scenario as the preferred planning scenario (**Figure 2**), the LUBWSS needs to be sized to provide an additional average volume of 100MI/d (with a 130 MI/d designed peak capacity), to meet the future 30-year demand projection.

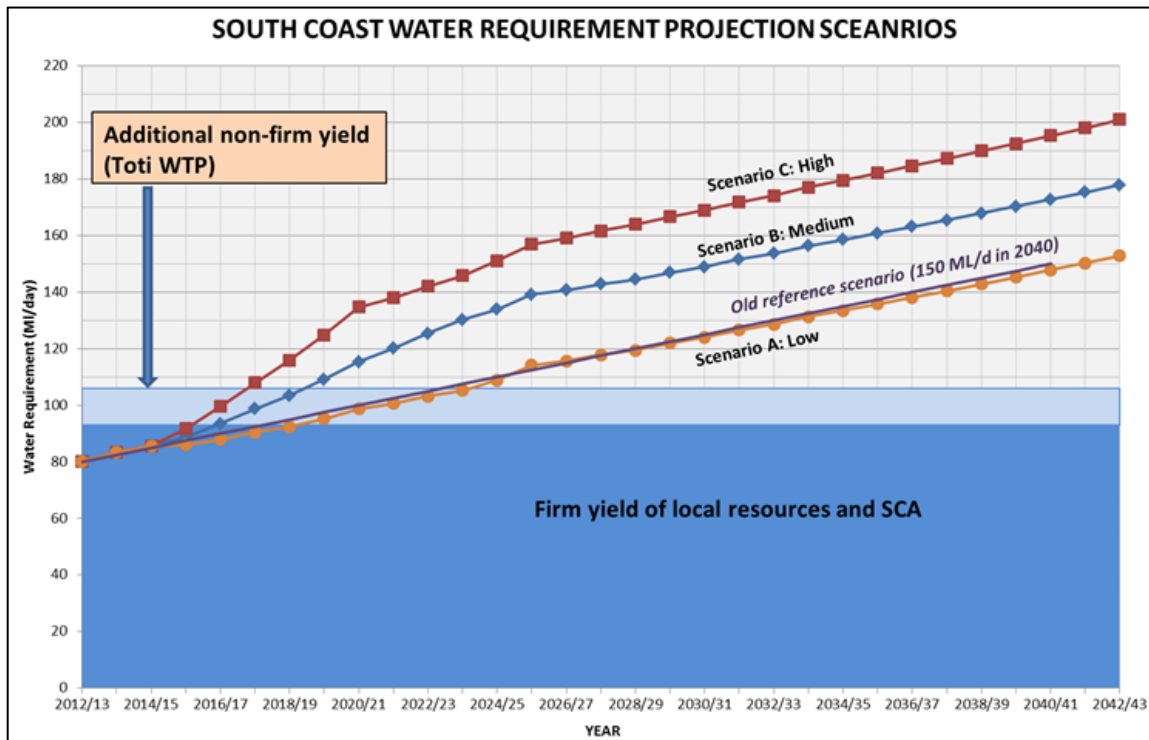


Figure 2: 30-year water demand projections and current water availability within the selected Upper and Middle South Coast supply area (AECOM, 2016a)

A Detailed Feasibility Study, which included preliminary design of components, has been completed for the LUBWSS by AECOM SA (Pty) Ltd. Of the options investigated, two scheme configuration options were carried forward to the feasibility investigation phase, and are defined as follows:

- **Scheme A:** Water supplied directly from the Ngwadini Dam to the water treatment plant (WTP) through a proposed 22km long pipeline; and
- **Scheme B:** The return of stored water to the river from Ngwadini Dam in the low flow periods and abstraction at the existing Goodenough weir and delivery to the WTP through a shorter 7km pipeline.

As the cost of the two schemes were considered similar, other factors including risk were focused on. While some risks can be mitigated or absorbed as a small cost increase, key risks are associated with impacts on water delivery timeframes due to the urgency of the project.

Based on the supply risks associated with Scheme A and Scheme B's increased flexibility for phasing and integrating with other regional schemes, Scheme B was selected as the preferred scheme to take forward to preliminary design. Initial supply from Scheme B's can commence before completion of the dam, but at lower levels of water assurance. Timeous implementation of Smithfield Dam upstream may mitigate the need for Ngwadini Dam for a lengthy period.

The proposed LUBWSS (**Figure 3**) consists of:

- The Ngwadini Weir and abstraction works to fill the Ngwadini Dam during summer periods of excess flow (*the scope of this report*);
- The Ngwadini OCS Dam, with a capacity of 10 million m³, and outlet infrastructure to release water back into the river and augment low flow periods;
- A second abstraction downstream at the Goodenough Weir site to abstract the raw water for delivery to the WTP;
- A pump station to pump water from the Goodenough abstraction to the WTP via;
- A short rising main and 7km gravity main with;
- A break pressure tank that also serves as a raw water storage reservoir;
- Hydrocyclones before the pump station and WTP to remove sediments during periods of higher turbidity river flows and reduce the WTP residual ("sludge");
- A 100 Ml/d WTP in the town of Craigieburn; and
- A potable gravity water pipeline from the WTP to Quarry Reservoir, the potable water delivery and tie-in point on the South Coast Pipeline.

The overall LUBWSS layout is shown in **Figure 3**, inclusive of the Water Supply Scheme which is not included in the scope of this application. The overall layout for the Ngwadini Weir, abstraction works and pipeline (together with the OCS Dam) are shown in **Figures 4 – 5**.

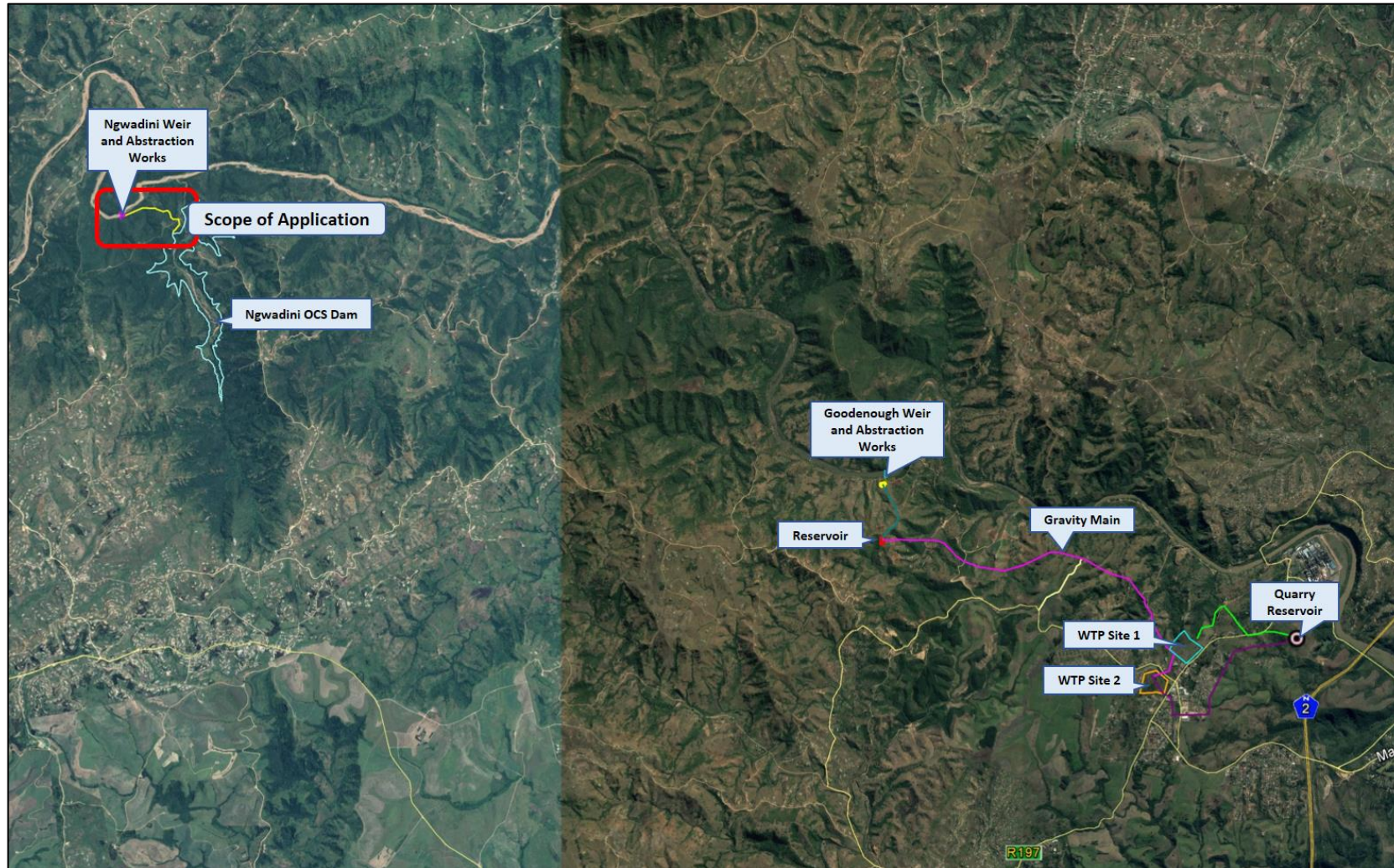


Figure 3: LUBWSS Layout

4 PROJECT LOCATION

The LUBWSS Ngwadini project components are primarily located within the Umdoni Local Municipality and the Ugu District Municipality, in KZN (**Figures 4 – 5**). The weir structure ties into the left bank of the uMkhomazi River, which is in the eThekweni Metropolitan Municipality. The study area falls within land that is administered by the Ingonyama Trust Board. The project area is approximately 20km north west of Scottburgh. The Ngwadini Weir and abstraction works will be built on the uMkhomazi River. The property details of the affected property are provided in **Table 2**.

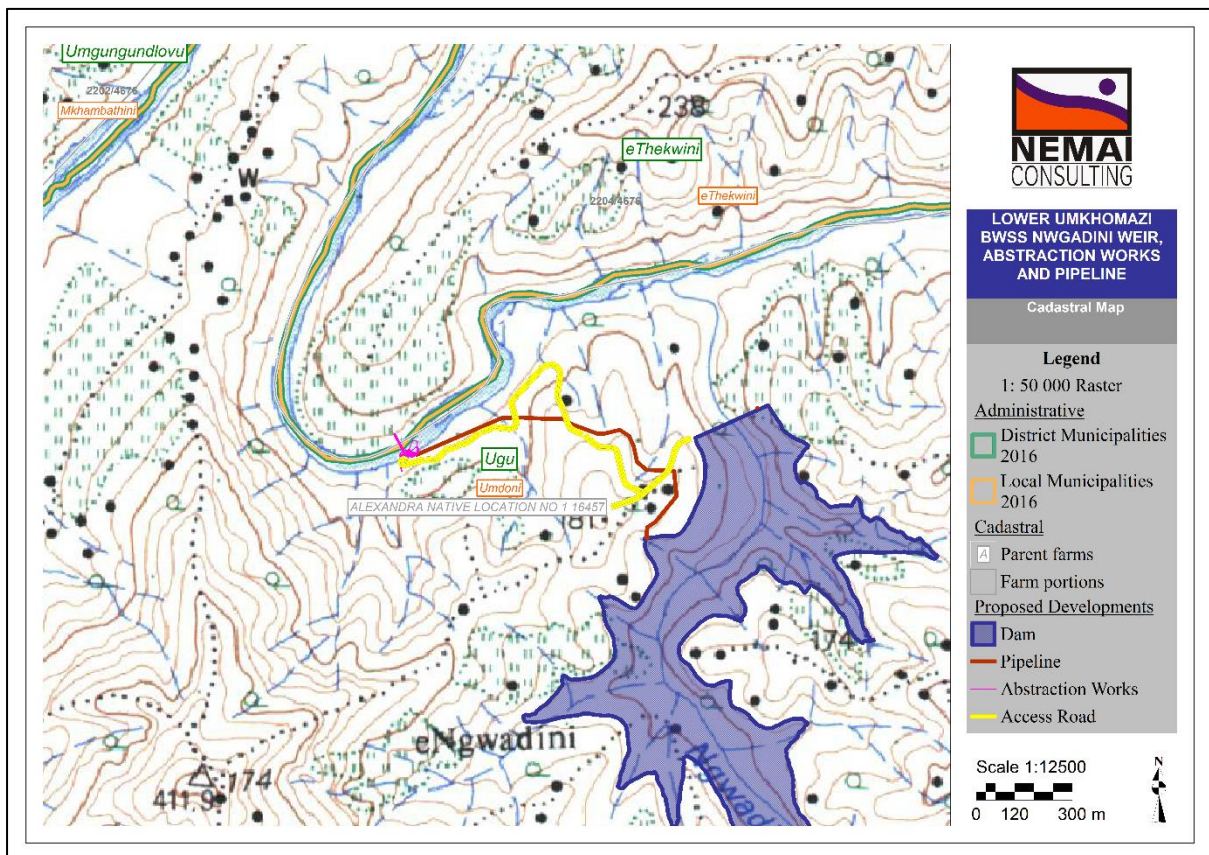


Figure 4: Locality Map

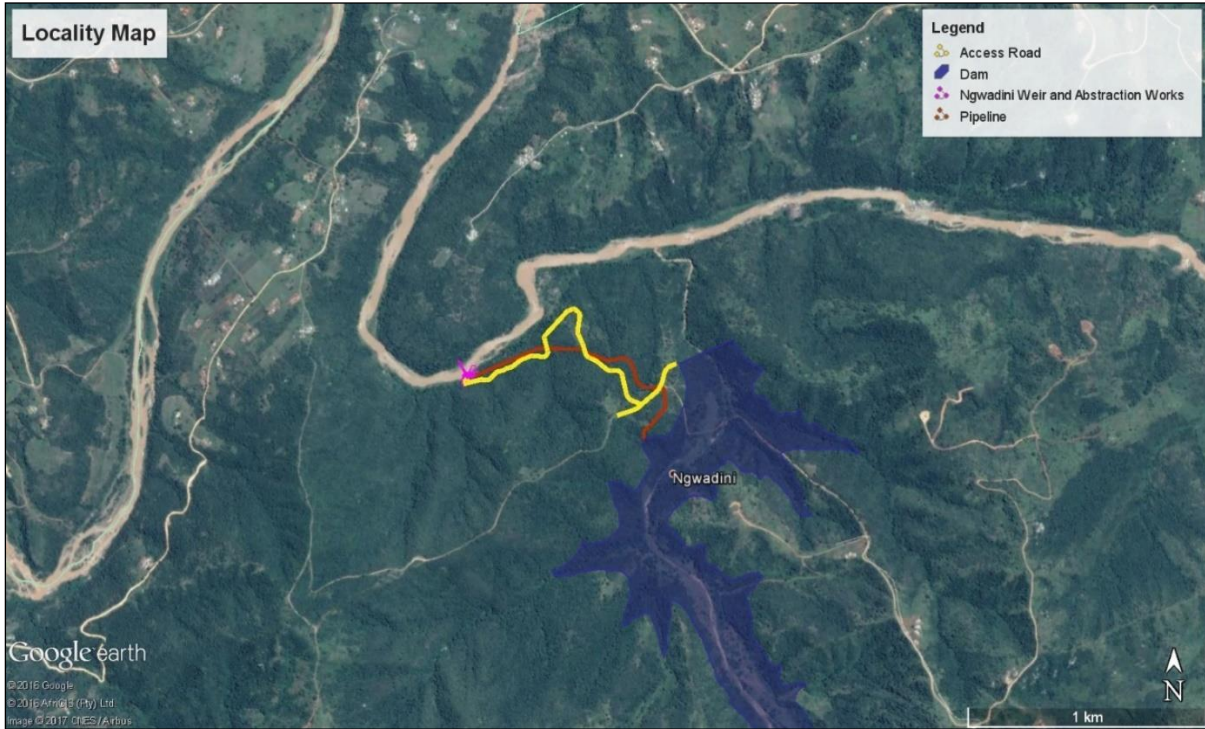


Figure 5: Google Earth map of the proposed project components

Table 2: Property Details

Province	KwaZulu-Natal
District Municipality	<ul style="list-style-type: none"> • Ugu District Municipality • eThekweni Metropolitan Municipality
Local Municipality	<ul style="list-style-type: none"> • Umdoni Local Municipality • eThekweni Metropolitan Municipality
Ward Number(s)	Ward 3 of Ugu District Municipality Ward 105 of eThekweni Metropolitan Municipality
Farm name and number	Alexandra Native Location No 1 16457 Umlazi Native Location 4676
Portion number	0
SG Code	N0ET0000000174480000 N0ET00000000467602204

5 PROJECT DESCRIPTION

5.1 Project Description

The following Feasibility Study reports compiled by AECOM informed the project design of the LUBWSS:

- Lower uMkhomazi Bulk Water Supply Scheme Detailed Feasibility Study and Preliminary Design (AECOM, 2016a);
- Lower uMkhomazi Bulk Water Supply Scheme Feasibility Design of Ngwadini Dam, Ngwadini Abstraction Works and Goodenough Abstraction Work (AECOM, 2016b); and
- Environmental Screening Report for the uMkhomazi River System (AECOM, 2016c).

The overall LUBWSS consists of the proposed components listed in **Table 3**. The requirements in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) are also explained.

The focus of this application will be the Ngwadini Weir, abstraction works, pipeline and access road.

Table 3: LUBWSS Components and NEMA Requirements

No.	Project Component		NEMA Requirements
1	Water Resource Development	Ngwadini weir, abstraction works and pipeline to fill the Ngwadini OCS Dam during summer periods of excess flow.	Authorisation previously received in terms of the Environment Conservation Act (ECA) (Act No. 73 of 1989). However, confirmed in consultation with KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA) that a new Basic Assessment process would need to be conducted due to changes in location and design. <i>This is the focus of this application.</i>
2		Ngwadini OCS Dam, with a capacity of 10 million m ³ , and outlet infrastructure to release water back into the river and augment low flow periods.	Authorisation previously received in terms of ECA. However, confirmed in consultation with KZN EDTEA that an amendment to the authorisation would need to be applied for due to slight changes in design. Separate Amendment Application to be submitted to KZN EDTEA.

No.	Project Component	NEMA Requirements
3	Water Supply Scheme – weir, abstraction works, conveyance infrastructure and WTP.	A Scoping and EIA process needs to be conducted. Separate Application to be submitted to DEA.

In 2008, SAPPI SAICCOR completed investigations and designs on the Ngwadini OCS dam to increase supply assurance for their industrial plant situated near the town of Umkomass in KZN. SAPPI SAICCOR, however, chose not to implement the dam and have handed over the project to Umgeni Water to implement for potable water supply.

5.1.1 Ngwadini OCS Dam

The Ngwadini Dam was re-designed for a concrete faced rockfill dam (CFRD) with a Full Supply Level (FSL) of 118m and associated full supply water surface area (FSA) of 0.71 km². The CFRD was designed with a side channel spillway, with a chute and downstream flip bucket, as per the previous design; but the flood hydrology and associated spillway capacities and coffer dams revised in line with the latest best practices. The capacity and height of the dam were not changed from that for which an ROD has been granted; namely 10 million m³ storage and a 49m height dam to Non Overspill Crest (NOC) level, but refinements were made to various aspects of the existing dam design. Additional geotechnical drilling investigations were conducted to augment the previous work, and confirmed adequate founding conditions for the CFRD, as well as, sufficient quantity and quality of required construction material. This construction material is to be sourced from the side channel spillway, plunge pool and a proposed quarry to be established in the dam basin.

The outlet capacity was designed to release water back to the uMkhomazi River as a flow of 1.62m³/s. To accommodate emergency draw down conditions, the dam was designed to empty from FSL to half depth in 60 days and the lowest outlet in 120 days with a velocity limit of 7 m/s. It is recommended that the Ngwadini Dam is categorised as a Category III dam, but this will be confirmed during the tender design phase.

SAPPI SAICCOR received the EA for the Water Resource Development components in 2008. An amendment to the EA for the Ngwadini OCS Dam needs to be applied for due to slight changes in design. A separate EA Amendment Application has been submitted to KZN EDTEA to authorise the Ngwadini OCS Dam.

The general layout of the proposed OCS Dam is provided in **Figure 6**.

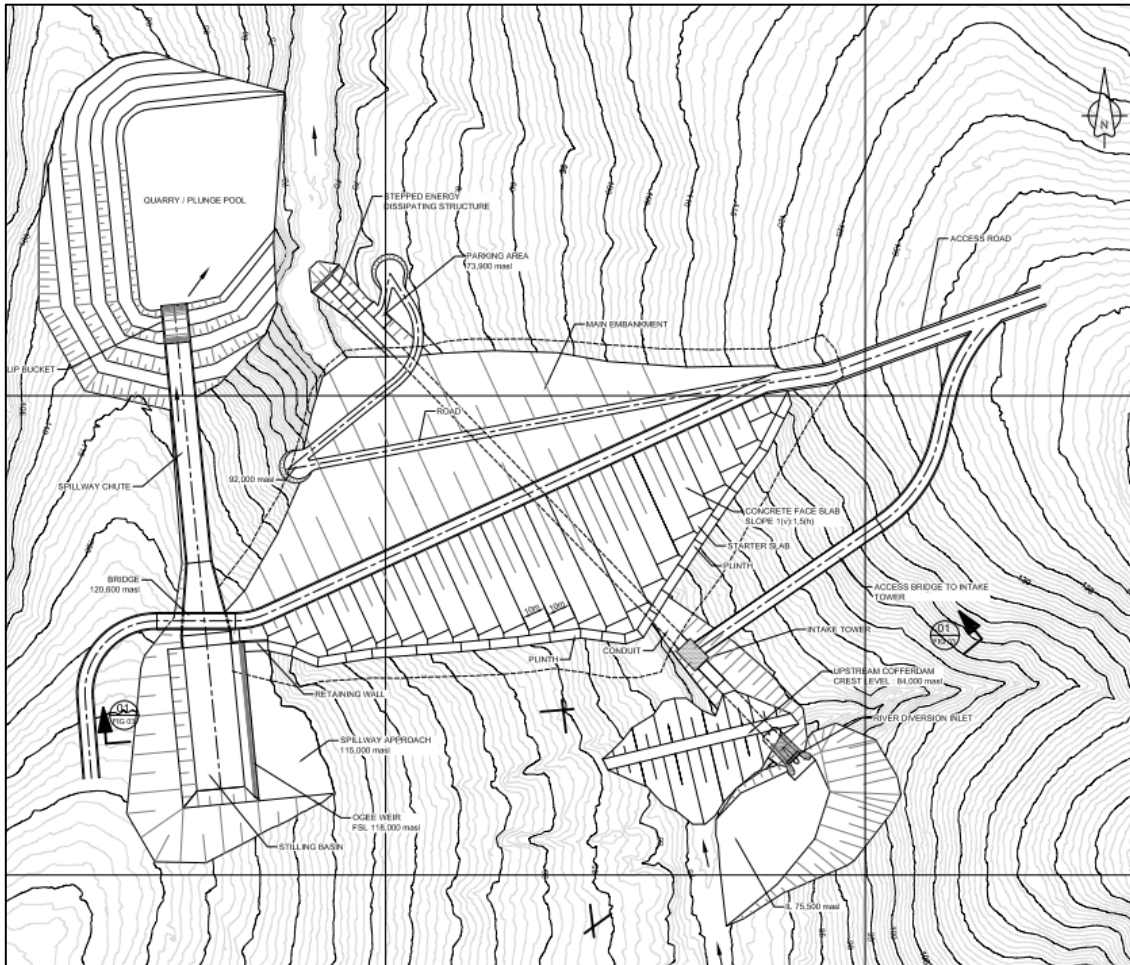


Figure 6: General Layout of the Ngwadini OCS Dam

5.1.2 Ngwadini Weir and Abstraction Works

The Ngwadini Abstraction Works, that will abstract and pump water from the uMkhomazi River to the Ngwadini OCS Dam on the Ngwadini River, was positioned and designed using a physical hydraulic model study. The chosen weir position was upstream of the previous positions considered during investigations for SAPPI SAICCOR, based on a combination of suitable hydraulic conditions on the outside of a bend, and good topography and geotechnical conditions. Therefore, Nema Consulting was appointed by Umgeni Water to conduct a BA process for the Ngwadini Weir, abstraction works and the pipeline to fill the Ngwadini OCS Dam during summer periods of excess flow, as well as the associated access road.

The abstraction capacity required for the selected scheme configuration is $1\text{ m}^3/\text{s}$. However, for the sake of flexibility and future upgrades, the civil infrastructure was designed at $2.6\text{ m}^3/\text{s}$.

The selected configuration of the Ngwadini Weir and abstraction works consists of the following (refer to **Figure 7**):

- A 3.5m high crump weir with low notch for gauging and to divert flows past the intake;
- A boulder trap external to the high wall;
- Three low-level slotted openings in the high wall to deliver water to;
- Two gravel traps;
- Four sand traps that also function as pumping canals;
- Radial or sluice gates are positioned at the downstream of each trap for flushing; and
- A dry well low lift pump station.

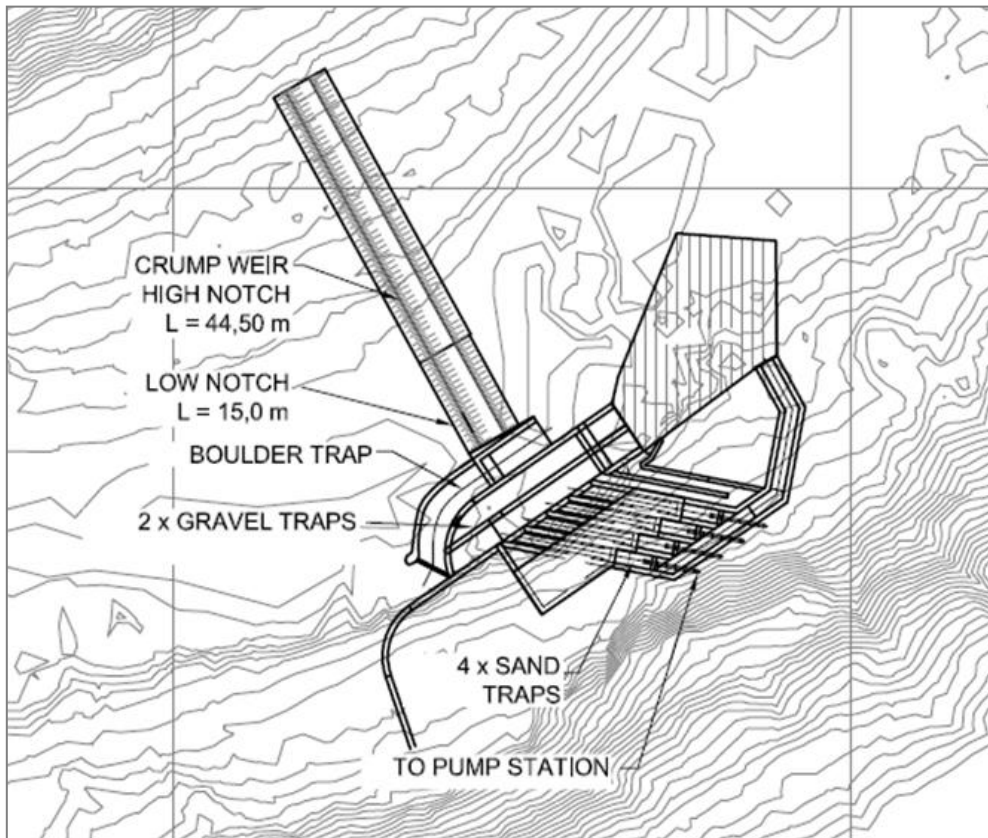


Figure 7: Ngwadini Abstraction Works Layout

The abstraction works was positioned in the river bed to be self-scouring. When necessary, the gates can be opened to flush the internal parts of the abstraction works. The preliminary design has taken into account a fishway, which should be refined in the detailed design, based on input from the Aquatic and Wetland Specialist.

5.1.3 Pipeline

A pipeline, approximately 1150m in length, will pump water from the Ngwadini weir and abstraction works to the Ngwadini OCS Dam (**Figure 8**). The construction servitude for the pipeline is 25m from the centreline on each side. Mild steel was selected for the LUBWSS pipelines.

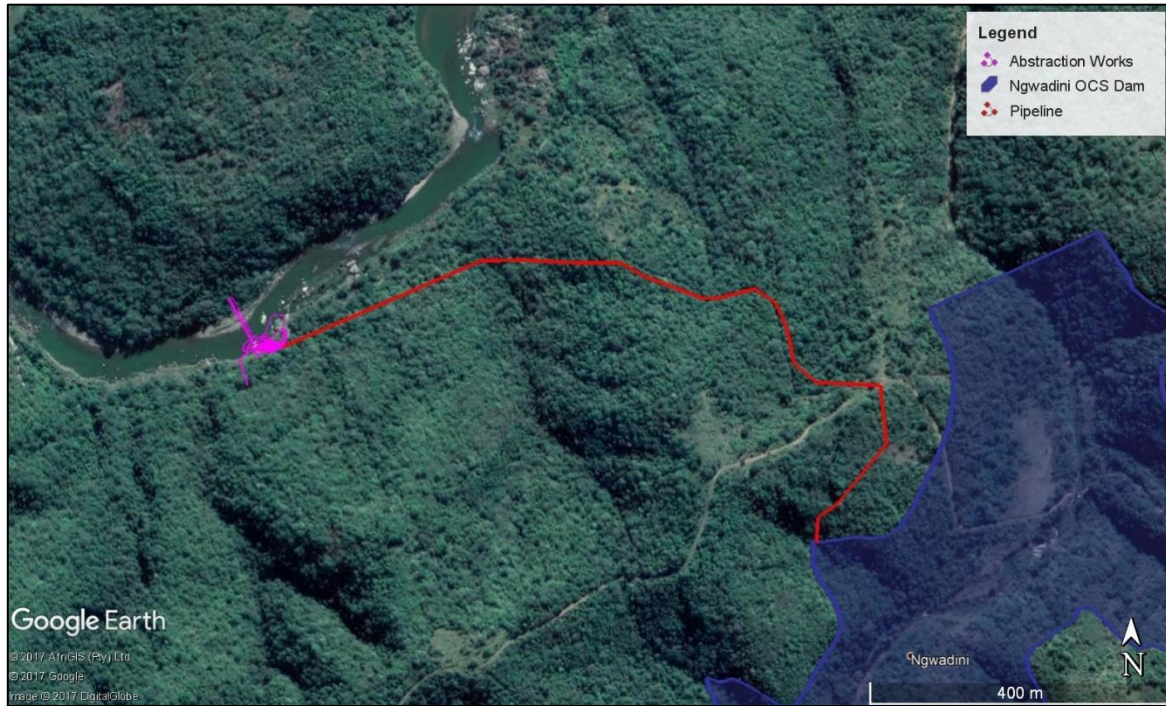


Figure 8: Pipeline route from Ngwadini Abstraction Works to the Ngwadini OCS Dam

Details of the pipeline to fill the OCS Dam are provided in **Table 4**.

Table 4: Steel pipeline details

Pipeline	Full capacity of scheme designed			
	Flow (Mℓ/d in 18hours)	Velocity (m/s)	Length (m)	Diameter (mm)
To fill OCS dam	65 Mℓ/d	1.273 m/s	1150 m	DN1000

A number of river crossings were noted for the LUBWSS. Instead of making use of expensive bridge structures, reinforced concrete bedding and backfill was recommended for length of pipeline submerged under each river crossing. The typical section of the river crossing is included in **Figure 9**. Detailed design will need to confirm the river crossing approach and further investigate the smaller drainage line crossings.

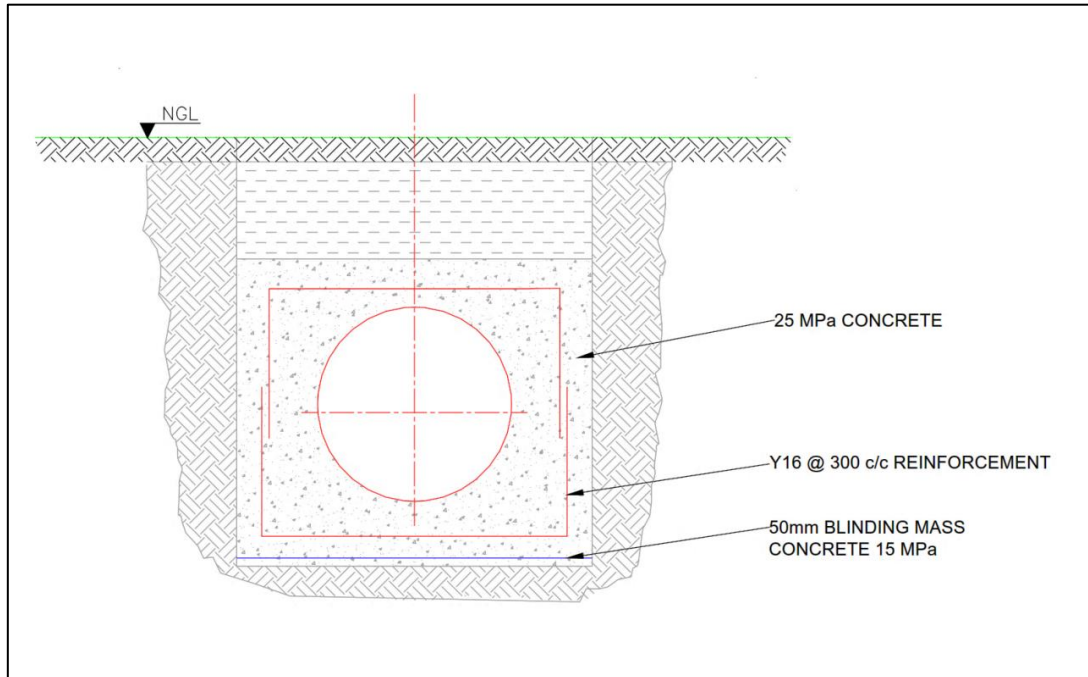


Figure 9: Proposed typical river crossing concrete encasement

5.1.4 Access Road

A new access road is required to access the Ngwadini weir and abstraction works, and the Ngwadini OCS Dam during the Construction and Operational Phases of the project (**Figure 10**). Most of the road will need to be constructed, while small sections are existing roads that require upgrading. The new sections of road to be constructed follows the contours around a steep and mountainous hill to access the Ngwadini weir and abstraction works. The access road is approximately 1270m in length and approximately 8m in width. The construction servitude for the road is 12m from the edge of the road.



Figure 10: Proposed Access Road from the Ngwadini Abstraction Works to the Ngwadini OCS Dam

5.1.5 Associated Electrical Conveyance Infrastructure

The following information was extracted from the Lower Umkhomazi Bulk Water Supply Scheme: Detailed Feasibility Study and Preliminary Design: Bulk Electrical Services compiled by DNA Consulting Engineers and Project Managers in 2016.

Bulk electrical power is required at all the proposed Ngwadini weir and abstraction works. Spur lines would need to be constructed from the Eskom backbone to the Ngwadini weir and abstraction works.

The Feasibility Study confirmed that Eskom will be the electrical supplier for the LUBWSS and not the municipality. Eskom's existing supply networks are constrained and new bulk power infrastructure is required to deliver adequate power to the LUBWSS infrastructure sites.

Eskom has transmission networks (132kV – 275kV) in the area but not in close proximity. A 132kV and 275kV network infrastructure is available in the region. The closest 132kV line that has the available capacity and is not constrained is approximately 25km away along the coastal belt.

Eskom Distribution Networks (11kV – 22kV) are available in the area of the LUBWSS. Many of the networks in the area are constrained with insufficient power available to provide power for the proposed scheme.

The positions of infrastructure sites 1 to 5 that require electrical bulk supply from Eskom for the LUBWSS are provided in **Figure 11**.

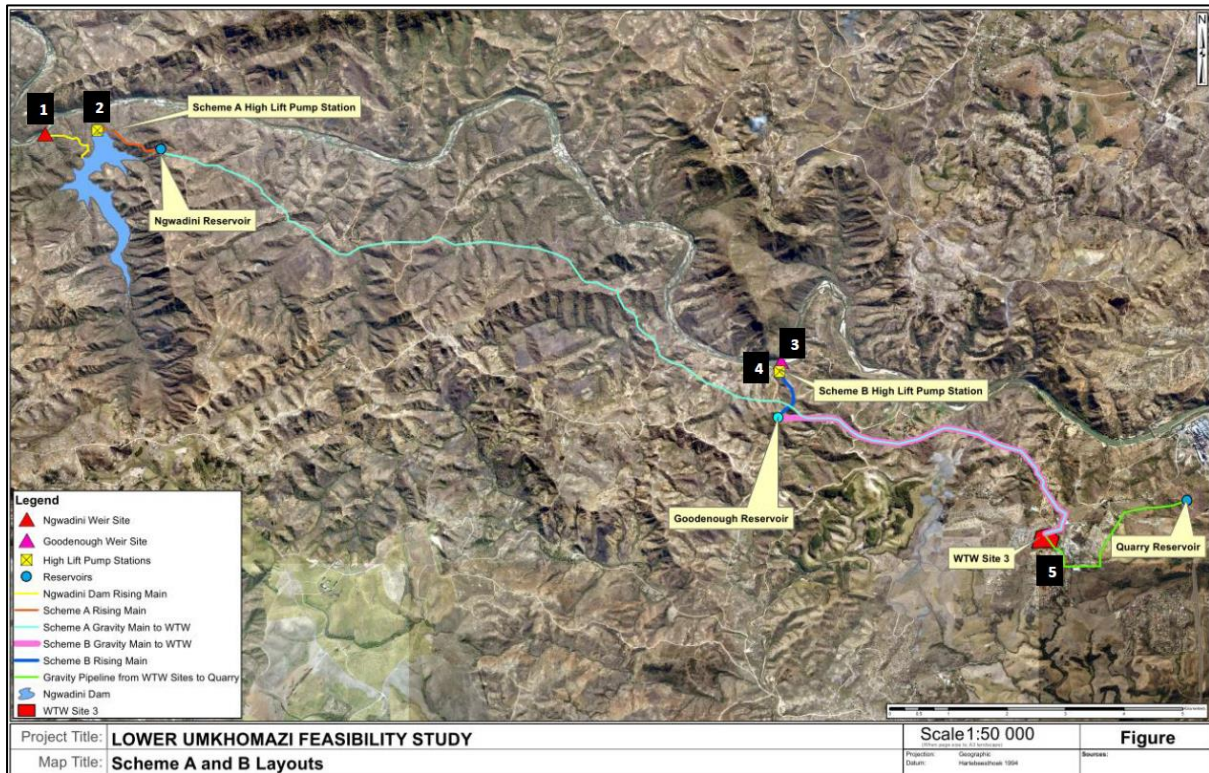


Figure 11: Bulk electrical supply points for the LUBWSS

A total of seven applications were made with Eskom for bulk power supplies in September 2015. Changes in loads and scheme options associated with the overall concept designs by AECOM did result in changes that need to be made on the Eskom applications. In consultation with Eskom, it was agreed that the current applications would remain and adjustments would be made on the applications during detailed design stage.

Based on analysis received from Eskom, there is no power supply available on the sites requested and it will therefore be necessary to extend the Eskom existing transmission and distribution networks to the various sites. There are 22kV and 11kV existing Eskom networks in the area.

Eskom has confirmed that they will need to construct a new substation (Ngwadini substation) in the area. This is on the condition that other consumers can be supplied off this new substation. Eskom cannot guarantee that such a substation will be built or if another alternative supply can be provided for the required full load.

As indicated by the Eskom Transmission Development Plan for 2013-2022, Eskom are currently upgrading and expanding their 132kV Transmission Network in the Umkomaas region. This has been confirmed by Eskom Planning.

Figure 12 below reflects the existing electricity infrastructure in relation to the proposed pump stations and WTPs for LUBWSS. For LUBWSS, a new 132kV transmission line is currently under construction to a proposed Ngwadini substation located in the proximity of the Ngwadini OCS Dam. Power supplies to Goodenough pump stations and the WTPs is proposed to be fed off existing infrastructure that would need to be upgraded.

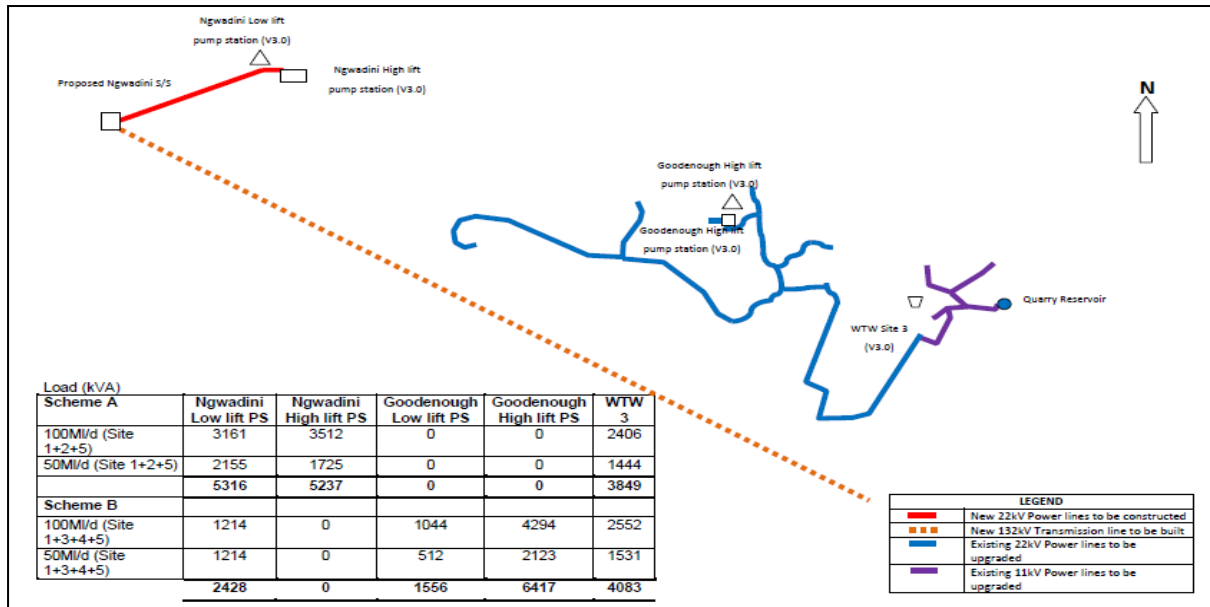


Figure 12: Proposed electrical infrastructure

The new Eskom infrastructure required is a regional substation already identified in Eskom’s long-term plans, and a 132kV transmission line.

The final total power required is 4000kVA for all key locations, including the Ngwadini abstraction works, Goodenough abstraction works, high lift pump station, and at the WTP. The new substation is required due to constrained local networks, and has already been identified as part of a regional solution. The substation is close to the Ngwadini Dam site and on private land.

Eskom will be responsible for the power supply and therefore apply for EA for the infrastructure.

5.2 Project Lifecycle

To adequately consider the impacts associated with the Ngwadini weir, abstraction works and pipeline project, the major activities during each phase of the project lifecycle are listed in the sub-sections to follow.

5.2.1 Pre-feasibility and Feasibility Phases

Major activities that form part of the Pre-feasibility and Feasibility Phases include:

- Assessment of base conditions;
- Technical, economic and environmental screening of alternatives;
- Surveying;
- Sizing and costing of infrastructure; and
- Geotechnical investigations.

5.2.2 Pre-Construction Phase

Major activities that form part of the pre-construction phase include:

- Negotiations and agreements with the affected landowners, stakeholders and authorities;
- Detailed engineering design;
- Detailed geotechnical investigations;
- Geophysical investigations;
- Survey and mark construction servitude;
- Survey and map topography for determination of post-construction landscape, rehabilitation and shaping (where necessary);
- Possible removal of trees within construction servitude;
- Possible further phases of heritage site investigation and fencing of heritage sites;
- Procurement process for Contractors;
- Selective improvements of access roads to facilitate the delivery of construction plant and materials;
- Arrangements for accommodation of construction workers;
- The building of a site office and ablution facilities;
- Permits if protected trees are to be cut, disturbed, damaged, destroyed or removed;
- Permits if heritage resources are to be impacted on and for the relocation of graves;
- Confirmation of arrangements with individual landowners and/or land users for managing and mitigating issues such as fencing and gate dimensions for traversing servitude, traversing patterns of livestock over servitude, access to livestock drinking points, security, opening and closing of gates and access to private property;
- Confirmation of the location and condition of all buildings, assets and structures within the servitude; and
- Determining and documenting the road conditions for all identified haul roads.

5.2.3 Construction Phase

General activities associated with the construction phase include the following:

- Site establishment;
- Relocation of infrastructure;
- Prepare access roads;
- Establish construction camp;
- Bulk fuel storage;
- Storage and handling of material;
- Construction employment;
- Site clearing;
- Excavation;
- Blasting;
- Establishment of and operations at crusher;
- Establishment of and operations at batching plant;
- Establishment of and operations at materials testing laboratory;
- Create haul roads;
- Concrete Works;
- Steel works;
- Mechanical and Electrical Works;
- Temporary river diversions for pipeline crossings;
- Electrical supply;
- Construction of weir and abstraction works;
- Construction of pipeline;
- Cut and cover activities;
- Stockpiling (sand, crushed stone, aggregate, etc.);
- Waste and wastewater management;
- Relocation of graves, protected species, etc.; and
- Reinstatement and rehabilitation of construction domain (as necessary).

The methodology for the installation of the pipeline is as follows:

- Site clearing.
- Remove topsoil in the area where construction will take place and stockpile separately for later re-instatement.
- Excavate pipe trench.
- Install and compact pipe bedding.
- Install pipe sections by means of side booms (special cranes) and weld joints.



Figure 13: Typical trench excavation and pipe installation activities

- Repair field joints and backfill and compact pipe trench in layers.
- Construct air and scour valves. Air valves, which are generally positioned at high points along the route, release air from the pipeline as it fills, allow air into the pipeline when it is draining and 'bleed' off air during normal operations. The scour valves serve to drain water from the pipeline (typically during maintenance), and are located at low points along the route for drainage purposes. A detailed hydraulic analysis for the positioning of the valves will be performed as part of the detail design.
- Construct access chambers.



Figure 14: Typical examples of chambers (left - during construction; right – completed)

- Re-shape the impacted area to its original topography and replace stripped topsoil.



Figure 15: Typical views of reinstated (left) and rehabilitated (right) pipeline routes

- Install final Cathodic Protection measures.
- Install AC mitigation measures.
- Install pipeline markers (concrete posts) at changes in direction and at regular intervals along the route.
- Rehabilitation.

Watercourse crossings will generally consist of pipe sections encased in concrete in accordance with the relevant Umgeni Water criteria. The typical construction methodology for a river crossing is as follows:

- An earthen berm (coffer dam) and temporary bypass canal is constructed to divert the water around the construction site.
- The trench is excavated across the dry river channel
- A concrete bedding is constructed first, followed by the installation and restraining of the pipe to prevent flotation. Encasement is completed by the construction of further concrete lifts.
- Once the concrete has set, the temporary coffer dam is removed and the bypass canal backfilled to re-instate the flow.
- The impacted area is re-shaped to its original topography.
- The disturbed area is rehabilitated.
- If erosion of the disturbed river banks is a concern, suitable measures will be implemented to ensure the stabilisation of the river structure.



Figure 16: Typical river crossing showing concrete encased pipe section

5.2.4 Operation Phase

Key activities to be undertaken as part of the operation and maintenance include the following:

- Pipeline –
 - Create access track along pipeline servitude;
 - Conduct routine maintenance inspections of the project infrastructure;
 - Scouring of pipeline, where the water conveyed and stored within this system will be released into the receiving watercourses along the alignment from scour valves. A detail hydraulic analysis will be conducted to determine the optimum positioning of the scour valves;
 - Undertake maintenance and repair works, where necessary; and
 - Ongoing consultation with directly affected parties.
- Weir and Abstraction Works
 - Conduct routine maintenance inspections of the project infrastructure;
 - Undertake maintenance and repair works, where necessary; and
 - Ongoing consultation with directly affected parties.

5.2.5 Decommissioning Phase

Decommissioning is not considered applicable to the scheme. However, should decommissioning be required the activity will need to comply with the appropriate environmental legislation and best practices at that time.

5.3 Preliminary Implementation Programme

Various project packaging and delivery alternatives were considered. The packaging of the overall project was also explored to identify packages that can be lumped together for functionality purposes. Two packages were proposed:

- **Package 1 – Potable supply**: This package includes the Goodenough abstraction weir and works, high lift pump station, the rising and gravity main to and from the Goodenough Reservoir, the WTP, and the gravity main to Quarry Reservoir.
- **Package 2 – The water resource augmentation**: This package includes the Ngwadini abstraction weir and works, rising main to the dam, and the Ngwadini Dam.

Since there is an urgent need to augment water supply to the Upper and Middle South Coast by 2018, delivery mechanisms were explored with the primary focus on expedited project delivery time frames. For this purpose, two delivery mechanisms are proposed, and for each of which a project program developed:

- A Design-Bid-Build approach and contract (current Umgeni Waters' standard).
- A Design-Build approach and contract which can reduce the need for two tender phases and cultivate innovation.

Neither delivery mechanism can have the scheme implemented by 2018, but the design-build approach can potentially reduce the time to first delivery of water from September 2021 to December 2019. This is based on the time frames of package 1. Package 1 can deliver water, albeit with a 10% risk, before Package 2, the water resource augmentation is completed. A Design-Build package is recommended for Package 1 to expedite first water delivery, and a design-bid-Build for Package 2. If selected as the preferred scheme for the South Coast, the implementation packages of the LUBWSS need to be confirmed, and the preferred delivery mechanism for each selected as soon as possible.

5.4 Resources Required for Construction and Operation

This section briefly outlines the resources that will be required to execute the project.

5.4.1 Water

During the construction stage, water will be required for various purposes, such as concrete batching, washing of plant and equipment in dedicated areas, dust suppression, potable use by construction workers, etc. Water for construction purposes will be sourced directly from watercourses on site and groundwater (boreholes) will also be utilised. Water tankers will also supply water to the site. All water use triggered in terms of Section 21 of the NWA must comply with DWS's requirements.

5.4.2 Sanitation

Sanitation services along the pipeline route will be required for construction workers in the form of chemical toilets, which will be serviced at regular intervals by the supplier. A temporary septic field/ tank system will be provided at the site camps and site offices.

5.4.3 Waste

Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g. at construction camps) and will be removed at regular intervals and disposed of at approved waste disposal sites within each of the local municipalities that are affected by the project. All the waste disposed of will be recorded.

Construction-related wastewater, which refers to any water adversely affected in quality through construction activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g. equipment, staff); and
- Drainage over contaminated areas (e.g. cement batching / mixing areas, workshop, equipment storage areas).

5.4.4 Electricity

Electricity will be obtained from diesel generators or temporary electricity connections during the construction phase. Electricity requirements for the operation of the scheme will be supplied by Eskom. A separate EIA will be conducted to seek approval for supplying electricity to the project. The power supply is discussed in detail in **Section 5.1.5**.

5.4.5 Construction Workers

The appointed Contractor will make use of skilled labour where necessary. In those instances where casual labour is required, Umgeni Water will request that such persons are sourced from local communities as far as possible.

5.4.6 Construction Site Camps

The location and number of the construction camps will in part depend on the number of construction packages. Preliminary locations for the following construction camp sites have been identified:

- Ngwadini abstraction, Ngwadini rising main and Ngwadini Dam site;
- Goodenough abstraction, high lift pump station, reservoir site and associate pipeline;
- WTP;
- The gravity main from Goodenough Reservoir to the WTP; and

- The gravity main from the WTP to Quarry reservoir.

The suggested locations for the construction camps are provided in **Figures 17** and **18**. No construction camp sites were identified within the dam basin due to the narrow, steep-sided dam basin. The construction camp locations will need to be reviewed further during the detailed design phase. Two site camps will be required at the Ngwadini Dam and abstraction site. One shall be used as a lay-down area and the other as a professional camp. Site dimensions are assumed to be 50 000m². Site camps near the Goodenough infrastructure and WTP are slightly smaller, at a suggested 18 000m². Lay-down areas along the pipeline route have been designed to vary between 18 000m² and 8 000m², depending on site topography.

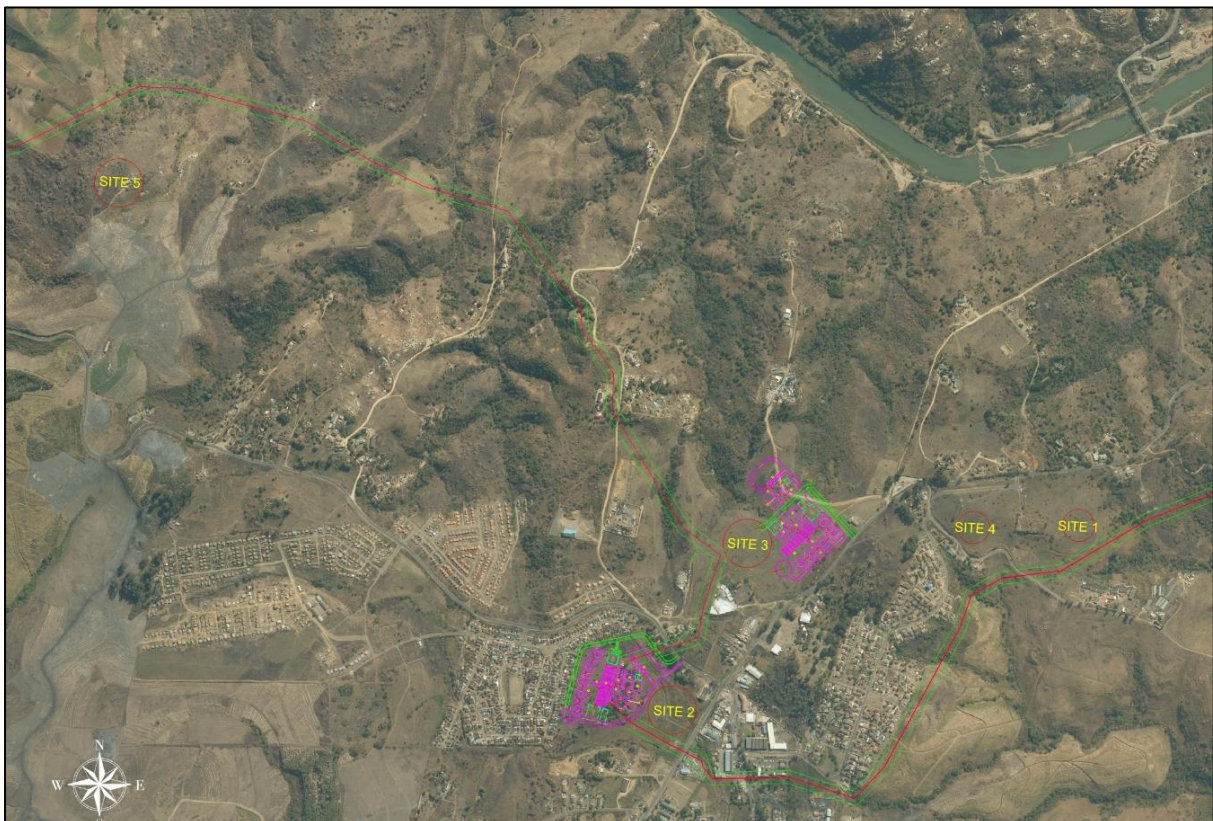


Figure 17: Construction Camp Sites Section 1



Figure 18: Construction Camp Sites Section 2

6 ALTERNATIVES

6.1 Introduction

The 2014 EIA Regulations, as amended (07 April 2017) require that feasible project specific alternatives are identified (including the "do nothing" option). Alternatives are defined as different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

- property on which or location where the activity is proposed to be undertaken;
- type of activity to be undertaken;
- design or layout of the activity;
- technology to be used in the activity; or
- operational aspects of the activity; and
- the option of not implementing the activity.

The sub-sections to follow discuss the alternatives investigated during the Feasibility Study that led to the selected location of the proposed Ngwadini weir and abstraction works being selected as the best option to implement. In addition, the alternatives to be assessed in the BA process are also detailed.

By conducting the comparative analysis, the BPEO can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that “provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term”.

6.2 Alternatives Screened during the Feasibility Phase

A number of alternatives were considered during the Feasibility Study conducted for the project in April 2016.

Site alternatives for the abstraction works were investigated during the feasibility and design phases by Brown and Roots for SAPPI SAICCOR. This included a physical hydraulic model study at the University of Stellenbosch in 1997. The physical model study concluded that the conditions were not ideal at either the natural weir position Option 1B, or downstream at Option 1A, as such a point further downstream on a straighter reach of the river at Option 2 was considered and investigated further. During the site visit on February 2015, an additional site was added to the options, namely Option 3, via visual inspection of the conditions (**Figure 19**).

However, after having received authorisation for the Ngwadini weir and abstraction works based on the options investigated, the weir and abstraction works was relocated (**Figure 20**). The following were considered in the abstraction works site selection:

- Sites suggested or recommended by previous studies as well as sites identified during a site visit in February 2015;
- River bend flow and secondary currents to create local scour at the intake and transport bedload away from the intake;
- Location of the main channel relative to the floodplain on the right-hand river bank, and the steepness of the river bank, to allow the shortest intake wall; and
- Weir length.

The chosen weir position was upstream of the previous positions considered during investigations for SAPPI SAICCOR, based on a combination of suitable hydraulic conditions on the outside of a bend, and good topography and geotechnical conditions.

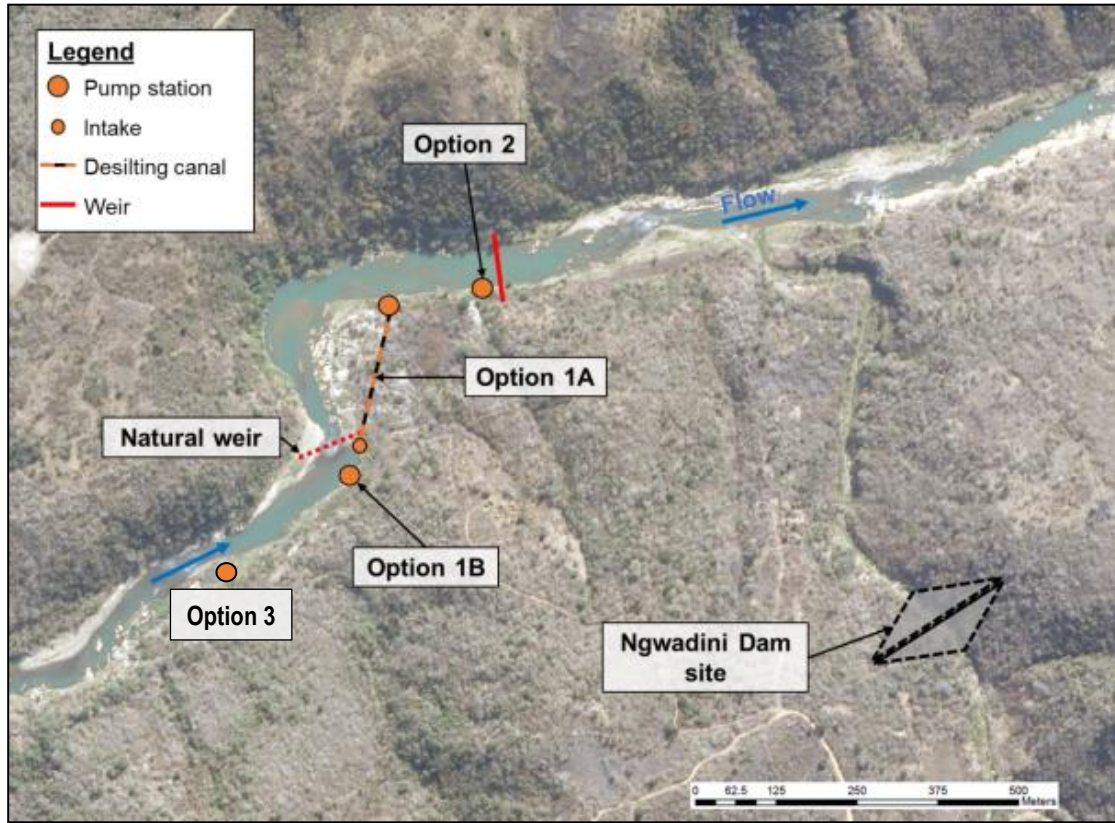


Figure 19: Location options for the Ngwadini weir and abstraction works

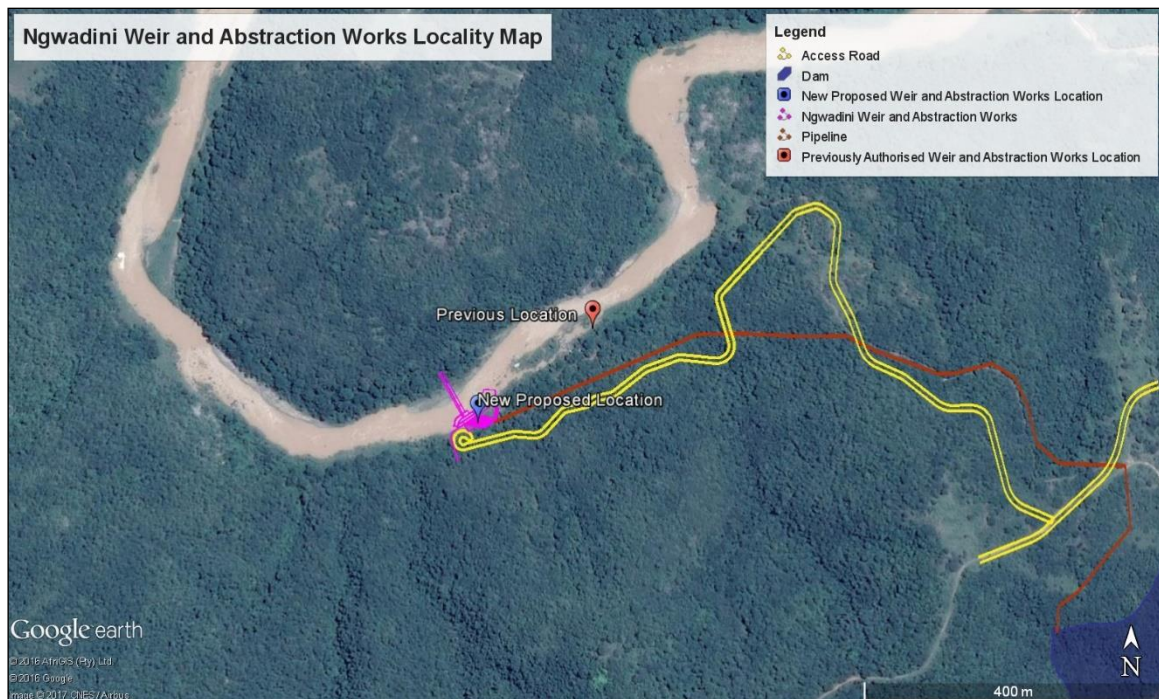


Figure 20: Previously authorised and new proposed locations for the Ngwadini weir and abstraction works

In addition to the change in location of the Ngwadini weir and abstraction works, the configuration of the works was also investigated. A number of abstractions works configuration options were considered during the feasibility design:

- Pumps only without weir and abstractions works;
- Abstraction works and weir with hoppers; and
- Abstraction works with weir and pump canals.

Pumps station only, without weir and abstraction works

The abstraction works mainly comprise of a rectangular pump station with a river intake and pump sump at the bottom and three operating levels (**Figure 21**). No weir is provided. The road entrance to the pump station and highest operating level is located above the 1:100 year flood line (75 masl). A concrete guide wall in the river at the existing rock outcrop directs flows through the intake canal during low flows to measure the flow depth. Water flows through trashracks before entering the intake canal, penstock and ultimately the pump sump. One pump with a peak duty discharge capacity of 0.425 m³/s, as well as space for a second future pump, is located on the downstream end of the pump station. The pump and motor are situated above the 1:100 year flood line with an intake pipe down to the pump sump. The slope of the sump is inclined down towards the middle. Falls in the sump floor towards the pump intake pipes are provided. A jet pump is located in the lowest point of the pump sump, below the pump intake pipe, for desilting purposes.

This option was not considered further due to a number of issues which included reliability and capacity challenges. Without a weir, abstracting the flows during low flow periods would be difficult, as the flow may meander away from the pumps inlet. During high flow periods, debris, sediment and rocks could cause operational challenges and impact reliability without an abstraction works. In addition, this option was not considered further for the following reasons:

- The abstraction capacity or peak discharge capacity is not sufficient – larger or more pumps should be provided;
- No standby capacity accounted for – a second pump can be installed however, it is not recommended to have only one duty pump; and
- The sediment exclusion capability is not considered sufficient and sediment accumulated in the pump sump cannot be flushed. Although a jet pump is provided to desilt the sump, additional pumps sump cleaning measures need to be incorporated should the jet pump fail.

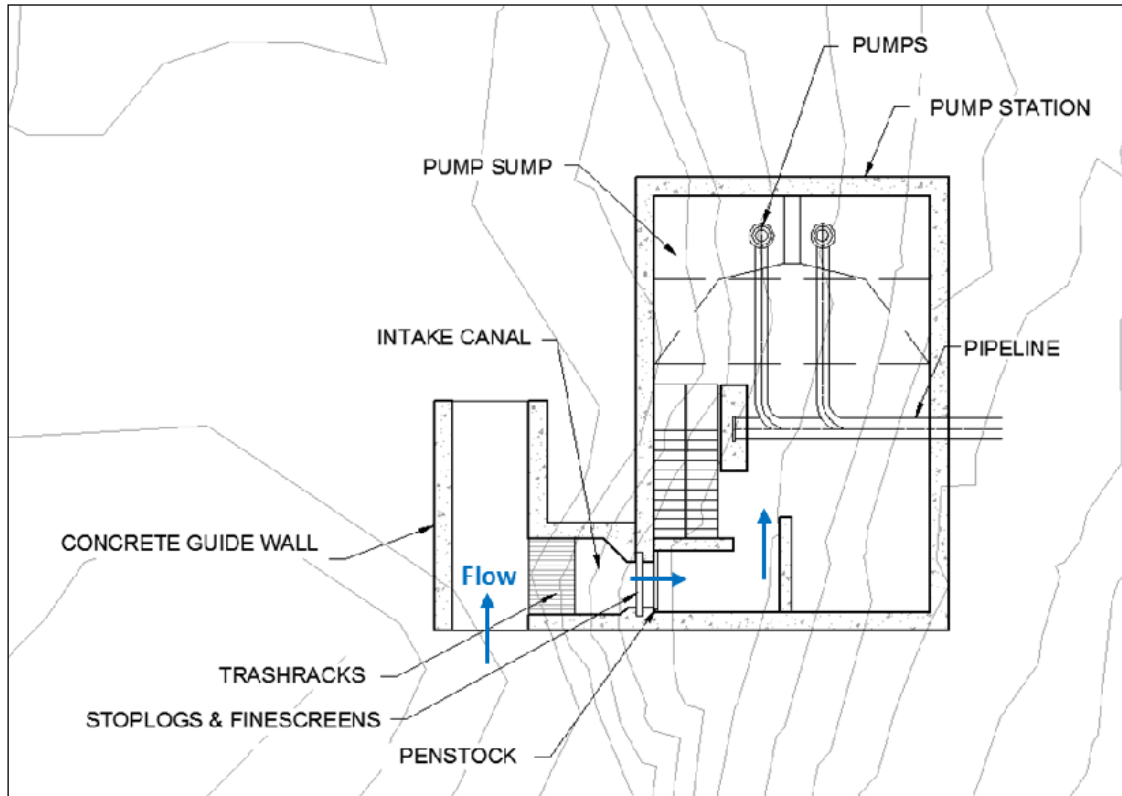


Figure 21: Option 1 Layout Configuration

6.3 Ngwadini Weir and Abstraction Works Configuration Options

The following abstraction works layout options will be assessed as alternatives for the project:

Option 1: Abstraction works with weir and hopper(s)

Option 1 consists of a submerged inlet weir to a gravel trap and a sand trap (**Figures 22 and 23**). A weir is incorporated to ensure sufficient head for flushing the gravel and sand traps as well as to ensure sufficient head for the pumps during low flow conditions. The weir has a 15m long low notch adjacent to the abstraction works to direct water towards the submerged weir of the gravel trap. The height of the low notch is approximately 2m from the river bed. The remainder of the weir will be 300mm higher than the low notch. The gravel and sand traps allow coarse sediment particles to settle out before entering the hoppers. Both these traps can be flushed by opening the radial gates on the downstream ends of the traps. The slope of both these traps is steep to ensure sufficient flushing. The gravel trap is submerged during normal operating conditions. The inlet to the sand trap has trash racks to prevent debris and gravel from entering. The soffit of the trash rack is below the MOL to ensure that no floating debris will collect at the front. The hopper(s), hydraulically connected to the sand trap, is shaped like upside down pyramids. A jet pump(s) is situated at the bottom of the hopper to remove

sediment. The hopper(s) is protected by side walls and cover slabs up to the 1:100 year flood level. Three submersible pumps, each with a short pump canal, are situated behind the hopper. Two pumps will be duty pumps whereas the third will be a standby pumps, thus providing a 50% standby capacity. The majority of sediment is removed via the hopper(s) and jet pump(s) and thus less head is required to flush other components such as the gravel and sand traps. In light of this, the diversion weir can possibly be lower, ultimately limiting the impact on the river.

However, the use of jet pumps and hoppers are less preferred due to the following:

- Additional flow of minimum 12 l/s, is required to operate the jet pump;
- Jet pumps are highly dependent on power supply and skilled maintenance – both of which is limited in the area and amounts to higher operational costs;
- Sediment is overall not effectively deposited in the pit due to the shorter length available for settlement; and
- Fine sediment that may consolidate and affect the removing ability of the jet pump – causing unnecessary down time.

Provision is made for a vertical fishway between the gravel trap canal and the sand trap canal to enable the mitigation of fish from downstream to upstream.

The size of this option is as follows:

- Footprint including weir = 975m²; and
- Footprint excluding weir = 250m².



Figure 22: Ngwadini Weir and Abstraction Works Layout Option 1

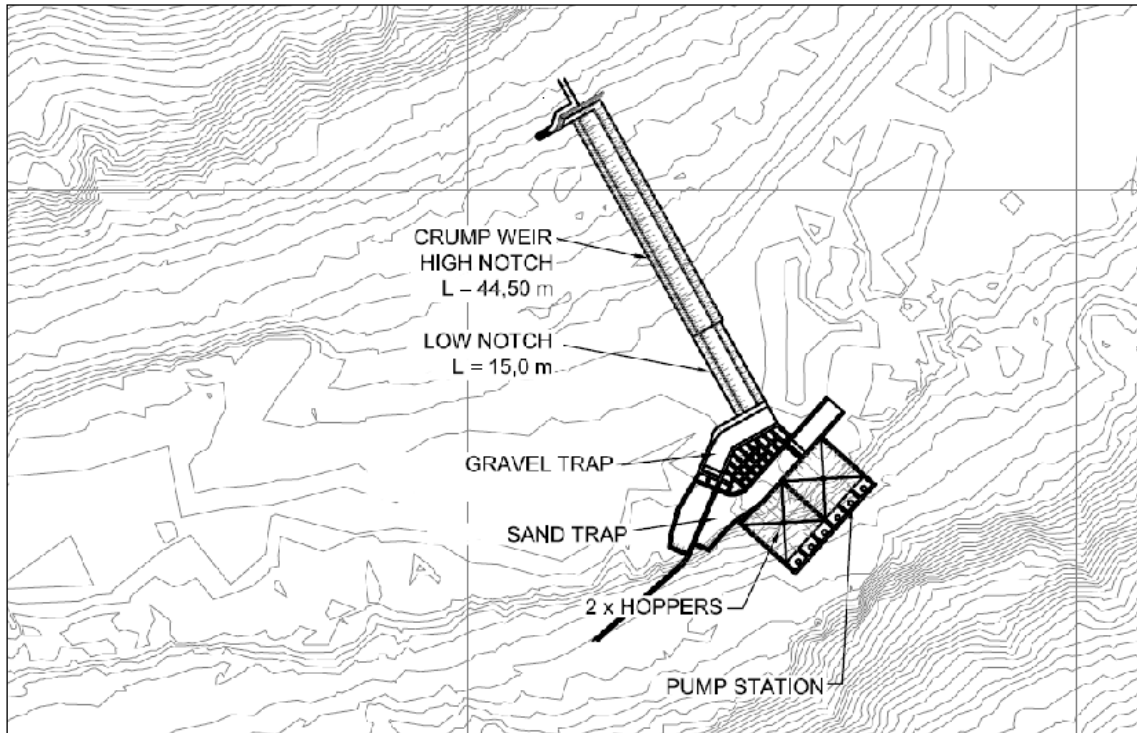


Figure 23: Option 2 Layout Configuration

Option 2: Abstraction works with weir and pump canals

The abstraction works option 2 comprises of a weir, boulder trap, high wall with openings to a gravel trap with protected trash racks, sand traps or pump canals and a dry well pump station (**Figures 24 and 25**). The design aims to remove as much sediment as possible and has a higher reliability compared to the other options. Similar to Option 1, a weir is required but the height of the low notch above the river bed should be approximately 3m to ensure adequate flushing. Water enters the boulder trap by flowing over the low notch of the weir near the right bank. The majority of the coarse sediment particles, such as boulders and cobbles will deposit in the boulder trap. The boulder trap is self-scouring during medium to large floods, but can be flushed during small floods by opening the downstream radial gate. Water from the boulder trap enters the two gravel traps through a set of submerged openings in a high wall. The less turbulent flow in the gravel traps allow for the deposition of gravel and sand particles. A low dividing wall is provided between the gravel traps to deflect water from the high wall openings during flushing. The slopes of the gravel traps are different. Radial gates at the downstream ends allow for the flushing of the gravel traps. From the right gravel trap, water splits into sand traps through a set of trash racks inclined 20 degrees to the vertical. The trash racks prevent large floating debris from entering the pump canals. A working platform above the 1:100 year flood line is provided to permit raising and cleaning of the trash racks. Finer sediment is deposited in the sand traps or pump canals. Each canal is designed to accommodate a

maximum discharge capacity of $0.9\text{m}^3/\text{s}$ and has a pump intake to a dry well installed pump at the downstream end. The pumps should be capable of handling coarse sediment up to 40mm in diameter. Concrete benching with a slope of 0.25H:0.5V is provided at the bottom corners of the pump canals to improve the flushing at low river flows. Fine screens and stop logs are situated upstream of the pumps for protection purposes. The pump canals can be flushed during small floods by opening a vertical sluice gate downstream of the pump. The fine screens and stop logs must be raised during flushing. A river return canal is located on the downstream end of the pump canals to divert water from the pump canals back to the uMkhomazi River during flushing. Provision is also made for a fishway on the downstream side of the pump canals to enable the mitigation of fish from downstream to upstream.

The size of this option is as follows:

- Footprint including weir = 2500m^2 ; and
- Footprint excluding weir = 1150m^2 .



Figure 24: Ngwadini Weir and Abstraction Works Layout Option 1

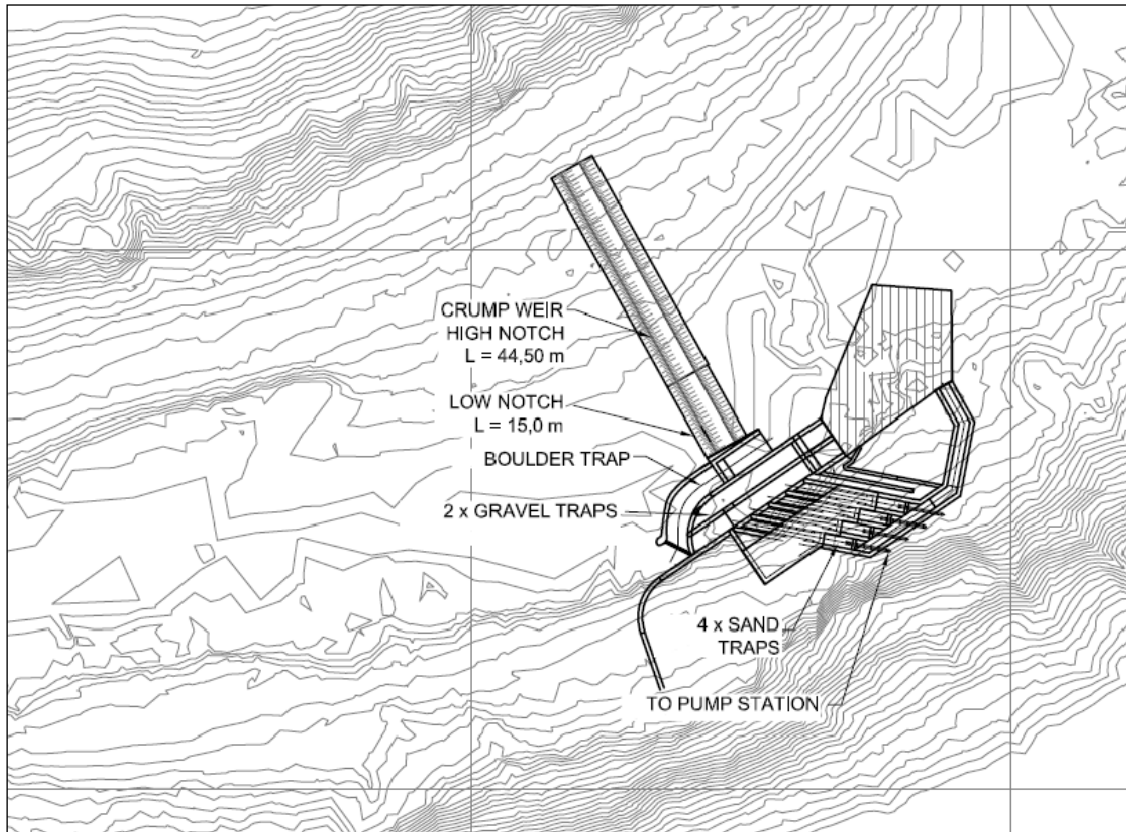


Figure 25: Option 3 Layout Configuration

6.4 Preferred Ngwadini Weir and Abstraction Works Layout

Option 2 was selected as the preferred option for the following reasons:

- The trashracks are protected, which will require less frequent cleaning and maintenance compared to the unprotected trashracks of Option 1;
- The high wall and submerged inlets included in Option 1, directs debris away from the trashracks and reduces the accumulation thereof;
- The high wall allows easier cleaning of the trashrack during floods as the flow is less turbulent behind the wall;
- Jet pumps, as included in Option 2, are not preferred due to the reliability issues;
- Less pumps are required for Option 2 and subsequently less maintenance and operational effort, especially with regard to the exclusion of jet pumps;
- The availability of submersible pumps capable of meeting the required pump head of 81.5 m and the associated flow capacity is very limited and specialised. Dry well high lift pumps are more commonly available and also have the advantage that they can be visually inspected during operation;

- The double gravel traps and sand traps or pump canals of Option 2 allows for more sediment to be deposited before the sediment laden water reaches the pumps and subsequently Ngwadini Dam; and
- The overall layout contributes to a more robust design and lower risk of failure.

A view of the Ngwadini weir and abstraction works site is provided in **Figure 26**.



Figure 26: Ngwadini weir and abstraction works site

6.5 No-go Alternative

The 'no-go' alternative refers to a situation where the proposed Ngwadini weir and abstraction works, as well as the pipeline from the abstraction works to the OSC Dam is not built. This would mean that there will be no transfer of water from the uMkhomazi River to the OSC Ngwadini Dam during summer periods of excess flow, therefore the Ngwadini OCS Dam will not be filled.

Based on the medium growth scenario, the LUBWSS needs to be sized to provide an additional average volume of 100 Ml/d (with a 130 Ml/d designed peak capacity), to meet the future 30-year demand projection.

Based on **Figure 27**, the risk of non-supply of water to Ngwadini OSC Dam in a given year appears to be about even (i.e. about 50 %). If Ngwadini were not to be built, the risk captured in **Figure 27** would be the risk each year until Smithfield Dam was completed. Not building Ngwadini Dam would also require Impendle Dam to be brought forward.

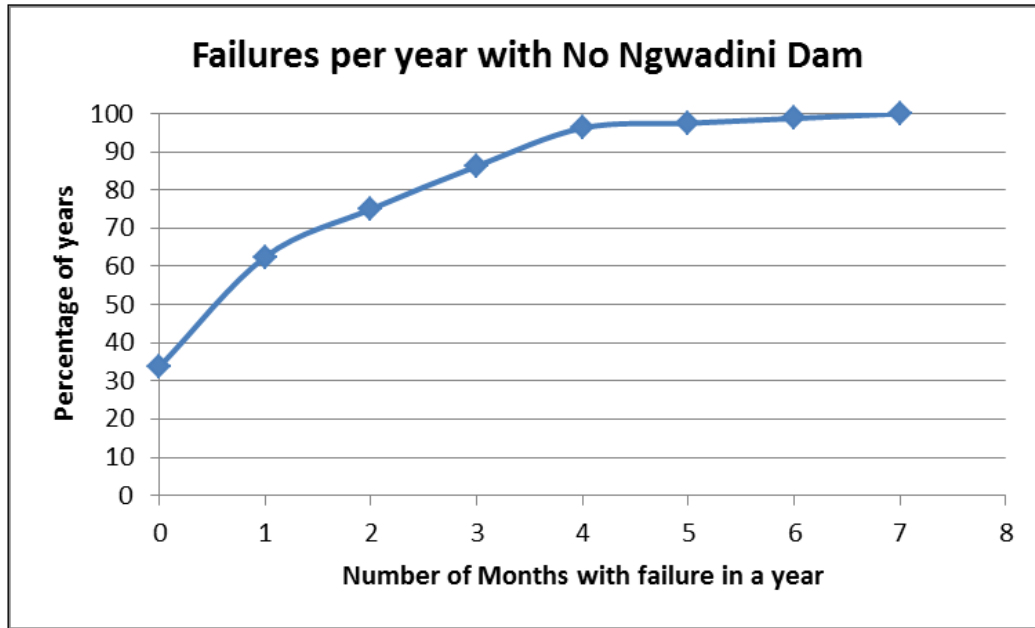


Figure 27: Projected number of failure months per year for a scenario with no Ngwadini Dam

As a result of the Ngwadini weir, abstraction works and pipeline not being built, the Ngwadini OCS Dam will not be filled, therefore there would not be the much needed increase in water supply to the South Coast of KwaZulu-Natal. In addition, the projected 30-year water demands will not be met. If future water requirements are not met, severe and frequent restrictions of water supply may need to be implemented in the region. These restrictions would be in effort to support the projected growth and water requirements in the water supply area of the South Coast.

7 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed as the Independent Environmental Assessment Practitioner (EAP) to compile the BAR for the proposed Ngwadini weir, abstraction works and pipeline. This section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the project team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng), Durban (KwaZulu-Natal), and Cape Town (Western Cape).

The core members of Nemai Consulting that are involved with the project are captured in **Table 5** below.

Table 5: Project Team Core Members

Name	Qualification	Responsibility
Ms D. Naidoo	BSc – Eng (Chem)	Project Manager and Environmental Engineering
Mr D. Henning	MSc – Aquatic Health Ecology	Environmental Assessment Practitioner/Study Leader
Ms. S. Gerber	BSc (Hons) – Environmental Sciences	Environmental Assessment Practitioner

8 LEGISLATION AND GUIDELINES CONSIDERED

8.1 Overview of Legislation

The legislation that has possible bearing on the proposed project from an environmental perspective is captured in **Table 6** below. **Note:** *this list does not attempt to provide an exhaustive explanation, but rather represents an identification of the most appropriate sections from pertinent pieces of legislation.*

Table 6: Environmental statutory framework

Legislation	Relevance
Constitution of the Republic of South Africa (Act No. 108 of 1996)	Chapter 2 – Bill of Rights. Section 24 – environmental rights.
National Environmental Management Act (Act No. 107 of 1998)	Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment). Section 28 – Duty of care and remediation of environmental damage. Environmental management principles. Authority – DEA.
GN. R. 982 of amended 2014 EIA Regulations (07 April 2017)	Purpose – regulate the procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.
GN. No. R. 983 of 2014 EIA Regulations, as amended (07 April 2017) (Listing Notice 1)	Process for undertaking Basic Assessment / Scoping and EIA process.
GN. No. R. 984 of 2014 EIA Regulations, as amended (07 April 2017) (Listing Notice 2)	Activities that need to be assessed through a Basic Assessment process.
GN. No. R. 985 of 2014 EIA Regulations, as amended (07 April 2017) (Listing Notice 3)	Activities that need to be assessed through a Scoping and EIA process.

Legislation	Relevance
National Water Act (Act No. 36 of 1998)	Chapter 3 – Protection of water resources. Section 19 – Prevention and remedying effects of pollution. Section 20 – Control of emergency incidents. Chapter 4 – Water use. Chapter 12 – Safety of dams Authority – DWS.
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes. Authority –DEA.
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	Air quality management. Section 32 – dust control. Section 34 – noise control. Authority – DEA.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	Management and conservation of the country's biodiversity. Protection of species and ecosystems. Authority – DEA.
National Environmental Management: Waste Act (Act No. 59 of 2008)	Chapter 5 – licensing requirements for listed waste activities (Schedule 1). Authority – Minister (DEA) or MEC (provincial authority)
Occupational Health & Safety Act (Act No. 85 of 1993)	Provisions for Occupational Health & Safety. Authority – Department of Labour.
National Heritage Resources Act (Act No. 25 of 1999)	Section 34 – protection of structure older than 60 years. Section 35 – protection of heritage resources. Section 36 – protection of graves and burial grounds. Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m ² in extent. Authority – Amafa aKwaZulu-Natali.
KZN Heritage Act (Act No. 04 of 2008)	Conservation, protection and administration of both the physical and the living or tangible heritage resources of KZN. Authority – Amafa aKwaZulu-Natali.
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	Control measures for erosion. Control measures for alien and invasive plant species. Authority – Department of Forestry and Fisheries (DAFF) and Department of Agriculture.
National Forestry Act (Act No. 84 of 1998)	Section 15 – authorisation required for impacts to protected trees. Authority – DAFF.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	Permit required for borrow pits. Authority – Department of Mineral Resources (DMR).
National Road Traffic Act (Act No. 93 of 1996)	Authority – Department of Transport (DoT).
Tourism Act of 1993	Authority – South African Tourism Board.
KwaZulu-Natal Nature Conservation Management Act (Act No. 09 of 1997).	Institutional bodies for nature conservation in KZN. Establish control and monitoring bodies and mechanisms. Authority – Ezemvelo KZN Wildlife.

Legislation	Relevance
Kwazulu-Natal Planning and Development Act (Act No. 06 of 2008)	Directs and regulates planning and development in KZN. An application may be required before land may be used or developed for a particular purpose. All developments need to be in accordance with the municipality's planning scheme. Authority – Municipality
Integrated Coastal Management Act (Act No. 24 of 2008)	Management of uMkomaas Estuary. Authority – DEA.
Spatial Planning and Land Use Management Act (Act No.16 of 2013)	Directs and regulates planning and development in South Africa. Govern planning permissions and approvals, sets parameters for new developments and provides for different lawful land uses in South Africa. Authority – DEA.

8.2 The Constitution (Act No. 108 of 1996)

The Constitution of the Republic of South Africa, Act No. 108 of 1996, is the supreme law of the land and provides amongst others the legal framework for legislation regulating coastal management in general. It also emphasises the need for co-operative governance. In addition, the Environmental clause in Section 24 of the Constitution provides that:

“Everyone has the right –

- a) To an environment which is not harmful to their health or wellbeing;*
- b) To have the environment protected for the benefit of present and future generations through reasonable legislation and other measures that:

 - I. Prevent pollution and ecological degradation;*
 - II. Promotes conservation;*
 - III. Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development”.**

The Constitution provides the overarching framework for sustainable development.

8.3 The National Environmental Management Act (Act No. 107 of 1998)

The proposed Ngwadini weir, abstraction works and pipeline in terms of NEMA, and the BAR was undertaken in accordance with the 2014 EIA Regulations, as amended (07 April 2017).

The 2014 EIA Regulations, as amended, consist of the following:

- EIA Procedures - Government Notice No. R. 982;
- Listing Notice 1 - Government Notice No. R. 983;
- Listing Notice 2 - Government Notice No. R. 984; and

- Listing Notice 3 - Government Notice No. R. 985.

The proposed development triggered activities under Listing Notices 1 and 3 and thus a BA process needs to be undertaken. The listed activities are fully explained in context of the project in **Table 7**.

Table 7: Listed activities triggered by the proposed project

Listed Activity	Listed Activity Description per project														
<p>GN 983 – Activity 9</p> <p>The development of infrastructure exceeding 1 000 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;</p>	<p>Details of the pipeline to fill the OCS Dam are provided below:</p> <table border="1"> <thead> <tr> <th rowspan="2">Pipeline</th> <th colspan="4">Full capacity of scheme designed</th> </tr> <tr> <th>Flow (Mℓ/d in 18hours)</th> <th>Velocity (m/s)</th> <th>Length (m)</th> <th>Diameter (mm)</th> </tr> </thead> <tbody> <tr> <td>To fill OCS dam</td> <td>65 Mℓ/d</td> <td>1.273 m/s</td> <td>1150 m</td> <td>DN1000</td> </tr> </tbody> </table>	Pipeline	Full capacity of scheme designed				Flow (Mℓ/d in 18hours)	Velocity (m/s)	Length (m)	Diameter (mm)	To fill OCS dam	65 Mℓ/d	1.273 m/s	1150 m	DN1000
Pipeline	Full capacity of scheme designed														
	Flow (Mℓ/d in 18hours)	Velocity (m/s)	Length (m)	Diameter (mm)											
To fill OCS dam	65 Mℓ/d	1.273 m/s	1150 m	DN1000											
<p>GN 983 – Activity 12</p> <p>The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —</p>	<p>Various infrastructure within 32m from watercourse(s) and within a watercourse, including:</p> <ul style="list-style-type: none"> • Weir and abstraction works (uMkhomazi River); • Pipeline; and • Access roads. 														
<p>GN 983 – Activity 19</p> <p>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 of more than 10 cubic metres from a watercourse;</p>	<p>Construction of various infrastructure within watercourse(s), including:</p> <ul style="list-style-type: none"> • Weir and abstraction works; and • Access road. <p>This will result in the excavating, dredging and infilling within a watercourse of more than 10m³.</p>														
<p>GN 983 – Activity 24</p> <p>The development of a road— (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;</p>	<p>The new access road to be constructed will be 8m in width where no reserve exists.</p>														
<p>GN 983 – Activity 30</p> <p>Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).</p>	<p>The proposed developments will fall within areas of KZN ESA areas. In addition, multiple plant species of conservation of importance was identified on site by the Ecological Specialist.</p>														

Listed Activity	Listed Activity Description per project
<p>GN 985 – Activity 4(d)(xi)</p> <p>The development of a road wider than 4 metres with a reserve less than 13,5 metres.</p> <p>d. KwaZulu-Natal xi. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p>	<p>The proposed developments will fall within areas of KZN ESA areas.</p>
<p>GN 985 – Activity 14(d)(viii)</p> <p>The development of—</p> <p>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or</p> <p>(ii) infrastructure or structures with a physical footprint of 10 square metres or more;</p> <p>where such development occurs—</p> <p>(a) within a watercourse;</p> <p>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p>d. KwaZulu-Natal viii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p>	<p>The construction of various infrastructure will occur within watercourse(s) or within 32m of a watercourse, including:</p> <ul style="list-style-type: none"> • Weir and abstraction works; • Pipeline; and • Access road. <p>The proposed developments will fall within areas of KZN ESA areas within a watercourse and within 32m from a watercourse.</p>

8.4 The National Environmental Management: Waste Act (Act No. 59 of 2008)

The National Environmental Management Waste Act (Act No. 56 of 2008) (NEM: WA) regulates waste management in order to protect the health and environment of South African citizens. This is achieved through pollution prevention, institutional arrangements and planning matters, national norms and standards and the licensing and control of waste management activities.

The list of waste management activities that have or are likely to have a detrimental effect (GN No. 921 of 29 November 2013) contains activities listed in Categories A and B that would require licensing from the provincial or national authorities and activities contained in Category C which would require meeting the requirements of various Norms and Standards.

The purpose of the Norms and Standards for the Storage of Waste is to provide a uniform approach to the management of waste storage facilities, ensure best practice is the management of waste storage facilities and provide minimum standards for the design and operation of new and existing waste storage facilities.

The Norms and Standards require registration of new storage facilities. They also provide details on the management of all storage facilities in terms of access control and notices, operation, general requirements of waste storage containers, minimum requirements for above ground storage facilities and minimum requirements for below ground storage facilities.

The Norms and Standards also require that training be undertaken and an emergency preparedness plan be compiled. In addition, specific monitoring and inspections need to be undertaken as well as internal and external audits.

The following should be noted with regards to waste management during the Construction Phase:

- Temporary waste storage facilities will remain below the thresholds contained in the listed activities under Schedule 1 of NEM: WA; and
- The Environmental Management Programme (EMPr) will make suitable provisions for waste management, including the storage, handling and disposal of waste.

8.5 The National Water Act (Act No. 36 of 1998)

The National Water Act (Act No. 36 of 1998) (NWA) regulates the water resource of South Africa and aims to achieve the sustainable use water for the benefit of all users. Water is considered a scarce commodity and should therefore be adequately protected. Amongst others, the act deals with the protection of water sources, water uses, water management strategies and catchment management, dam safety and general powers and functions, as well as water quality.

The purpose of the act is to ensure that South Africa's water resources are protected, used, developed, conserved, managed and controlled, and for achieving this purpose, to establish suitable institutions and to ensure that they have appropriate community, racial and gender representation.

Section 21 of the NWA provides information on what water uses require approval (i.e. Water Use License Applications or WULAs). These include:

- a) Taking water from a water resource;
- b) Storing water;
- c) Impeding or diverting the flow of water in a watercourse;
- d) Engaging in a stream flow reduction activity;
- e) Engaging in a controlled activity;
- f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- g) Disposing of waste in a manner which may detrimentally impact on a water resource;

- h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- i) Altering the bed, banks, course or characteristics of a watercourse;
- j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- k) Using water for recreational purposes.

Any development within a regulated area of a watercourse, namely the riparian habitat, 1:100 year floodline, wetland systems or a 500m radius of a wetland will require an authorisation from DWS.

As the proposed development occurs within a regulated area of a watercourse and involves abstraction of water, an Integrated WULA (IWULA) is required in terms of Sections 21 (a), (b), (c) and (i) of the NWA (**Table 8**).

Table 8: Explanation of the relevant NWA Section 21 Activities

Section 21	Description of Water Use	Relevance to Project
21 (a)	Taking water from a water resource	Abstraction from the uMkhomazi River at the Ngwadini Weir and Abstraction Works.
21 (b)	Storing water	Storage of water in the Ngwadini OCS Dam.
21 (c)	Impeding or diverting the flow of water in a watercourse	Construction activities within the regulated area of any watercourse. This includes encroachments into the regulated areas of watercourses by the following project infrastructure – weir, abstraction works and watercourse crossings (pipelines and access roads).
21 (i)	Altering the bed, banks, course or characteristics of a watercourse	

The requisite documentation to satisfy DWS’s requirements for the Water Use Authorisation process will be compiled. In addition, an aquatic and wetland assessment has been conducted and is summarised in **Section 17**.

8.6 The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)

The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) sets out the requirements with which applicants for prospecting rights, mining rights and mining permits must comply in Sections 16, 22 and 27 of the MPRDA. The MPRDA aims “to make provision for equitable access to and sustainable development of the nation’s mineral and petroleum resources; and to provide for matters connects therewith”.

No Mining Permits are required for the proposed development as borrow pit material (e.g. soil, gravel or sand) will be sourced from a commercial source.

8.7 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) was promulgated for the management and conservation of South Africa's biodiversity through the protection of species and ecosystems and the sustainable use of indigenous biological resources.

The main implication of this act is the protection of biodiversity.

The proposed development falls within Ecological Support Areas (ESAs), and traverses watercourses, therefore NEMBA needs to be considered.

8.8 The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

The aim of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003) (NEMPA) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a Protected Environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

The proposed development does not occur within a Protected Area.

8.9 National Forest Act (Act No. 84 of 1998)

In terms of the National Forests Act (Act 84, 1998), trees in natural forests or protected tree species (as listed in Government Gazette Notice 1012 of 27 August 2004) may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under licence granted by the DAFF.

8.10 National Heritage Resources Act (Act No. 25 of 1999)

The National Heritage Resources Act (Act No. 25 of 1999) was promulgated for the protection of National Heritage Resources and the empowerment of civil society to conserve their heritage resources.

The proposed developments will trigger certain categories as listed below that require a Heritage Impact Assessment (HIA) in terms of Section 38 of the National Heritage Resources Act. These categories are:

- Any development or other activity which will change the character of a site
 - Exceeding 5 000 m² in extent; or
 - Involving three or more existing erven or subdivisions thereof; or
 - Involving three or more erven or divisions thereof which have been consolidated within the past five years;
 - The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; or
 - Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

The Act also makes provision for General Protections, which apply automatically to certain categories of heritage resources such as archaeological and paleontological sites, cemeteries and graves, and structures older than 60 years.

As the pipeline and access road exceed 300m, a Phase 1 HIA is required. The HIA compiled will be submitted to Amafa aKwaZulu-Natali for comment and approval.

8.11 The National Environmental Management: Air Quality Act (Act No. 39 of 2004)

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEMAQA) provides for the setting of national norms and standards for regulating air quality monitoring, management and control and describes specific air quality measures so as to protect the environment and human health or well-being by:

- Preventing pollution and ecological degradation; and
- Promoting sustainable development through reasonable resource use.

It also includes the establishment of national ambient dust fall out levels that may be relevant to the construction.

There will be dust impacts associated with the construction phase of the project. Therefore, no authorisation in terms of NEMAQA is required. However, NEMAQA needs to be considered to decrease ambient dust impacts associated with construction activities.

8.12 The Occupational Health and Safety Act (Act No. 85 of 1993)

The Occupational Health and Safety Act (Act No. 85 of 1993) provides for the health and safety of people at work as well as the health and safety of persons using plant and machinery.

This act will need to be taken into account should the proposed development be approved.

8.13 Policy, Programmes, Guidelines and Plans

8.13.1 Guidelines

The following guidelines were considered during the preparation of the Scoping Report:

- Integrated Environmental Management Information Series, in particular Series 2 – Scoping (DEAT, 2002);
- Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2010a);
- Guideline on Need and Desirability, EIA Guideline and Information Document Series (DEA&DP, 2010b);
- Integrated Environmental Management Guideline Series 5: Companion to the EIA Regulations 2010 (DEA, 2010a);
- Integrated Environmental Management Guideline Series 7: Public Participation in the EIA Process (DEA, 2010b); and
- Guidelines for Involving Specialists in the EIA Processes Series (Brownlie, 2005).

8.13.2 Regional Plans

The following regional plans will be considered during the execution of the EIA:

- National Development Plan;
- KZN Provincial Biodiversity Plan;
- Durban Metropolitan Open Space System;
- eThekweni Municipality Durban's Systematic Conservation Assessment;
- Municipal Spatial Development Frameworks (SDF);
- Municipal Integrated Development Plans (IDP); and
- Relevant provincial, district and local policies, strategies, plans and programmes.

9 BASIC ASSESSMENT PROCESS

9.1 Environmental Assessment Triggers

The proposed Ngwadini weir, abstraction works and pipeline entails certain activities that require authorisation in terms of NEMA. Refer to Section 7 for further discussion on the legal framework.

The process for seeking authorisation is undertaken in accordance with the 2014 EIA Regulations (GN No. R. 982, R. 983, R. 984 and R. 985), as amended (07 April 2017), promulgated in terms of Chapter 5 of NEMA.

Based on the types of activities involved which include activities listed in GN No. R. 983, R. 984, and R. 985 of the 2014 EIA Regulations (as amended), the requisite environmental assessment for the project is a BA Process.

9.2 Environmental Assessment Authorities

In terms of the Regulations, the lead decision-making authority for the environmental assessment is the DEA, as the project proponent is Umgeni Water.

9.3 BA Process

9.3.1 Formal Process

An outline of the BA Process for the proposed Ngwadini weir, abstraction works and pipeline is provided in **Figure 28**.

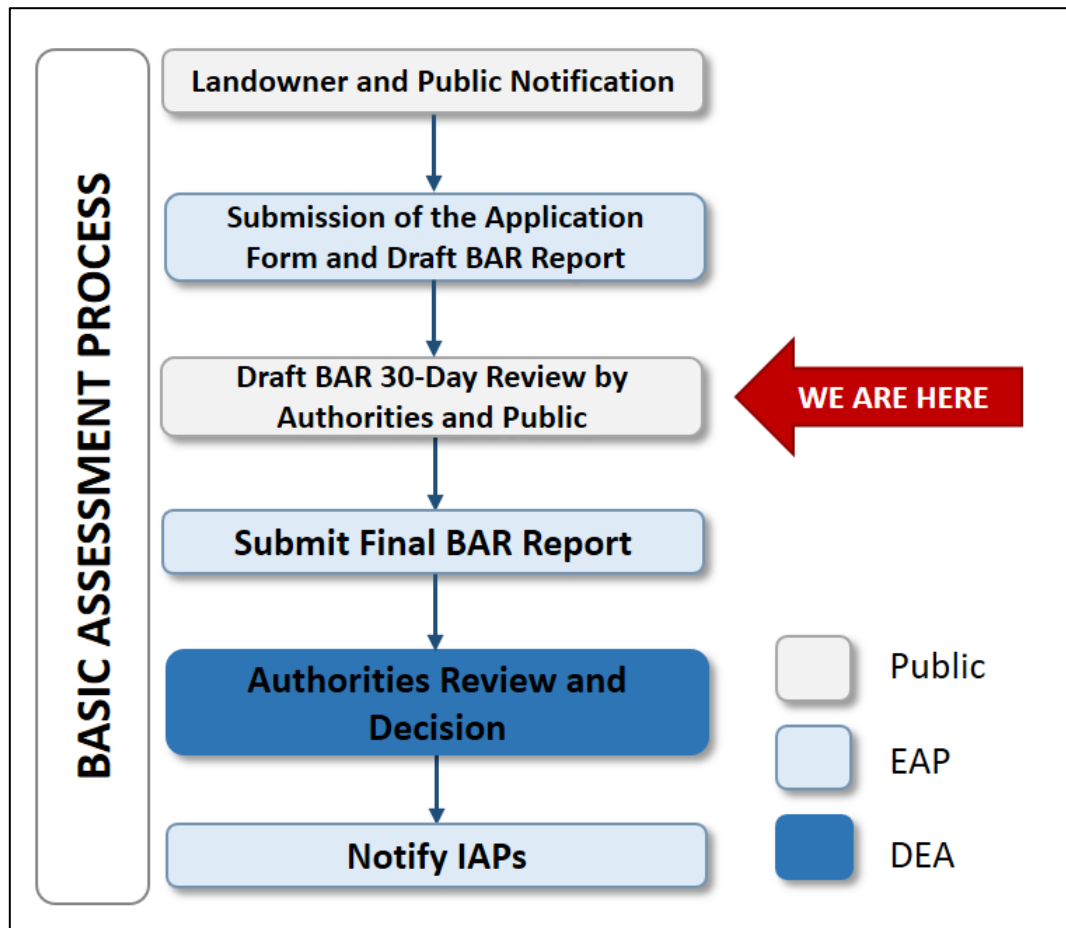


Figure 28: BA Process

9.3.2 Landowner Consent

According to Regulation 39(1) of GN No. R 982 of the 2014 EIA Regulations (as amended), if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.

This requirement does not apply *inter alia* for linear developments (e.g. pipelines, power lines, roads) or if it is a Strategic Integrated Project (SIP) as contemplated in the Infrastructure Development Act (2014). The project is a SIP project, therefore landowner consent is not required for the Ngwadini weir, abstraction works and pipeline.

9.3.3 Landowner Notification

The proposed Ngwadini weir, abstraction works and pipeline traverses Ingonyama Trust Board Land. The Ingonyama Trust Board and the Traditional Authority have been notified of the project and are thus aware of the proposed development in the area.

Please refer to **Appendix E4** for the proof of landowner notification and the consent received.

9.3.4 Application Form

An Application Form, in terms of Regulation 16 of Government Notice No. R. 982 of the 2014 EIA Regulations (as amended), will be submitted to DEA together with the Draft BAR.

9.3.5 Public Participation and Review of BAR

The Draft BAR will be made available to Interested and Affected Parties (IAPs) for a 30-Day Review Period. All comments received will be taken into account in the Final BAR and will also be noted in the Comments and Response Report.

More detail on the Public Participation Process is provided in **Section 15**.

10 ASSUMPTIONS AND LIMITATIONS

The following assumptions were made during the BA process:

- The detailed engineering design will be finalised at a later stage. The conditions of the EA, if issued, must be factored into the final design;
- As the design of the project components is still in feasibility stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change during the detailed design phase;

- The findings of the Impact Assessment are informed by the Specialist reports which are assumed to be accurate; and
- The mitigation measures provided in the EMPr will be implemented and it assumed that the measures are adequate and will successfully enhance positive impacts while limit the negative impacts.

11 NEED AND DESIRABILITY

In terms of 3(1)(f) of Appendix 1 of GN No. R. 982 of the amended 2014 EIA Regulations (07 April 2017), this section discusses the need and desirability of the project. The format contained in the Guideline on Need and Desirability (DEA&DP, 2009) has been used in **Table 9**.

Table 9: Need and Desirability

No.	Question	Response
NEED ('timing')		
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	<p>The Ugu IDP mentions the LUBWSS as part of Umgeni Water's Master Plan for Umgeni Water to provide bulk water infrastructure for the provision of potable water to Ugu District Municipality. In addition, one of the key issues identified in the Ugu IDP with regards to Service Delivery and Infrastructure Development was the rapidly aging infrastructure especially water infrastructure which has led to numerous water outages and slowed down the pace of backlog eradication.</p> <p>The continued economic growth and development of the KwaZulu-Natal Coastal Metropolitan area requires an assured water supply in line with DWS's policy of water for growth and development.</p> <p>The eThekweni Metropolitan Municipality SDF highlights one of the key interventions as improving basic infrastructure, provision of supporting infrastructure and services including housing opportunities and adequate facilities. This would include the provision of water. In addition, the provision of bulk water is identified as critical for the municipality.</p> <p>Therefore, the land use is considered in the SDFs and IDPs for the municipal areas.</p>

No.	Question	Response
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	The project involves the construction of the Ngwadini weir and abstraction works, as well as the pipeline between the Ngwadini abstraction works and the OCS Dam and an access road to the works. The proposed development is located on Ingonyama Trust land. As the Ingonyama Trust has provided consent that the developments can be built on their land, the land use rights will thus remain the same.
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate)	<p>The strategic need for the project is discussed in Section 3.</p> <p>The provision of basic services and bulk infrastructure such as water has been identified as a priority for the Umdoni Local Municipality, Ugu District Municipality, and eThekweni Metropolitan Municipality.</p> <p>This project will transfer water from the uMkhomazi River to the OCS Ngwadini Dam during summer periods of excess flow, therefore filling the OCS Ngwadini Dam. This will link into the LUBWSS and thus ensure that the local communities will have access to a safe and reliable supply of water, which will address the issue of the inadequate water provision within the municipal areas.</p>
4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	<p>The abstraction works will have water and sanitation facilities, both incorporated into the footprint of the site.</p> <p>All relevant applications will be submitted to all the Municipalities.</p>
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services)?	The proposed developments are categorised as water service provision and therefore is planned for under the municipalities due to the need for increased water supply.
6.	Is this project part of a national programme to address an issue of national concern or importance?	There is an urgent need to provide water services to communities within South Africa. With the completion of this project, basic water services will be provided to the citizens within KwaZulu-Natal in South Africa through the provision of water.
DESIRABILITY ('placing')		
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	Two alternative abstraction works layouts are considered for the project. Option 2 was selected. Reasons are provided in Appendix 6.4 .

No.	Question	Response
		<p>The BPEO therefore includes the following:</p> <ul style="list-style-type: none"> • Abstraction Works Layout Option 2; • Mitigation measures recommended by the Specialists; and • The measures proposed by the Stormwater Management Plan, and the Geotechnical Investigation.
8.	<p>Would the approval of this application compromise the integrity of the existing approved municipal IDP and Spatial Development Framework (SDF) as agreed to by the relevant authorities?</p>	<p>In the KZN Spatial Development Framework, the Mkomazi – Umgeni Transfer Scheme is listed as one of the provincial catalytic projects to support growth and development within the eThekweni Municipality, as well as support the proposed spatial structure and areas in need on intervention. In addition, the Ugu IDP mentions the LUBWSS as part of Umgeni Water's Master Plan for Umgeni Water to provide bulk water infrastructure for the provision of potable water to Ugu District Municipality.</p> <p>The Umdoni Local Municipality IDP identifies the provision of basic services in the rural component of the municipality with emphasis on water and sanitation as an issue within the local municipality. Therefore, the provision of basic services such as water is a priority. The IDP aims to ensure that all communities within the municipal area are serviced in terms of water provision and sanitation to at least those minimum levels agreed to at national, provincial and district levels. The Umdoni Municipality IDP also identified a key challenge within the municipality as inefficient and ineffective water supply and sanitation and notes that the municipality is experiencing water shortage and disruption of services on a regular basis.</p> <p>Therefore, as the project aims to address the water provision issues, it is not anticipated that the proposed development will contradict or be in conflict with the IDP and SDF for the area.</p>
9.	<p>Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?</p>	<p>Currently, there is no existing EMF for the region. Therefore, this application will not compromise the integrity of environmental management priorities in the area as the project involves the supply of water to surrounding communities and the municipalities.</p> <p>A number of mitigation measures have also been provided by all specialists and these have been incorporated into the EMPr contained in Appendix G.</p>

No.	Question	Response
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context).	The proposed development will be constructed in an open, undeveloped area on the uMkhomazi River within the District Municipality. However, this infrastructure will supply water to the surrounding community and will address the water outages and issues faced within the municipality. Therefore, the land use is favoured.
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	<p>Although the development will be built within an undeveloped area, any negative impacts will occur during the construction phase of the project and therefore will be short term. However, due to the permanent nature of the project, there will be permanent clearing of indigenous vegetation. From a positive impacts, the project will provide water supply to the municipalities and the local communities that are currently suffering from a lack of adequate water provision. These benefits will have a positive and long term impact during the operational phase of the water supply scheme.</p> <p>See compilation of significant environmental issues associated with the proposed project contained in Section 18.3.</p>
12.	How will the development impact on people's health and wellbeing (e.g. i.t.o. noise, odours, visual character and sense of place, etc)?	<p>Potential negative impacts include noise and increased levels of dust, as well as impacts to flora and fauna, heritage resources, and watercourses in the area. These impacts will be mostly confined to the Construction Phase of the project.</p> <p>The positive impact would be the sufficient water supply to the Upper and Middle South Coast of KZN. These benefits will have a positive and long term impact during the operational phase of the water supply scheme.</p> <p>The Ngwadini weir and abstraction works will be permanent structures, therefore will be a permanent visual impact to surrounding receptors. However, there are no settlements within the study area, therefore it is unlikely that people's health and wellbeing will be directly impacted on.</p> <p>See compilation of significant environmental issues associated with the proposed project contained in Section 18.3.</p> <p>These impacts will be managed through the EMPr contained in Appendix G.</p>
13.	Will the proposed activity or the land use associated with the activity	The weir will be located within the uMkhomazi River, it does not require a change in land use. In

No.	Question	Response
	applied for, result in unacceptable opportunity costs?	addition, the pipeline will be an underground pipeline and the land use will not be impacted. Therefore, there will be no unacceptable opportunity costs.
14.	Will the proposed land use result in unacceptable cumulative impacts?	There will be no change in land use for the proposed development. However, cumulative impacts are discussed in Section 19.13 .

12 TIMEFRAMES

In terms of 3(1)(q) of Appendix 1 of GN No. R. 982 of the amended 2014 EIA Regulations (07 April 2017), this section discusses the period for which the EA is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised. These proposed timeframes are provided in **Table 10**.

Table 10: Timeframes

Requirement	Proposed Timeframe
Environmental Authorisation	2018
Pre-Construction	June 2018
Construction	February 2019 – February 2025
Post Construction Monitoring	March 2025 – February 2026

The project is currently in its feasibility phase. The timeframes are confirmed after the design phase and when the project is in execution phase. These timeframes are usually determined after EA is obtained.

13 FINANCIAL PROVISIONS

In terms of 3(1)(s) of Appendix 1 of GN No. R. 982 of the amended 2014 EIA Regulations (07 April 2017), this section discusses details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.

Due to the sensitive nature of financial provisions, Umgeni Water cannot detail the exact amounts but can confirm that there is sufficient amount of finances to ensure the project can be completed.

14 RESOURCE USE AND PROCESS DETAILS

14.1 Waste, Effluent, Emission and Noise Management

14.1.1 Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?

YES	<input type="checkbox"/>
X	<input checked="" type="checkbox"/>
Unknown	

If yes, what estimated quantity will be produced per month?

How will the construction solid waste be disposed of (describe)?

Not yet determined as the detailed design stage will only commence in February 2018.

Where will the construction solid waste be disposed of (describe)?

It will be disposed of at municipal landfill sites.

Will the activity produce solid waste during its operational phase?

If yes, what estimated quantity will be produced per month?

How will the solid waste be disposed of (describe)?

Has the municipality or relevant service provider confirmed that sufficient air space exists for treating/disposing of the solid waste to be generated by this activity?

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

Where will the solid waste be disposed if it does not feed into a municipal waste stream (describe)?

Note: If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation?

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

If yes, inform the competent authority and request a change to an application for scoping and EIA.

Is the activity that is being applied for a solid waste handling or treatment facility?

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Describe the measures, if any, that will be taken to ensure the optimal reuse or recycling of materials:

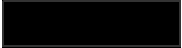


14.1.2 Liquid effluent (other than domestic sewage)

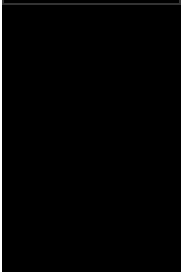
Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

If yes, what estimated quantity will be produced per month?



If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the liquid effluent to be generated by this activity(ies)?



Will the activity produce any effluent that will be treated and/or disposed of on site?

If yes, what estimated quantity will be produced per month?

If yes describe the nature of the effluent and how it will be disposed.



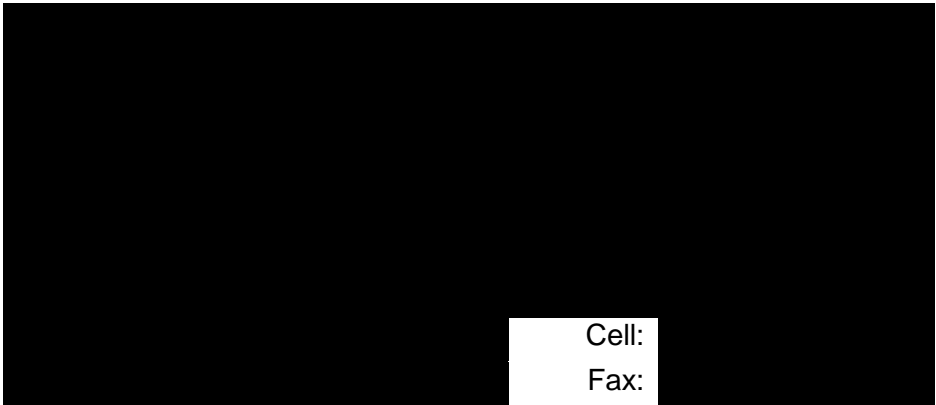
Note that if effluent is to be treated or disposed on site the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility?

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

If yes, provide the particulars of the facility:

Facility name:
Contact person:
Postal address:
Postal code:
Telephone:
E-mail:



Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:



14.1.3 Liquid effluent (domestic sewage)

Will the activity produce domestic effluent that will be disposed of in a municipal sewage system?

NO
X

If yes, what estimated quantity will be produced per month?

If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the domestic effluent to be generated by this activity(ies)?

NO
X

Will the activity produce any effluent that will be treated and/or disposed of on site?

If yes describe how it will be treated and disposed off.

14.1.4 Emissions into the atmosphere

Will the activity release emissions into the atmosphere?

NO
X

If yes, is it controlled by any legislation of any sphere of government?

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If no, describe the emissions in terms of type and concentration:

Only construction related emissions.

14.2 Water Use

Indicate the source(s) of water that will be used for the activity

Municipal	Directly from water board	groundwater	river, stream, dam or lake	Other	the activity will not use water

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate

the volume that will be extracted per month:

If Yes, please attach proof of assurance of water supply, e.g. yield of borehole, in the appropriate Appendix

Does the activity require a water use permit from the Department of Water Affairs?

YES
X

If yes, list the permits required

An Integrated Water Use License Application (WULA) is required.

If yes, have you applied for the water use permit(s)?

NO

X

If yes, have you received approval(s)? (attached in appropriate appendix)

NO

X

14.3 Power Supply

Please indicate the source of power supply e.g. Municipality / Eskom / Renewable energy source

Please refer to Section 5.1.5 and 5.4.4 for an overview of the electrical requirements.

If power supply is not available, where will power be sourced from?

Please refer to Section 5.1.5 and 5.4.4 for an overview of the electrical requirements.

14.4 Energy Efficiency

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

N/A

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

N/A

15 PUBLIC PARTICIPATION PROCESS

15.1 Public Participation

The purpose of the public participation process for the proposed development includes:

- Providing IAPs with an opportunity to obtain information about the project;
- Allowing IAPs to express their views, issues and concerns with regard to the project;
- Granting IAPs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the project; and
- Enabling the project team to incorporate the needs, concerns and recommendations of IAPs into the project, where feasible.

The public participation process that was followed for the proposed project is governed by NEMA and GN No. R. 982 of the 2014 EIA Regulations, as amended. A combined Public

Participation Process is being undertaken for the proposed Ngwadini weir, abstraction works and pipeline. Details of the process are provided below. All Public Participation material can be referred to in **Appendix E**.

15.2 Pre-Application Consultation

A Pre-Application Consultation Meeting was held with DEA on 06 June 2017 (refer to **Appendix E7** for a copy of the minutes of the meeting). The purpose of the meeting included the following:

- Pre-Application Consultation Meeting with DEA to discuss the BA and EIA requirements;
- To reintroduce the project to DEA based on changes to the scope of works;
- To seek clarification regarding certain matters that pertain to the BA and EIA process; and
- To confirm the process and timeframes.

15.3 Identification of IAPs and Compilation of IAP Database

A database of IAPs, which includes authorities, different spheres of government (national, provincial and local), parastatals, ward councillors, stakeholders, landowners, interest groups and members of the general public, was prepared for the project and is contained in **Appendix E8**. This database will be maintained and updated as necessary during the course of the BA Process.

15.4 Landowner Notification

The properties that are directly affected by the proposed development are shown in **Figure 6** and listed in **Table 2**. The details of the affected landowners are included in the IAP database.

According to Regulation 39(1) of GN No. R 982 of 4 December 2014 (as amended), if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land. This requirement does not apply *inter alia* for linear developments (e.g. pipelines, power lines, roads) or if it is a SIP as contemplated in the Infrastructure Development Act, 2014.

The proposed Ngwadini weir, abstraction works and pipeline traverses Ingonyama Trust Board Land. The Ingonyama Trust Board and the Traditional Authority have been notified of

the project and are thus aware of the proposed development in the area. The details of the affected landowners are included in the IAP database which is contained in **Appendix E8**.

Please refer to **Appendix E4** for the proof of landowner notification.

15.5 Project Announcement

The notification process undertaken is detailed in the sections to follow:

15.5.1.1 Background Information Document (BID)

BIDs (**Appendix E1**) and Reply Forms were distributed by email to the IAPs contained in the IAP Database. BIDs contained a brief background and description of the project, as well as the BA process, and listed the details for submitting comments regarding the proposed development. The BID served to notify IAPs of the project and the details on how to register as an IAP.

Proof of initial notification is provided in **Appendix E4**.

15.5.1.2 Onsite Notices

Onsite notices were placed at strategic points within the study area. Notification of the proposed development were provided on the site notice. Details of the locations of the onsite notices and accompanying photographs are contained in **Appendix E2**.

Additional onsite notices were placed notifying the public of the Draft BAR 30-Day Review Period and were primarily placed in proximity to the proposed development, based on the availability of public access.

Figure 29 provides the locations of each site notice in relation to the proposed development. Proof of these notices will be provided in the Final BAR.

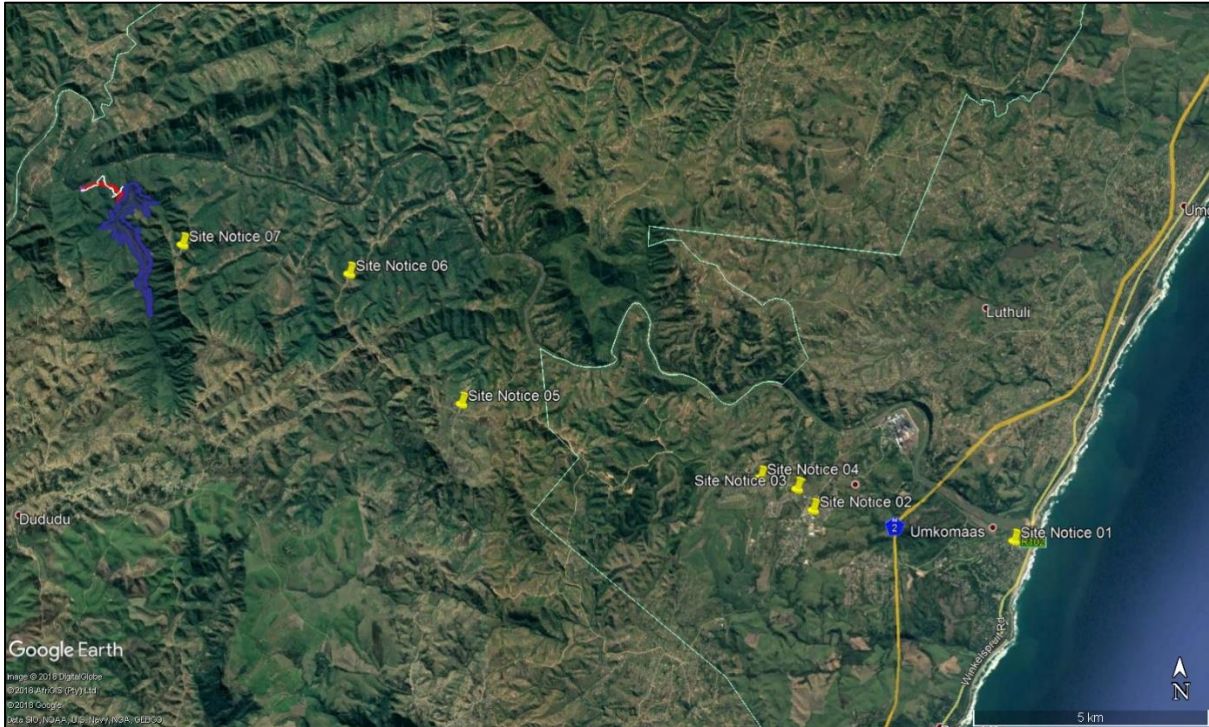


Figure 29: Site Notice Locations

15.5.1.3 Newspaper Notices

A newspaper advertisement was placed in the following newspapers as notification of the proposed Ngwadini weir, abstraction works and pipeline and the 30-Day Review Period. Advertisements were placed in the following newspapers as notification of the project:

- South Coast Fever; and
- Isolezwe.

Proof of these advertisements will be provided in the Final BAR.

15.6 Review Process for the Draft BAR

15.6.1 30-Day Public Review Period

In accordance with GN No. R. 982 of the amended 2014 EIA Regulations (07 April 2017), IAPs were granted an opportunity to review and comment on the Draft BAR. Hardcopies of the document were placed at the public venues provided in **Table 11**. Emails and SMS's will be sent to all registered IAPs to notify them of the review of the Draft BAR. The 30-Day public review period will take place from **19 February 2018 to 21 March 2018**.

Table 11: Location of Draft BAR for Review

Venue	Address	Contact Details
uMkomaas Library	41 Barrow Street, Umkomaas	039 311 5444
Craigieburn Library	1 Civic Street, Craigieburn	039 311 5400

15.6.2 30-Day Authority Review Period

Hardcopies of the Draft BAR were also provided to the key regulatory and commenting authorities, which include the following:

- DEA;
- KZN EDTEA;
- DWS: KZN Region;
- Ezemvelo KZN Wildlife;
- Department of Mineral Resources (DMR);
- DAFF: KZN Offices;
- Department of Transport (DoT);
- Amafa AkwaZulu-Natali/Heritage KZN;
- eThekweni Metropolitan Municipality;
- Municipal Ward Councillor for Ward 3; and
- Municipal Ward Councillor for Ward 105.

Proof of notification to commenting authorities of the review period and all proof of deliveries of the Draft BAR to all organs of states will be available in the Final BAR.

15.6.3 Public Meeting

A public meeting will be held, which will include a discussion on the Ngwadini weir, abstraction works and pipeline. All identified IAPs were notified of the public meeting via site notice, newspaper advert, email or SMS. The minutes and attendance registers of the meeting will be provided in the Final BAR.

15.6.4 Focus Group Meeting

Focus Group Meetings will be held with the traditional authorities to discuss the Ngwadini weir, abstraction works and pipeline.

The minutes and attendance registers of the meeting will be provided in the Final BAR.

15.6.5 Comments and Responses Report

The Comments and Responses Report, which summarises the salient issues raised by IAPs and the project team's response to these matters, is contained in **Appendix E6**. The issues

listed in the Comments and Response Report were identified from completed Reply Forms, emails, and other correspondence received to date.

16 ENVIRONMENTAL ATTRIBUTES

The environmental attributes associated with the proposed Ngwadini weir, abstraction works and pipeline include the geographical, physical, biological, social, economic and cultural aspects of the environment. The following significant environmental attributes are focused on in this report, and are discussed in more detail in **Section 18**:

- Geology and Geohydrology;
- Soils;
- Topography;
- Surface Water;
- Flora;
- Fauna;
- Socio – Economic Environment;
- Air Quality;
- Noise;
- Historical and Cultural Features;
- Existing Structures and Infrastructure;
- Transportation; and
- Aesthetic Qualities.

The sensitive environmental features, attributes and aspects, for which mitigation measures are included in the BAR and EMP, are further discussed in **Section 18**.

17 SUMMARY OF SPECIALIST STUDIES

The following Specialist Studies were undertaken as part of the BA process:

1. Terrestrial Ecological Impact Assessment;
2. Aquatic and Wetland Baseline and Impact Assessment; and
3. Phase 1 Heritage Impact Assessment.

17.1 Terrestrial Ecological Impact Assessment

17.1.1 Details of the Specialist

Specialist	
Organisation:	Nemai Consulting
Name:	Mr. Avhafarei Phamphe
Qualifications:	MSc (Botany)
Affiliation (if applicable):	<ul style="list-style-type: none"> Professional Natural Scientist-Ecological Science (Reg No. 400349/12) with South African council for Natural Scientific Professions (SACNASP) Professional member of South African Institute of Ecologists and Environmental Scientists (SAIEES) Professional member of South African Association of Botanists (SAAB)

17.1.2 Main Findings

The proposed development falls within the Savanna Biome and this Biome is the largest Biome in South Africa and occupies over one third of the whole area. It is characterized by a grassy ground layer and distinct upper layer of woody plants. The data sourced from South African National Biodiversity Institute indicates that the project area falls entirely within one vegetation type, namely Eastern Valley Bushveld, listed as *Least threatened*. The proposed development does not fall within any of the terrestrial threatened ecosystems.

According to the Ezemvelo KZN Wildlife (2016), the proposed development site does not fall within the KZN CBA Irreplaceable areas but entirely falls within the KZN ESA (**Figure 30**). Only sections of the OCS Dam falls within the KZN CBA: Optimal areas. However, the dam is not part of the scope of the report.

The proposed development site does not fall within parts of a D'Moss area. D'Moss is a network of natural open spaces, defined by the eThekweni Metropolitan Municipality (EMM) as critical for the ecosystem goods and services that they supply to the residents of the municipal area. D'Moss aims to conserve local biodiversity and to ensure the supply of environmental services for current and future generations.

Of the protected plant species that are known to occur within the region, only one tree, Marula tree (*Sclerocarya birrea* subsp. *caffra*) was recorded (**Figures 31 and 32**) during the field assessments.

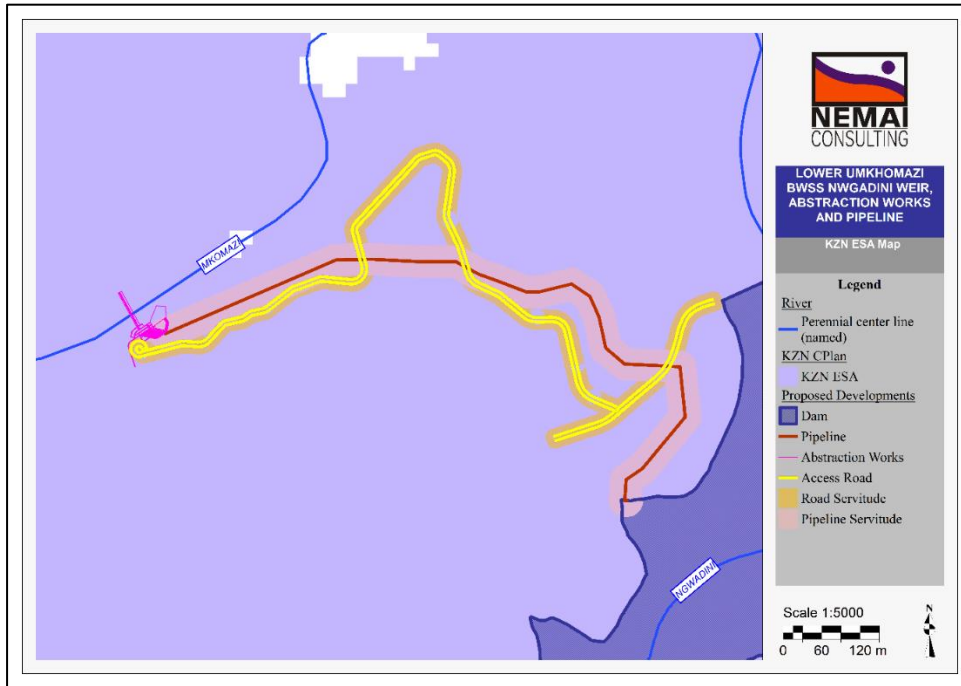


Figure 30: The entire proposed development site falls within the KZN ESA



Figure 31: A Marula tree recorded within the project area

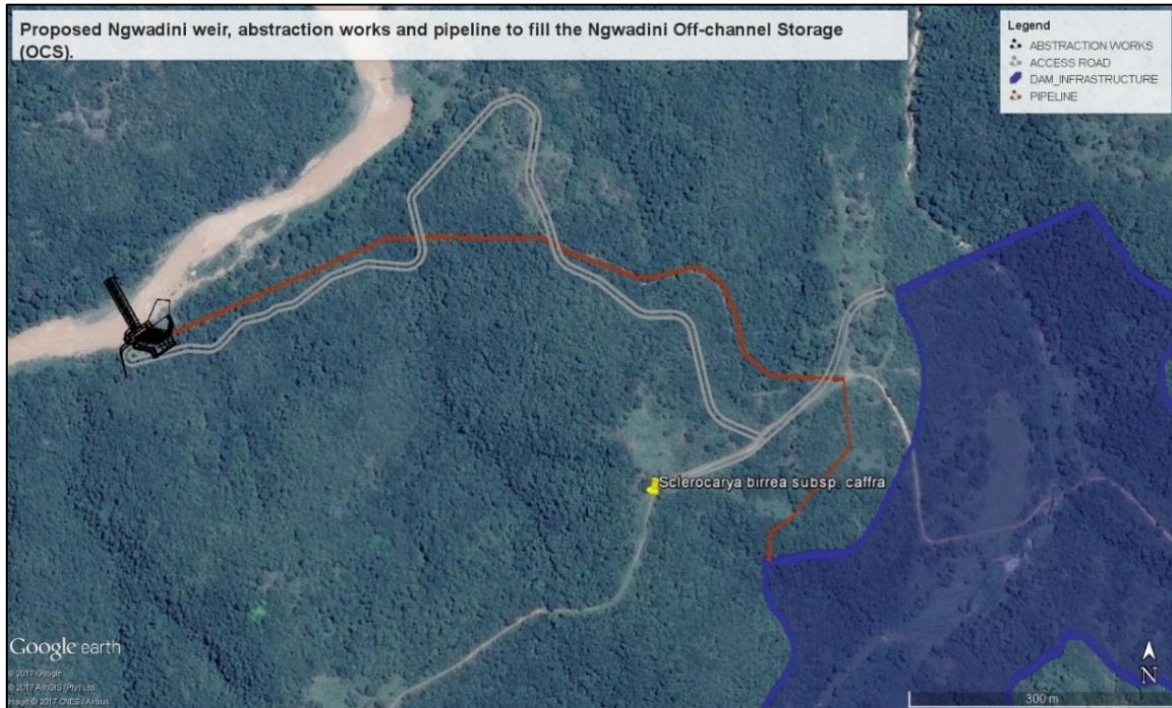


Figure 32: A Google Earth Map indicating where the Marula tree was recorded within the project area

There are three plant species which are “specially protected indigenous plants” in terms of Natal Nature Conservation Ordinance, 15 of 1974 Schedule 12, namely:

- All *Stapelia* (Figure 33);
- *Hypoxis hemerocallidea* (Star flower/African potato) (Figure 34); and
- *Millettia grandis* (umzimbeet wood) (Figure 35).



Figure 33: *Stapelia* sp recorded within the project area



Figure 34: Hypoxis hemerocallidea recorded within the project area



Figure 35: Millettia grandis recorded within the project area

The distribution of the specially protected plant species on the proposed development site are indicated in **Figure 36** below.

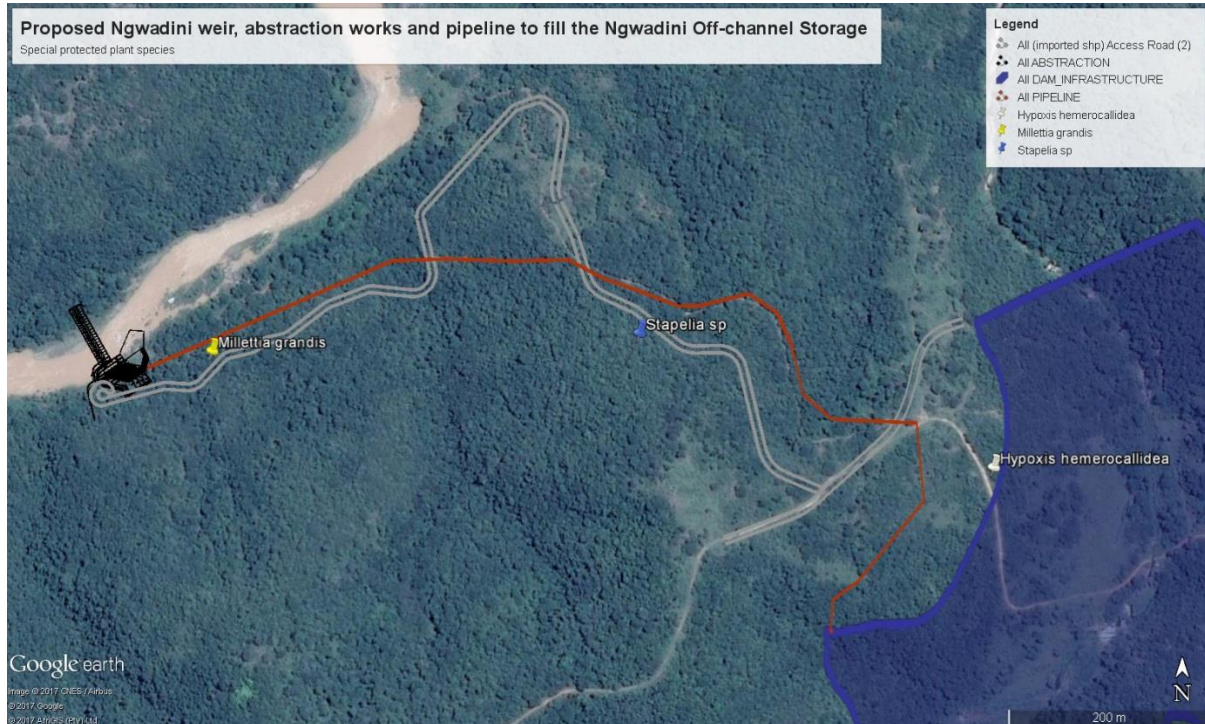


Figure 36: Distribution of the specially protected plant species within the project area

A permit to remove these plant species will need to be obtained from Ezemvelo KZN Wildlife. The removal should occur during the summer months and with due care, preferably by a qualified botanist or similarly qualified individual. The plants should be relocated into areas with the same aspect, soil conditions and elevation to ensure that the relocations are successful.

During the field surveys, only one plant species of conservation concern was observed in the study area, namely *Hypoxis hemerocallidea* (Star flower/African potato). According to Raimondo *et al.* 2009, this plant species is listed as *Declining*. Even though this plant species is not directly affected by the components of the project but may be affected by the construction activities of pipeline and OCS dam infrastructures.

Given the site review methodology expounded above:

- Only one plant species of conservation concern was recorded on site.
- The probability of the presence of Red data species on site is considered to be “low” on account that there is no suitable habitat for such species to occur.
- Before the construction commences, there must be walk-down survey to search for the presence of these species and should they be found, they must be removed to area with suitable survival and growth-enabling conditions.

The riparian habitats were investigated for any signs or indications that the water system may be inhabited by Otters and only scats of Cape Clawless Otter (*Aonyx capensis*) were recorded

on the proposed development site (**Figure 37**). In order to protect habitat for the detected African/Cape Clawless Otter (*Near Threatened*), a buffer around riparian vegetation is recommended.



Figure 37: Scats of Cape Clawless Otter recorded along the uMkhomazi River

A terrestrial ecological field assessment was carried out to determine the most sensitive areas along the proposed routes. All the areas denoted as *high* in terms of terrestrial ecological sensitivity must be taken into account when the final layout is designed (**Figure 38**). The natural and near natural areas along the routes contain plants and animal species of conservation concern and it is advisable that the infrastructure development should be placed in areas which are already disturbed (shown in Orange colour). A pre-construction survey should be undertaken by a qualified ecologist and must identify all conservation important species and a detailed Search, Rescue and Relocation Plan needs to be developed.

One endemic species recorded on the proposed development site was a Jackal Buzzard (*Buteo rufofuscus*) (**Figure 39**).

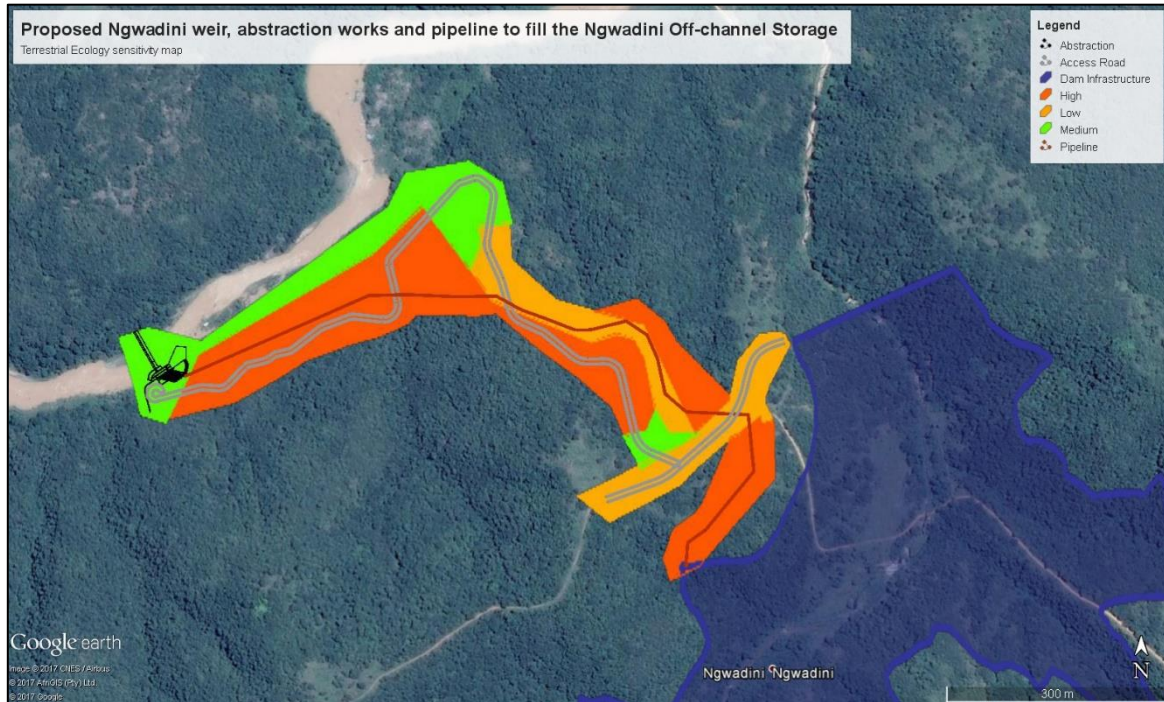


Figure 38: Terrestrial Ecological Analysis Map of proposed development area based on field assessment



Figure 39: Jackal Buzzard recorded in the proposed development site

17.1.3 Conclusions and Recommendations

From a broad and preliminary evaluation of the site in question, it is evident that the proposed development activities will have low to medium impacts on the receiving environment. The development activities proposed within the survey area will therefore not have a significant impact on biodiversity conservation within the region. It is recommended that the larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain for aesthetic purposes.

After the conclusion of this Terrestrial Ecological Assessment, it is the opinion of the ecologist that the proposed development be considered favourably provided that the sensitivity map be considered during the planning and construction phases of the proposed development activities to aid in the conservation of ecology within the study area.

17.2 Aquatic and Wetland Baseline and Impact Assessment

17.2.1 Details of the Specialist

Specialist	
Organisation:	The Biodiversity Company
Name:	Mr. Russell Tate
Qualifications:	MSc (Aquatic Health)
Affiliation (if applicable):	<ul style="list-style-type: none"> Professional Natural Scientist- Ecological Science, Environmental Science and Aquatic Science (Reg number: 400213/11) with South African council for Natural Scientific Professions (SACNASP)

17.2.2 Main Findings

The river reach under consideration were located within an Upstream Management Area. The SQR was classified as a wetland/estuary Freshwater Ecological Protection Area (FEPA) within the upper reaches of the estuarine functional zone.

The desktop data of the considered SQR is presented below (**Table 12**).

Table 12: Desktop information for the U10M-4746

Component	Category
PES	Class B (largely natural)
Importance and sensitivity	Very High and Very High
Default Ecological Category	class A (natural)

The results of the desktop assessment indicate that the receiving waterbody considered in this assessment was in a largely natural status (class B). This result provides an indication that the current activities within the river catchment area are not significantly negatively affecting the aquatic environment.

Two (2) wetland FEPAs are located within 500m of the project area. The FEPA wetlands in the vicinity of the project site are shown **Figure 40**. The FEPA sites within 500m are listed in **Table 13**.

The identified FEPA wetlands were classified as Channelled Valley Bottom wetlands. Both FEPA wetlands are classified as natural. They were classified as Rank 4 FEPA wetlands

(other wetlands associated with them) with a wetland vegetation condition of AB (> 75% Natural Cover). The NFEPA wetland information is a coarse data set and must be ground truthed.

Table 13: NFEPA description for the FEPA sites within the study area

Classification Levels				Wetland Vegetation Class	Natural / Artificial	Wetland Condition	Rank
L1 (System)	L2 (Ecoregion)	L3 Landscape Position	L4 HGM Classification				
Inland System	North Eastern Coastal Belt	Valley Floor	Channelled Valley Bottom	Sub-Escarpment Savanna	Natural	AB	4
Inland System	North Eastern Coastal Belt	Valley Floor	Channelled Valley Bottom	Sub-Escarpment Savanna	Natural	AB	4

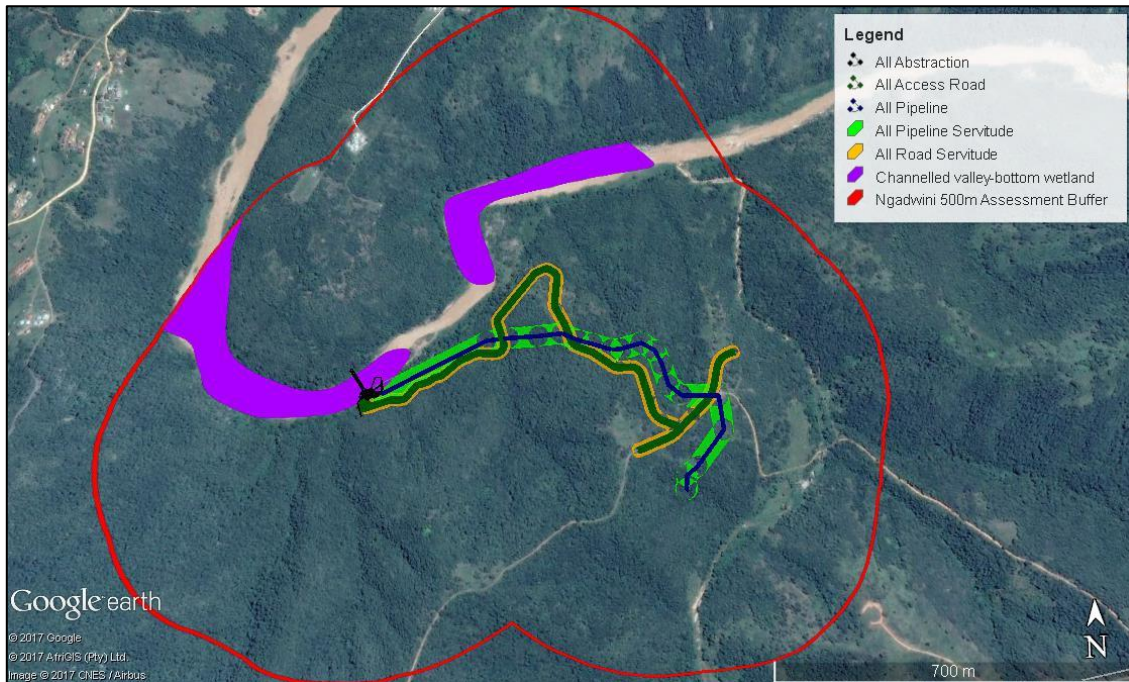


Figure 40: The NFEPA wetlands associated with the Ngwadini project area

The wetland field assessment was conducted in September 2017 and is considered a dry season survey.

The wetland delineation is shown in **Figure 41**, and the HGM allocation is shown in **Figure 42**, with the wetland classification as per SANBI guidelines (Ollis et al., 2013) in **Table 14**. One (1) HGM type was identified within the 500m project assessment boundary, namely:

- Channelled Valley Bottom.

A total of two (2) HGM units were identified for the project. The two HGM units identified for the study are presented in **Figure 42**.

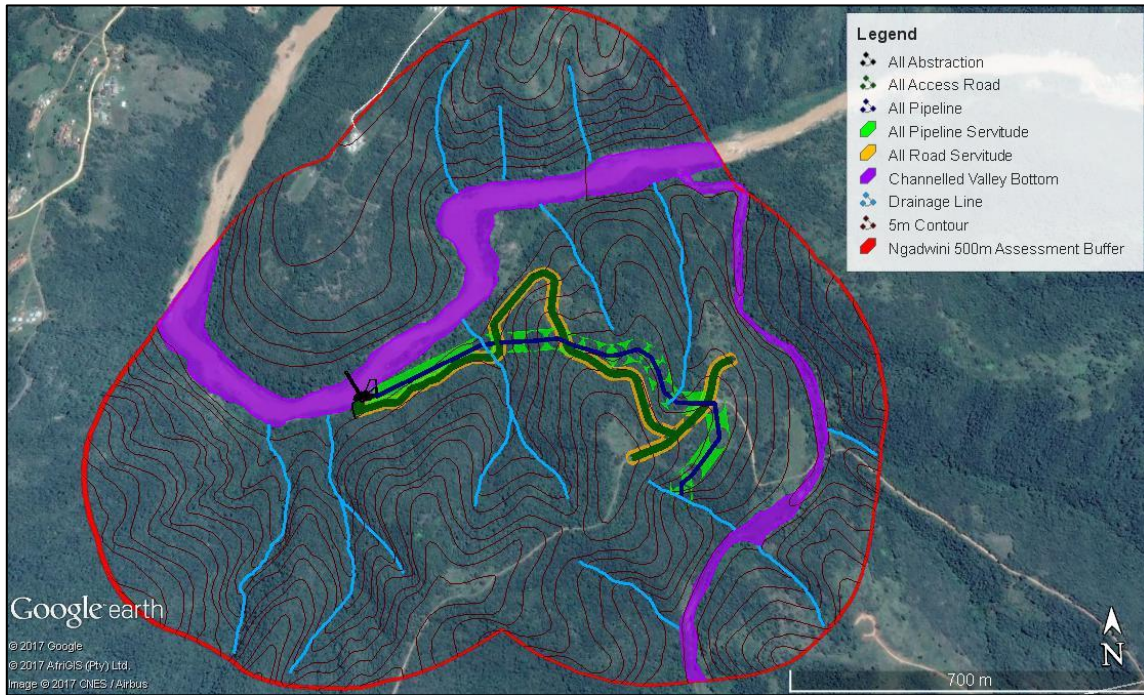


Figure 41: The project area wetland delineation

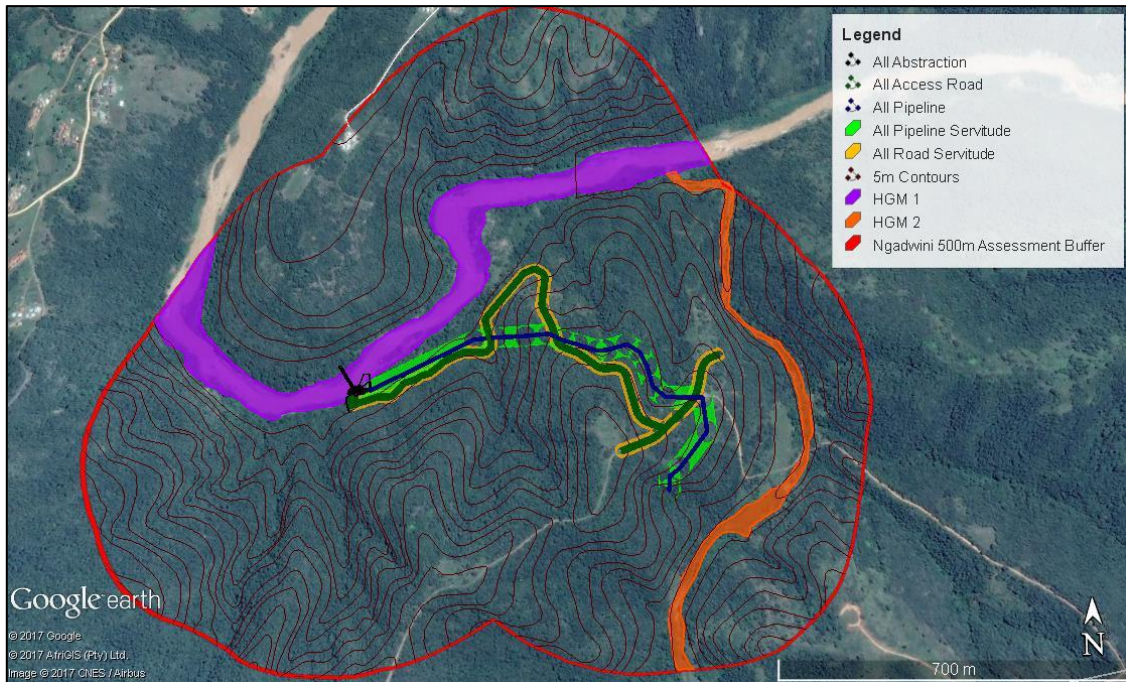


Figure 42: The HGM units identified for the study

Table 14: Wetland classification as per SANBI guideline (Ollis et al. 2013)

HGM	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
1	Inland	North Eastern Coastal Belt	Sub-Escarpment Savanna	Valley floor	Channelled Valley Bottom	N/A	N/A
2	Inland	North Eastern Coastal Belt	Sub-Escarpment Savanna	Valley floor	Channelled Valley Bottom	N/A	N/A

The PES results are described in the sections below with **Table 17** showing the combined results. The overall rating for both HGM units was that of largely natural systems (B).

Table 15: The PES results for the wetlands associated with the proposed project

Wetland	Area (ha)	Hydrology		Geomorphology		Vegetation	
		Rating	Score	Rating	Score	Rating	Score
HGM 1	13	B: Largely Natural	1.0	A: Unmodified Natural	0.3	C: Moderately Modified	2.1
Overall PES Score		1.1		Overall PES Class		B: Largely Natural	
Wetland	Area (ha)	Hydrology		Geomorphology		Vegetation	
		Rating	Score	Rating	Score	Rating	Score
HGM 2	3.30	B: Largely Natural	1.5	A: Unmodified Natural	0.2	D: Largely Modified	2.5
Overall PES Score		1.4		Overall PES Class		B: Largely Natural	

The EIS for HGM 1 showed Very High (A) Levels of importance, with HGM 2 showing a High (B) level of importance. The Hydrological Functioning and Direct Human Benefits for Both HGM 1 and HGM 2 was rated as Moderate (C) importance.

There are four (4) main project components to consider with regards to the buffer assessment for the Ngwadini project:

- Ngwadini weir;
- Ngwadini abstraction works;
- Pipeline infrastructure; and
- Access Road.

In order to protect wetland areas for the abstraction works construction, a buffer zone of 55m was proposed for all wetland systems during the construction phase. It is noted that the buffer zone is only applicable to secondary activities such as laydown yards and stockpiles and that primary activities can take place in the prescribed buffer zone.

The proposed road falls within the 89m pre-mitigation buffer from the wetland. However, the prescribed mitigation measures will reduce the risks to low which reduces the required buffer to 29m and 15m from the wetlands for the construction and operational phases respectively.

The proposed pipeline falls within the 25m pre-mitigation buffer from the wetland. However, the prescribed mitigation measures will reduce the risks to low which has reduced the required buffer to 15m for the construction and operational phases.

In situ water quality analysis results from the September 2017 survey are provided in **Table 18**.

Table 16: *In situ* water quality results for the September 2017 survey

Site	pH	Conductivity (µS/cm)	DO (mg/l)	DO Saturation (%)	Temperature (°C)
TWQR*	6.5-9.0	<700**	>5.00	80-120	5-30
S1	8.57	217	6.7	107	25
S2	8.31	512	7.3	109	20
*TWQR – Target Water Quality Range **Expert opinion range					

The results of the September 2017 survey derived no constituents exceeding the water quality guidelines. The water quality results observed in this study should be used to monitor the potential impacts of the proposed development.

The results of the PES assessment are provided in the table below (**Table 19**).

Table 17: Present Ecological Status of the river reach assessed in the September 2017 survey

Aspect Assessed	Ecological Category
Riparian ecological category	C
Aquatic invertebrate ecological category	A/B
Ecostatus	B

The results of the PES assessment derived largely natural (class B) conditions in the river reach considered in this assessment. This result was in agreement with the desktop data. Based on the overall results, the attainable ecological class was currently not being attained. The established PES will be used to guide the potential impacts of the proposed project.

17.2.3 Conclusions and Recommendations

The following recommendations are provided for the project:

- The recommended buffer zones should be strictly adhered to during the construction phase of the project, with exception of the activities and structures required to traverse a watercourse. This includes structures such as culverts for drainage lines and the weir structure itself. Any supporting aspects and activities, such as laydown and mixing yards, not required to be within the buffer area should adhere to the buffer zone.

The physical abstraction of water from the abstraction point was determined to be the second largest impact. This impact will result in the loss of wetland and marginal aquatic habitats within the sacrificial zone. However, it is anticipated that shortly after the completion of the abstraction point, newly deposited sediments will act as a substrate for wetlands to occupy and thereby promote the extent of the wetland areas immediately downstream. However, on a greater scale, the removal of water will have an overall negative impact on wetland and aquatic PES.

The construction of the weir will require that activities take place within the river channel and the river will be diverted in some form. The aspects as listed in the tables above will impact on the following:

- The alteration of flow volumes and patterns (Construction and Operation Phases);
- The increased sediment and turbidity (Construction Phase);
- The risk of hydrocarbon contamination (Construction Phase); and
- The increase in water temperature (Operation Phase).

During the construction phase, many of the moderate risks can be mitigated to low risks by implementing the mitigation measures. These measures attempted to reduce the significance of the identified impacts, and do not make considerations for potential rehabilitation initiatives and offset strategies. Several mitigation actions have been provided with the most important mitigation action being the incorporation of an appropriately designed fishway.

Considering the status of the aquatic and wetland ecosystems, and furthermore the nature and requirements of the project, the proposal has the potential to negatively affect local ecology. However, should the proposed mitigation actions be implemented these impacts may be reduced. In light of the above mentioned, no fatal flaws could be identified through the completion of this study.

17.3 Phase 1 Heritage Impact Assessment

17.3.1 Details of the Specialist

Specialist	
Organisation:	JLB Consulting
Name:	Ms. Jean Beater
Qualifications:	MA in Heritage Studies
Affiliation (if applicable):	<ul style="list-style-type: none">• Member of Association of South African Professional Archaeologists (No. 349)• Member of IAIAsa (No. 1538)

17.3.2 Main Findings

An archaeological survey of the proposed Ngwadini Dam was undertaken by Anderson (1997) and his analysis indicated that no previous archaeological surveys had been undertaken in the area, nor were there any known archaeological sites in this area. It was suggested that archaeological sites may exist in the affected dam area, since it is located near a main water source (the uMkhomzai River) (Anderson: 1). During the Anderson survey, no archaeological sites were recorded in the affected area. The only artefacts we observed were a few Middle Stone Age stone tools that are common in KwaZulu-Natal and were assessed to be of low archaeological significance (Anderson: 2).

The site of the proposed weir and abstraction works was inspected. It will be situated on the southern bank of the uMkhomazi River. The area and rocks along the river bank were inspected for any visible fossils but none were found. The area adjacent to the location of the works was inspected and no heritage sites were found.

In a more open area with an existing gravel track and cattle path, an abandoned house close to the remains of another structure were found. Close to the abandoned house, a potential grave site was found. It has a border made of rocks roughly cemented together and appears to be a single grave. It is located at 30°08'05.4"S 30°35'55.7"E and is situated about 12m east of the proposed access road and on the outer edge of the buffer area demarcated for the road (**Figure 43**). The abandoned house is located 10m east of the buffer area of the road.



Figure 43: Possible grave site with abandoned house in background

The remains of the structure (**Figure 44**) fall within the access road and is located at $30^{\circ}08'06.0''S$ $30^{\circ}35'55.0''E$. The structure was made from soil with white-washed walls. A wooden support can still be seen in the photograph below.



Figure 44: Remains of structure

South-west of the proposed dam wall and falling within the buffer of the proposed access road, as seen below, the grave of a member of the Mbele clan was pointed out by Messrs. Latha and Ngcobo. The grave is situated at $30^{\circ}08'13.1''S$ $30^{\circ}36'08.6''E$. The grave is not visible as it is heavily overgrown with vegetation and has no headstone or other marker identifying it (**Figure 45**).



Figure 45: Mbele grave

The South African Fossil Sensitivity Map indicates that the project area falls mainly within an area of insignificant / zero fossil sensitivity as indicated by the grey colour in **Figure 46** below. There is overlap into an area of low fossil sensitivity (blue colour). An area of insignificant / zero fossil sensitivity requires no palaeontological study; an area of low fossil sensitivity also does not require palaeontological study but does require a protocol for fossil finds.

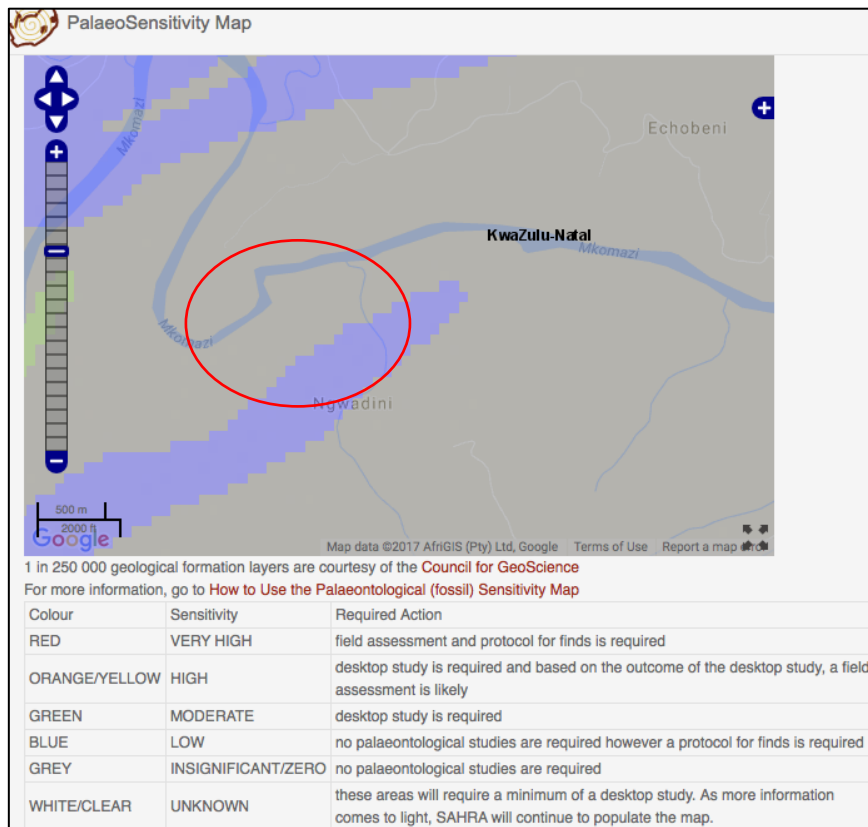


Figure 46: Fossil sensitivity of approximate project area as indicated with red circle

17.3.3 Conclusions and Recommendations

Two grave sites were found during the site inspection. Due to the very thick vegetation making access difficult to almost impossible in some sections, it is possible that other graves and remains of structures were not found during the site inspection. The two local residents pointed out many graves that are located in the proposed Ngwadini Dam hence it is likely that more graves may be found in the project area especially along the proposed route for the pipeline and access road.

It is therefore recommended that a Phase 2 HIA is undertaken when the area for the access road and pipeline area are cleared of vegetation to allow access to them. It is recommended that a heritage specialist with experience with grave relocations should undertake the Phase 2 so that if it is decided that the identified graves and any others found should be moved, then the process can start immediately.

However, it is strongly recommended that graves are not moved and, where possible, the route for infrastructure (pipelines and roads) is adjusted to avoid such sites. Graves are highly significant to many people and there are many traditional, cultural and personal sensitivities concerning the removal of graves.

The age of the abandoned dwelling and dilapidated remains of a structure found close to the first grave site could not be ascertained. Both structures are common in the area and therefore have a low significance and can therefore be demolished if necessary. Applying the precautionary principle, it is recommended that if the structures are to be demolished, then application be made to Amafa for permission to do so. According to section 33 (1) (a) of the KZN Heritage Act, no structure which is, or which may reasonably be expected to be older than 60 years, may be demolished, altered or added to without the prior written approval of the Amafa Council having been obtained on written application to the Council.

If the graves and structures are left in situ, then a 10m cordon / buffer must be placed around them to prevent any damage to them during the construction and operation of the access road and pipeline.

18 IMPACT ASSESSMENT

18.1 Overview

This section focuses on the pertinent environmental impacts that could potentially be caused by the proposed Ngwadini weir, abstraction works and pipeline during the pre-construction, construction and operational phases of the project.

Please note that an “impact” refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

The impacts to the environmental features are linked to the project activities, which in broad terms relate to the proposed development and its associated services and infrastructure.

Impacts were identified as follows:

- Impacts associated with listed activities contained in GN No. R. 983, R.984 and R. 985, for which authorisation has been applied for;
- Issues highlighted by environmental authorities;
- Comments received during public participation;
- An appraisal of the project description and the receiving environment; and
- Findings from specialist studies.

18.2 Project Activities

For the purposes of effective and efficient monitoring, the aspects of construction are outlined separately for pre-construction, construction and operational phases. In order to understand the impacts related to the project it is necessary to unpack the activities associated with the project life-cycle, as shown below:

Table 18: Activities associated with the Pre-construction Phase

PRE-CONSTRUCTION PHASE
Project Activities
1. Applicant to appoint ECO
2. Negotiations and agreements with the individual affected landowners and stakeholders
3. Detailed engineering design
4. Detailed geotechnical design
5. Site survey
6. Procurement of contractors
7. Mark construction servitude
8. Pre-construction photographic records
9. Development and approval of method statements

10. Development and approval of construction plans
11. Development of employment strategy
12. Construction site planning, access and layout
Environmental Activities
1. Undertake a walkdown survey of the project footprint by the relevant environmental specialists to identify sensitive environmental features
2. Conduct Phase 2 HIA
3. Develop Search, Rescue and Relocation Plan
4. Demarcation of buffers around sensitive areas
5. Diligent compliance monitoring of the EA, EMPr and other relevant environmental legislation
6. Barricading and installing barriers around buffer areas identified in specialist studies
7. Ongoing consultation with landowners and affected parties
8. Establish baseline water quality data for river crossings based on aquatic and wetland studies

Table 19: Activities associated with the Construction Phase

CONSTRUCTION PHASE
Project Activities
1. Site establishment (including site camp and labour camp)
2. Fencing of the construction area
3. Registration of the servitude
4. Pegging of central line and overall footprint
5. Site clearing
6. Delivery of construction material
7. Transportation of equipment, materials and personnel
8. Storage and handling of material
9. Cut and cover activities
10. Stockpiling (sand, crushed stone, aggregate, etc.)

11. Stormwater control mechanisms
12. Management of topsoil and spoil
13. Waste and wastewater management
14. Traffic control measures
15. Bulk earthworks
16. Site security
17. Electrical supply
18. Construction of the weir, abstraction works and pipeline
19. Road surface finishes
20. Concrete works
21. Temporary river diversion for weir and pipeline crossings
22. Landscaping
Environmental Activities
1. Reinstatement and rehabilitation of construction domain
2. Control of invasive plant species
3. Diligent compliance monitoring of the EA, EMPr and other relevant environmental legislation
4. Conduct environmental awareness training
5. Implement EMPr
6. Ongoing consultation with landowners and affected parties
7. Ongoing search, rescue and relocation of red data, protected and endangered species, medicinal plants, heritage resources and graves (based on area of influence of the construction activities) – permits to be in place
8. Ongoing monitoring for red data, protected and endangered species, medicinal plants, heritage resources and graves (based on area of influence of the construction activities)

Table 20: Activities associated with Operational Phase

OPERATIONAL PHASE
Project Activities

1. Servitude access arrangements and requirements
2. Routine maintenance inspections of the Ngwadini weir, abstraction works and pipeline
3. Repair and maintenance works of Ngwadini weir, abstraction works and pipeline
Environmental Activities
1. Ongoing consultation with landowners and affected parties
2. Erosion monitoring programme
3. Management of sensitive areas or buffered areas
4. Management of vegetation clearance
5. Stormwater management
6. Pollution control measures
7. Control of invasive plant species
8. Satisfy EWR

18.3 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact. **Tables 23, 24 and 25** provide the environmental aspects that have been identified for the proposed project, are linked to the project activities (note that only high level aspects are provided).

Table 21: Environmental aspects associated with the Pre-Construction Phase

ENVIRONMENTAL ASPECTS
Pre-construction Phase
1. Insufficient construction site planning and layout
2. Poor consultation with landowners, affected parties, stakeholders and authorities
3. Site-specific environmental issues not fully understood

ENVIRONMENTAL ASPECTS
Pre-construction Phase
4. Inadequate environmental and compliance monitoring
5. Absence of relevant permits
6. Lack of barricading of sensitive environmental features
7. Poor waste management
8. Absence of ablution facilities

Table 22: Environmental aspects associated with the Construction Phase

ENVIRONMENTAL ASPECTS
Construction Phase
1. Poor consultation with landowners and affected parties
2. Inaccurate walk-down survey
3. Inadequate environmental and compliance monitoring
4. Lack of environmental awareness creation
5. Construction starting without or inadequate search and rescue
6. Indiscriminate site clearing
7. Poor site establishment
8. Poor management of access and use of access roads
9. Inadequate provisions for working on steep slopes
10. Poor transportation practices
11. Poor traffic management
12. Disturbance of topsoil
13. Disruptions to existing services

ENVIRONMENTAL ASPECTS
Construction Phase
14. Inadequate storage and handling of material
15. Inadequate storage and handling of hazardous material
16. Erosion
17. Poor maintenance of equipment and plant
18. Poor management of labour force
19. Pollution from ablution facilities
20. Inadequate management of construction camp
21. Poor waste management practices – hazardous and general solid, liquid
22. Poor management of pollution generation potential
23. Poor management of water
24. Damage to significant fauna and flora
25. Environmental damage of sensitive areas
26. Disruption of archaeological and culturally significant features (if encountered)
27. Dust and emissions
28. Noise nuisance due to construction activities
29. Influence to resource quality of the affected rivers from river diversions
30. Poor reinstatement and rehabilitation

Table 23: Environmental aspects associated with the Operational Phase

Operational Phase
1. Poor consultation with landowners, affected parties, stakeholders and authorities
2. Inadequate environmental and compliance monitoring

3. Inadequate management of access, routine maintenance and maintenance works

4. Inadequate management of vegetation

5. Not satisfying the EWR

18.4 Potential Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. Refer to **Tables 26** and **27** for the potential significant impacts associated with the preceding activities and environmental aspects for the pre-construction, construction and operational phase.

Table 24: Potential significant environmental impacts during Construction Phase

Feature	Impact
Geology and Soil	<ul style="list-style-type: none"> • Unsuitable geological conditions • Impacts associated with the sourcing of construction material and loss of topsoil • Soil erosion (land clearance and construction activities) • Soil pollution e.g. hydrocarbon and cement spillages • Compaction and erosion of removed and stockpiled soils • Soil contamination from incorrect storage/handling/disposal of hazardous waste • Soil contamination through spillages and leakages • Soil contamination due to mismanagement and/or incorrect storage of hazardous chemicals • Poor stormwater management during construction
Topography	<ul style="list-style-type: none"> • Visual impacts during construction • Crossing topographic features (watercourses) • Erosion of affected areas
Geohydrology	<ul style="list-style-type: none"> • Groundwater pollution due to spillages and poor construction practices
Surface Water	<ul style="list-style-type: none"> • Increased stormwater runoff • Water leakages and wastage
Flora	<ul style="list-style-type: none"> • Loss of sensitive vegetation and habitat • Damage and loss of vegetation of conservation significance • Proliferation of exotic vegetation in disturbed areas • Damage to vegetation in surrounding areas • Destruction of potential red list plants during site clearing and construction • Disturbance of sensitive plant species if relocated

Feature	Impact
Fauna	<ul style="list-style-type: none"> • Loss of habitat through site clearing and construction • Illegal killing or hunting of mammals • Killing of snakes during construction phase due to poor environmental education procedures • Potential illness and/or death of fauna due to pollution and/or littering • Damage / clearance of habitat of conservation importance • Loss of fauna species of conservation significance • Obstruction to animal movement corridors
Air Quality	<ul style="list-style-type: none"> • Excessive dust levels • Greenhouse gas emissions
Transportation	<ul style="list-style-type: none"> • Construction-related traffic • Increase in traffic on the local road network • Damage to roads by heavy construction vehicles • Risks to road users
Noise	<ul style="list-style-type: none"> • Localised noise increase • Noise nuisance
Aesthetics	<ul style="list-style-type: none"> • Reduction in visual quality of area
Safety and Security	<ul style="list-style-type: none"> • Safety risk to landowners and surrounding communities
Waste Management	<ul style="list-style-type: none"> • Waste generated from site preparations (e.g. plant material) • Domestic waste • Surplus and used building material • Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags) • Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks • Land, air and water pollution through poor waste management practices
Socio – Economic	<ul style="list-style-type: none"> • Generation of employment opportunities for local community (positive) • Contribution to local economy (positive) • Conflicted land uses • Nuisance from noise and dust • Safety and security
Heritage Resources	<ul style="list-style-type: none"> • Damage to heritage resources
Water Users	<ul style="list-style-type: none"> • Water quality deterioration and disturbance to flow caused by construction activities may adversely affect downstream water users • Water abstracted from watercourses for construction purposes
Riparian Habitat	<ul style="list-style-type: none"> • Loss of riparian and instream vegetation within construction domain • Destabilisation of channel morphology at river • Wetland/aquatic habitat unit destruction • Soil erosion

Feature	Impact
Aquatic Ecology	<ul style="list-style-type: none"> • Disruptions to aquatic biota community due to water contamination, alteration of flow and disturbance to habitat during construction (particularly relevant to construction activities that take place instream or in close proximity to watercourses) • Alteration of habitat • Loss of aquatic-dependent biodiversity
Water Quality	<ul style="list-style-type: none"> • Inflow of contaminated storm water • Release of contaminants from equipment and concreting activities • Water quality impacts due to spillages and poor construction practices • Water quality impacts due to siltation and pollution
Flow Regime	<ul style="list-style-type: none"> • Alteration of flow • Affect aquatic biodiversity

Table 25: Potential significant environmental impacts for Operational Phase

Feature	Impact
Topography	<ul style="list-style-type: none"> • Visual impacts from disturbed area and infrastructure • Crossing topographic features (watercourses) • Erosion of affected areas
Water	<ul style="list-style-type: none"> • Damage to weir and abstraction works from major flood events
Flora	<ul style="list-style-type: none"> • Encroachment by exotic species through inadequate eradication programme
Aesthetics	<ul style="list-style-type: none"> • Visibility of weir and abstraction works to visual receptors • Inadequate reinstatement and rehabilitation of construction footprint
Socio – Economic	<ul style="list-style-type: none"> • Generation of employment opportunities for local community (positive) • Sustained economic and social beneficiation from the continued supply of electricity (positive) • Safety and security issues through improper access control during inspections and maintenance activities • Use of local road network for operation and maintenance purposes

18.5 Impact Assessment Methodology

The impact assessment carried out for each environmental impact that may result from the proposed project, forms the basis for determining which management measures are required to prevent or minimise these impacts. The management measures are furthermore a means by which the mitigation measures, determined in the impact assessment are translated to action items required to prevent or keep those impacts that cannot be prevented within acceptable levels.

Mitigation should strive to abide by the following hierarchy (1) prevent; (2) reduce; (3) rehabilitate; and/or (4) compensate for the environmental impacts.



Figure 47: Mitigation hierarchy

In order to establish best management practices and prescribe mitigation measures, the following project-related information needs to be adequately understood:

- **Activities** associated with the proposed project;
- **Environmental aspects** associated with the project activities;
- **Environmental impacts** resulting from the environmental aspects; and
- The nature of the surrounding **receiving environment**.

Information provided by specialists was used to calculate an overall impact score by multiplying the product of the nature, magnitude and the significance of the impact by the sum of the extent, duration and probability based on the following equation:

$$\text{Overall Score} = (N \times M \times S) \times (E + D + P)$$

Where:

- N = Nature;
- E = Extent
- M = Magnitude
- D = Duration
- P = Probability
- S = Significance

Table 26: Impact methodology table

Nature				
Negative		Neutral		Positive
-1		0		+1
Extent				
Local	Regional	National	International	
1	2	3	4	

Magnitude				
Low		Medium		High
1		2		3
Duration				
Short Term (0-5yrs)		Medium Term (5-11yrs)	Long Term	Permanent
1		2	3	4
Probability				
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain
1	2	3	4	5
Significance				
No Impact/None	No Impact After Mitigation/Low	Residual Impact After Mitigation/Medium	Impact Cannot be Mitigated/High	
0	1	2	3	

The following definitions apply:

For the methodology of the impact assessment, the analysis is conducted on a quantitative basis with regard to the nature, extent, magnitude, duration, probability and significance of the impacts. The following definitions and scoring system apply:

Nature (/Status)

The project could have a positive, negative or neutral impact on the environment.

Extent

- Local – extend to the site and its immediate surroundings.
- Regional – impact on the region but within the province.
- National – impact on an interprovincial scale.
- International – impact outside of South Africa.

Magnitude

Degree to which impact may cause irreplaceable loss of resources.

- Low – natural and social functions and processes are not affected or minimally affected.
- Medium – affected environment is notably altered; natural and social functions and processes continue albeit in a modified way.
- High – natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration

- Short term – 0-5 years.

- Medium term – 5-11 years.
- Long term – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
- Permanent – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability

- Almost certain – the event is expected to occur in most circumstances.
- Likely – the event will probably occur in most circumstances.
- Moderate – the event should occur at some time.
- Unlikely – the event could occur at some time.
- Rare/Remote – the event may occur only in exceptional circumstances.

Significance

Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows-

0 – Impact will not affect the environment. No mitigation necessary.

1 – No impact after mitigation.

2 – Residual impact after mitigation.

3 – Impact cannot be mitigated.

For example, the worst possible impact score of -117 would be achieved based on the following ratings:

N = Nature = -1

M = Magnitude = 3

S = Significance = 3

E = Extent = 4

D = Duration = 4

P= Probability = 5

Worst impact score = $(-1 \times 3 \times 3) \times (4+4+5) = -117$

On the other hand, if the nature of an impact is 0 (neutral or no change) or the significance is 0 (no impact), then the impact will be 0.

Impact Scores will therefore be ranked in the following way:

Table 27: Ranking of overall impact score

Impact Rating	Low/Acceptable impact	Medium	High	Very High
Score	0 to -30	-31 to -60	-61 to -90	-91 to -117

19 IMPACT MANAGEMENT

The impacts for each environmental feature identified are assessed for the pre-construction, construction, and operation phases for the proposed Ngwadini weir, abstraction works and pipeline.

19.1 Geology and Soil

19.1.1 Potential Impacts

The proposed developments of the weir, abstraction works, and pipeline will require suitable geological foundation conditions, which were confirmed through the geotechnical investigations as part of the Feasibility Study.

During the construction phase, large areas will be cleared of vegetation, which may lead to soil erosion. The EMPr will include suitable erosion and stormwater management measures to prevent the occurrence of erosion.

Soil may be polluted by poor storage of construction material, spillages and inadequate housekeeping practices. Specific mitigation measures are contained in the EMPr, where the primary objective is the effective and safe management of materials on site, in order to minimise the impact of these materials on the biophysical environment. The same objective applies to the correct management and handling of hazardous substances (e.g. fuel).

19.1.2 Impact Assessment

Geology and Soil	
Project Lifecycle:	Construction and Operational Phases
Potential Impact:	Soil Erosion
Proposed Mitigation:	Erosion Control: <ul style="list-style-type: none"> • Suitable erosion protective measures to be implemented for access roads. • Stabilisation of cleared areas to prevent and control erosion. The method chosen (e.g. watering, planting, retaining structures, commercial anti-erosion compounds) will be selected according to the site specific conditions. • Monitoring to be conducted to detect erosion. • Exposed areas to be rehabilitated as soon as possible to avoid erosion.

	<ul style="list-style-type: none"> • The Contractor shall take measures to the approval of the Engineer to ensure that there is no undue stormwater damage and soil erosion resulting from the construction activities outside the construction camp and works areas. • During construction, water diversion soil berms will be constructed to divert surface and stormwater from traversing the disturbed areas. • Cross and side stormwater drainage measures shall be constructed on access roads to the site. • At all stages of the project lifespan, stormwater control measures as specified by the Engineer shall be applied to keep soil on site by minimising: <ul style="list-style-type: none"> ○ erosion of temporary stockpiles of topsoil and permanent spoil dumps; ○ erosion from construction roads, excavations and other cleared areas; ○ silt-laden run off from all areas stripped of vegetation, including excavation surfaces and stockpiles of spoil and topsoil; ○ contaminated run off from storage areas. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Likely	3	-42
With Mitigation	-	Local	Low	Short	Unlikely	1	-4
Project Lifecycle:	Pre-Construction and Construction Phases						
Potential Impact:	Loss of topsoil						
Proposed Mitigation:	<ul style="list-style-type: none"> • During site preparation, special care must be taken during the clearing of the works area where organic material will be stored separately from the topsoil and spoil material to ensure for the protection thereof. This topsoil must be re-used during the rehabilitation phase. • Wind and water erosion-control measures to be implemented to prevent loss of topsoil. • After excavation, all soils must be replaced in the same order as they were removed. • Remove, stockpile and preserve topsoil for re-use during rehabilitation. • Topsoil should be temporarily stockpiled, separately from (clay) subsoil and rocky material, when areas are cleared. If mixed with clay sub-soil the usefulness of the topsoil for rehabilitation of the site will be lost. • Stockpiled topsoil should not be compacted and should be replaced as the final soil layer. No vehicles are allowed access onto the stockpiles after they have been placed. • Stockpiled soil should be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season. The need for such measures will be indicated in the site-specific report. • Topsoil stripped from different sites must be stockpiled separately and clearly identified as such. Topsoil obtained from sites with different soil types must not be mixed. • Topsoil stockpiles must not be contaminated with oil, diesel, petrol, waste or any other foreign matter, which may inhibit the later growth of vegetation and microorganisms in the soil. • Soil must not be stockpiled on drainage lines or near watercourses without prior consent from the Project Manager. • Soil should be exposed for the minimum time possible once cleared of invasive vegetation, that is the timing of clearing and grubbing should be coordinated as much as possible to avoid prolonged exposure of soils to wind and water erosion. Stockpiled topsoil must be either vegetated with indigenous grasses or covered with a suitable fabric to prevent erosion and invasion by weeds. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Likely	3	-42
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

19.2 Geohydrology

19.2.1 Potential Impacts

From the Technical Feasibility Study conducted, seasonal or local occurrences of groundwater might occur throughout the sections of pipeline east of the river. Groundwater will adversely affect excavation conditions, stability of the excavated slopes in the trenches, and pumping and possibly local de-watering will be required.

The project is unlikely to have an impact on groundwater as raw water is transported in the pipeline. However, groundwater may be impacted on as follows during construction phase:

- Contamination of groundwater resulting from incorrect storage/handling and disposal of hazardous waste materials.
- Contamination of groundwater through spillages from equipment, machinery and vehicle storage or from the batching plant.

19.2.2 Impact Assessment

Geohydrology							
Project Lifecycle:	Construction and Operational Phases						
Potential Impact:	Contamination through spillage of fuel, hazardous chemicals, leaking vehicles, etc.						
Proposed Mitigation:	<ul style="list-style-type: none"> • All construction activities to comply with NWA. • Ensure that all hazardous storage containers and storage areas comply with the relevant SANS standards to prevent leakage. • Regularly inspect all vehicles for leaks. • Re-fuelling of vehicles must take place off-site; if this is not possible then re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. • Littering must be prohibited by providing adequate number of rubbish bins during the construction and operational phases to ensure proper disposal of rubbish. • Staff must be trained to deal with fuel/chemical spills and spill kits must be easily available at all times. • Mixing of cement must be done on impermeable surface and all spills must be cleaned up immediately. • Ensure that all activities impacting on groundwater resources are managed according to the relevant DWS licensing requirements. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Moderate	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

19.3 Surface Water

19.3.1 Potential Impacts

The following impacts were identified by the Aquatic and Wetland Specialist and extracted from the Aquatic and Wetland Baseline and Impact Assessment (The Biodiversity Company, 2017):

- The alteration of flow volumes and patterns (Construction and Operation Phases);
- The increased sediment and turbidity (Construction);
- The risk of hydrocarbon contamination (Construction Phase); and
- The increase in water temperature (Operation Phase).

19.3.2 Impact Assessment

Surface Water – Hydrology

Project Lifecycle:	Construction Phase						
Potential Impact:	Impacts to watercourses from temporary diversions						
Proposed Mitigation:	<ul style="list-style-type: none"> Minimise influence to downstream flow regime when diverting and impeding flow (cofferdams, temporary river crossings etc.). Prevent erosion caused by temporary in-stream diversion. Install suitable buttressing / stabilisation structures to prevent future erosion, if required. Select appropriate crossing points (geotechnical conditions, sensitivity of riparian habitat and in-stream habitat), depending on technical feasibility. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4
Project Lifecycle:	Operational Phase						
Potential Impact:	Impacts to flow regime in the uMkhomazi River during the operation of the Ngwadini Scheme						
Proposed Mitigation:	<ul style="list-style-type: none"> Water abstracted from the uMkhomazi River must not impact the EWR of the uMkhomazi, i.e. the EWR must be satisfied and over abstraction must not take place. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Moderate	2	-12
With Mitigation	-	Local	Low	Short	Unlikely	1	-4
Surface Water – Water Quality							
Project Lifecycle:	Construction and Operational Phase						
Potential Impact:	Contamination of surface water through sedimentation from silt-laden runoff from disturbed areas.						
Proposed Mitigation:	<ul style="list-style-type: none"> Conduct water quality monitoring (baseline and during construction) at suitable up- and downstream sites. All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area. Storage area and ablution facilities to be located 50m from edge of riparian habitat. Where necessary, install in-stream silt traps during construction within the watercourse channel and along the riparian habitat. The style of silt trap will depend on materials used and the water movement patterns. Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses. Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand. Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. constructed out of geo-textiles and hay bales). 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Moderate	2	-20
With Mitigation	-	Local	Low	Short	Unlikely	1	-4
Project Lifecycle:	Construction and Operational Phase						
Potential Impact:	Contamination through spillage of fuel, hazardous chemicals, leaking vehicles, etc.						
Proposed Mitigation:	<ul style="list-style-type: none"> All construction activities to comply with the National Water Act (Act No. 36 of 1998). Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. Regularly inspect all vehicles for leaks. Re-fuelling of vehicles must take place off-site. Littering must be prohibited by providing adequate number of rubbish bins during the construction and operational phases to ensure proper disposal of rubbish. Staff must be trained to deal with fuel/chemical spills and spill kits must be easily available at all times. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Moderate	2	-20
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

Project Lifecycle:	Construction and Operational Phase						
Potential Impact:	Inadequate stormwater management due to lack of maintenance						
Proposed Mitigation:	<ul style="list-style-type: none"> Existing stormwater infrastructure should be maintained during construction activities to prevent the deterioration and subsequent failure of current infrastructure. Temporary berms should be constructed on the downstream perimeter of the site to channel runoff containing silt to a location where silt is allowed to settle prior to discharging into the existing stormwater infrastructure or natural watercourse. The main contractor is to control stormwater during construction by installing berms at the top of all cut and fill embankments. Runoff is to be diverted into the site and, either discharged by gravity or, if required, pumped to the Municipal stormwater network. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Moderate	2	-20
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

The methodology used by the aquatic and wetland specialist differs slightly from that described in Section 15.5. All impacts were analysed with regards to their nature, extent, magnitude, duration, probability and significance.

The assessments to follow were extracted from the Aquatic and Wetland Baseline and Impact Assessment (The Biodiversity Company, 2017) (**Tables 30 and 31**).

Table 28: Activity and impact table for the proposed project

Phase	Activity	Aspect	Impact
Construction	Construction of road and pipeline network	Site clearing and compaction	The activity would result in the deterioration of water and habitat quality within the downstream river reaches
		Storage of construction materials	
		Alteration of catchment drainage	
	Weir construction	Physical construction of the structure including the excavation of the streambed and removal of bank vegetation	Direct instream habitat loss and up and downstream habitat deterioration. Water quality impacts may also be anticipated through increased nutrients, suspended and dissolved solids
		Diversion of river for construction activities	
		Temporary infrastructure including mixing areas and ablutions	
		Spills and leaks of hydrocarbons and the operation of machinery	
Operation	Operation of the weir	Initial flooding of the impoundment	The flooding of upstream aquatic habitat and loss of water quantity downstream
		Maintenance of the impoundment and presence of barrier	The barrier will alter the hydrology of the river system resulting in negative effects to the ecology of the river system. The barrier

Phase	Activity	Aspect	Impact
			will serve to sever connectivity between up and downstream river reaches

Table 29: DWS Risk Impact Matrix for the proposed project

Risk Matrix (Based on DWS 2015 publication: Section 21 c and I water use Risk Assessment Protocol) This risk assessment was completed by Russell Tate (Pr. Sci. Nat: 400089/15)								
Aspect	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence
Construction Phase								
Site clearing and compaction	2	2	2	2	2	2	3	7
Storage of construction materials	0	3	1	3	1.75	2	3	6.75
Alteration of catchment drainage	3	1	3	2	2.25	2	3	7.25
Physical construction of the structure including the excavation of the streambed and removal of bank vegetation	2	2	3	3	2.5	2	3	7.5
Diversion of river for construction activities	3	2	3	2	2.5	1	3	6.5
Temporary infrastructure including mixing areas and ablutions	1	3	1	2	1.75	1	3	5.75
Spills and leaks of hydrocarbons and the operation of machinery	0	3	0	2	1.25	1	3	5.25
Operational Phase								
Initial flooding of the impoundment	4	2	4	4	3.5	2	4	9.5
Maintenance of the impoundment and presence of barrier	1	1	1	1	1	1	4	6
Physical abstraction of water	1	1	1	1	1	1	4	6
Runoff of contaminants and alteration of catchment hydrology	1	1	1	1	1	1	4	6

Table 30: DWS Risk Impact Matrix for the proposed project

Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
Construction Phase								
Site clearing and compaction	2	4	5	1	12	84	Moderate	Moderate
Storage of construction materials	2	3	1	3	9	60.75	Moderate	Low
Alteration of catchment drainage	2	4	5	1	12	87	Moderate	Moderate
Physical construction of the structure including the excavation of the streambed and removal of bank vegetation	2	4	5	1	12	90	Moderate	Moderate
Diversion of river for construction activities	2	4	5	1	12	78	Moderate	Low
Temporary infrastructure including mixing areas and ablutions	2	3	1	3	9	51.75	Moderate	Low
Spills and leaks of hydrocarbons and the operation of machinery	2	1	1	3	7	36.75	Moderate	Low
Operational Phase								
Initial flooding of the impoundment	1	5	5	1	12	114	Moderate	Moderate
Maintenance of the impoundment and presence of barrier	5	5	5	1	16	96	Moderate	Moderate
Physical abstraction of water	5	4	5	3	17	102	Moderate	Moderate
Runoff of contaminants and alteration of catchment hydrology	4	3	1	2	10	60	Moderate	Low
(*) denotes-In accordance with General Notice 509 "Risk is determined after considering all listed control / mitigation measures. Borderline moderate risk scores can be manually adapted downwards up to a maximum of 25 points (from a score of 80).								

The following recommendations are provided for the project:

- The recommended buffer zones should be strictly adhered to during the construction phase of the project, with exception of the activities and structures required to traverse a watercourse. This includes structures such as culverts for drainage lines and the weir structure itself. Any supporting aspects and activities, such as laydown and mixing yards, not required to be within the buffer area should adhere to the buffer zone.

Maintenance of Connectivity

The loss of connectivity between areas up- and downstream of the weir are anticipated to have the largest ecological impact, especially when considering the listed Near Threatened species. It is anticipated that the weir will act as a barrier. Therefore, in order to facilitate the movement of fish species, a fish ladder is recommended as the mitigation action. A fish ladder has been included in the initial proposed weir design options. However, the option considered from an aquatic ecology perspective should pose the least risk to fish migration.

Detailed fish ladder designs should implement the established protocols found in Water Research Commission (WRC) report No 1270/2/04 and WRC report No 1310/1/05. Essentially, four types of fishways should be considered namely: Pool and weir, vertical-slot, pool and slot, and natural by-pass channels.

Considering this literature, the following fishway concepts should be adhered to in the preferred option:

- The fishway should have water passing through it during both high flows and low flows to encourage fish to make use of the fishway no matter the flow levels;
- The fishway should cater for both rheophilic (fastmoving water) and anti-rheophilic (slow moving water) fish species. This can be achieved through having several different flow velocity areas across the fishway;
- It is recommended that a rough stone surface be cast into the fishway channel floor to cater for climbing and crawling species;
- Rocks used for the fishway should have flat sides with rounded edges (typical of quarried rock) rather than rounded rocks, as they provide a variety of water velocity and depths that easy for fish to navigate;
- Pools or depressions of varying sizes and depths should be created at random throughout the length and width of the fishway and should be placed behind large rocks to create lower velocity resting areas (eddies) for fish. The more pools incorporated in the design, the more successful the fishway will be; and
- Additional guidelines for fishway design include:
 - Channel slope (gradients) – between 1/8 and 1/10 is recommended for South African fish;

- Fishway entrance – furthest point upstream that the fish can penetrate, usually in a suitable pool (low turbulence with sufficient depth) located at the base of the low level weir;
- Fishway exit – located in a quiet area, sheltered, low velocity to prevent fish from being swept downstream and to afford protection from predators;
- - the invert level of the exit (i.e. water inflow) should be lower than that of the weir overflow to ensure the low flows are directed down the fishway;
- Depth of pool - small fish (20 to 200 mm in length: at least 300 mm to reduce predation and limit turbulence;
- - Larger fish (>200 mm): at least 500 mm can be deeper to reduce turbulence, if necessary;
- Length of pool – at least 2.5 times the length of the largest fish catered for;
- Drop height between pools/rock levels – maximum of 100 mm to cater for small fish;

Mitigation for Altered Hydrology

The following mitigation measures are prescribed:

- A water bar diverts water flowing down a surface (e.g. road) to one side. This reduces the volume of water that flows down the surface and the subsequent erosion that occurs;
- During the excavation of watercourses, flows should be diverted around active work areas where required. Water diversion must be temporary and re-directed flow must not be diverted towards any stream banks that could cause erosion;
- Construction areas should be demarcated and watercourses marked as “restricted” in order to prevent the unnecessary impact too and loss of these systems;
- Storm water channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion;
- Prevent uncontrolled access of vehicles through the wetlands that can cause a significant adverse impact on the hydrology and alluvial soil structure of these areas;
- All removed soil and material must not be stockpiled within the system. Stockpiling should take place outside of the water resources. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds; and
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil.

Mitigation for Impaired Water Quality Protection

The following mitigation measures are prescribed:

- Storm water channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion;

- Laydown yards, camps and storage areas must be beyond the water resource areas and associated buffers where applicable;
- During construction contractors used for the project must have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly;
- As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;
- All chemicals and toxicants during construction must be stored in bunded areas;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site;
- Cofferdams are temporary structures used to displace water and provide dry access to usually submerged areas (such instream construction and maintenance of bridges etc). They can also be built to prevent water coming into contact with high impact zones (e.g. construction and mining sites) and reduce the amount of sedimentation and pollution;
- Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation);
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems;
- No dumping of construction material on-site may take place; and
- All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.

Mitigation for Erosion and Sedimentation

The following mitigation measures are prescribed:

- Storm water channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion;
- During the excavation of watercourses, flows should be diverted around active work areas where required. Water diversion must be temporary and re-directed flow must not be diverted towards any stream banks that could cause erosion;
- All removed soil and material must not be stockpiled within the system. Stockpiling should take place outside of the water resources. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;

- A water bar diverts water flowing down a surface (e.g. road) to one side. This reduces the volume of water that flows down the surface and the subsequent erosion that occurs;
- Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching; and
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil.

Mitigation for Alien Invasive Plants

The following mitigation measures are prescribed:

- Quarterly vegetation rehabilitation surveys need to be conducted of the vegetation within the project footprint; and
- An alien invasive plant management plan needs to be compiled and implemented prior to construction to control and prevent the spread of invasive aliens.

Pipeline Trench Rehabilitation Measures

The following measures are required for digging within the watercourses:

- Trench must be side dug (where possible) from the access routes, or already disturbed areas;
- Trenches must be dug on-line (where applicable) creating narrower trenches;
- Where trench breakers are required, these must be imported appropriately and installed by the backfill crew, ahead of backfilling;
- Careful separation of soil types/ strata as identified;
- The soils must be removed in such a way that they can be easily reinstated in the reverse order;
- To ensure correct backfilling, the soil that is removed from the trench at its deepest point must be laid closest to the trench. The first layer of topsoil must be laid furthest away from the trench;
- Excess spoil must be temporarily windrowed over the trench to permit natural settling of the material prior to the reinstatement phase;
- Stripping must be demarcated to avoid unnecessary removals (survey pegs). Keep stripping areas to a minimum footprint area;
- Trenches within watercourses must be in excess of 1m to enable interflow within the system;
- Vegetation should be stripped / removed in a phased manner. Where possible, store vegetation for re-planting. Impacted areas can be re-vegetated using sods from removed vegetation;
- To avoid compaction of the backfilled trench, ripping should be done to a maximum depth of 300mm in two directions at right angles;

- Ripping should be conducted during the drier period;
- After construction, compacted top soil should be ripped and vegetation re-planted or seeds dispersed; and
- The construction of the pipeline should be undertaken in the dry season.

19.4 Terrestrial Ecology – Flora

19.4.1 Potential Impacts

Vegetation will be lost within areas that are to be cleared for the project infrastructure. The potential loss of significant flora species may occur.

One protected tree species recorded along the pipeline route was *Sclerocarya birrea* subsp. *caffra* (Marula tree). A permit for either removing or disturbing this plant will be required from Department of Agriculture, Forestry and Fisheries before any construction commences.

A permit to remove the identified Specially Protected Indigenous Plants (Natal Nature Conservation Ordinance, 15 of 1974) will need to be obtained from Ezemvelo KZN Wildlife.

During the field survey, only one plant species of conservation concern listed as Declining was observed in the study area, namely *Hypoxis hemerocallidea* (Star flower/African potato) and it is thus recommended that a Search, Rescue and Relocation Plan be developed.

Clearing of vegetation for construction purposes may result in the proliferation of exotic vegetation, which could spread beyond the construction domain. This potential impact will need to be managed.

19.4.2 Impact Assessment

The impact assessment below was extracted from the Terrestrial Ecological Impact Assessment (Phamphe, 2017):

FLORA PRE – CONSTRUCTION PHASE	
Potential Impact	Mitigation
Loss of plant species of conservation concern and protected trees on site	<ul style="list-style-type: none"> • It is recommended that prior to construction, the <i>Hypoxis hemerocallidea</i> plant species recorded must be searched and rescued and then following construction activities, they can be re-established at the site. • A permit to remove Specially Protected Indigenous Plants (Natal Nature Conservation Ordinance, 15 of 1974) will need to be obtained from Ezemvelo KZN Wildlife. The removal should occur during the summer months and with due care, preferably by a qualified botanist or similarly qualified individual. The plants should be relocated into areas with the same aspect, soil conditions and elevation to ensure that the relocations are successful.

FLORA PRE – CONSTRUCTION PHASE						
Potential Impact			Mitigation			
			<ul style="list-style-type: none"> A Permit to either cut, destroy, disturb and /or transplant the protected Marula tree must be obtained from DAFF. Given that the species of conservation importance were observed, it is important that a walk-down survey be conducted for plant species of conservation importance and threatened species which may occur on the project area and are addressed through a search and rescue plan. 			
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FLORA PRE – CONSTRUCTION PHASE	
Potential Impact	Mitigation
Destruction of indigenous flora during site establishment	<ul style="list-style-type: none"> Indigenous plants naturally growing on the proposed development area, but that would be otherwise destroyed during clearing for development purposes should be incorporated into landscaped areas. Vegetation clearing should be kept to a minimum, and this should only occur where it is absolutely necessary and the use of a brush-cutter is highly preferable to the use of earth-moving equipment. Rehabilitate all disturbed areas as soon as the construction is completed within the proposed development area. Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm and this can be achieved through provision of appropriate awareness to all personnel. Vehicles and construction workers should under no circumstances be allowed outside the site boundaries to prevent impact on the surrounding vegetation. Where possible, natural vegetation must not be cleared and encouraged to grow. Disturbance of vegetation must be limited only to areas of construction. Prevent contamination of natural areas by any pollution. Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent further spread. No storage of building materials or rubbles are allowed in the sensitive areas, such as the riparian habitats.

FLORA PRE – CONSTRUCTION PHASE						
Potential Impact			Mitigation			
			<ul style="list-style-type: none"> Avoid translocating stockpiles of topsoil from one place to sensitive areas in order to avoid translocating soil seed banks of alien species 			
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA AND FAUNA PRE – CONSTRUCTION PHASE						
Potential Impact			Mitigation			
Loss of Habitat & Habitat Fragmentation			<ul style="list-style-type: none"> The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining. No structures should be built outside the area demarcated for the development. Although it is unavoidable that sections of the road access and pipeline routes will need to traverse areas of potential sensitivity, the development should be constructed in such cases so as to avoid further impact to these areas. All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation. 			
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact			Mitigation			
Loss of vegetation due to fuel and chemical spills.			<ul style="list-style-type: none"> Appropriate measures should be implemented in order to prevent potential soil pollution through fuel and oil leaks and spills and then compliance monitored by an appropriate person. Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks. Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Drip-trays must be placed under vehicles and equipment when not in use. Implement suitable erosion control measures 			
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Introduction of alien species.		<ul style="list-style-type: none"> • During construction, the construction area and immediate surroundings should be monitored regularly for emergent invasive vegetation. • Promote awareness of all personnel. • The establishment of pioneer species should be considered with the natural cycle of rehabilitation of disturbed areas, which assists with erosion control, dust and establishment of more permanent species. This can be controlled during construction phase and thereafter more stringent measures should be implemented during the rehabilitation and post rehabilitation. • Larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain for aesthetic purposes. 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Destruction of alien vegetation.		<ul style="list-style-type: none"> • All alien seedlings and saplings must be removed as they become evident for the duration of construction phase • Manual / mechanical removal is preferred to chemical control. 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Increased soil erosion		<ul style="list-style-type: none"> • Topsoil should be stored in such a way that it does not compromise its plant-support capacity. • Topsoil from the construction activities should be stored for post-construction rehabilitation work and should not be disturbed more than is absolutely necessary. • Protect topsoil in order to avoid erosion loss on steep slopes. • Protect topsoil from contamination by aggregate, cement, concrete, fuels, litter, oils, domestic and wastes. • An ecologically-sound storm water management plan must be implemented during construction and appropriate water diversion systems put in place. 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of ESA habitats		<ul style="list-style-type: none"> • Vehicles and construction workers should under no circumstances be allowed outside the site boundaries to prevent impact on the surrounding vegetation. • Where possible, natural vegetation must not be cleared and encouraged to grow. • All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation. • Disturbance of vegetation must be limited only to areas of construction. • Prevent contamination of natural grasslands by any pollution. • Areas cleared of vegetation must be re-vegetated with indigenous plants local to the area prior to contractor leaving the site. 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA AND FAUNA CONSTRUCTION PHASE	
Potential Impact	Mitigation
Damage to plant and animal life outside of the proposed development area.	<ul style="list-style-type: none"> • Any fauna (mammal, reptile and amphibian) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be rescued and relocated by an experienced person. • Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent their spread. • No unauthorised vehicles should be allowed to drive through the site during the construction activities. • No trapping or any other method of catching of any animal may be performed on site. • Illegal hunting is prohibited. • No dumping of any form is permitted. • No damage and/or removal/trapping/snaring of indigenous plant or animal material for cooking and other purposes will be allowed. • All areas to be affected by the proposed development will be rehabilitated by indigenous vegetation.

FLORA AND FAUNA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
		<ul style="list-style-type: none"> Construction activities should be restricted to the development footprint area and then the compliance in terms of footprint can be monitored by Environmental Control Officer (ECO). 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION/POST CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of habitat due to construction activities		<ul style="list-style-type: none"> All areas to be affected by the proposed project will be rehabilitated after construction and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed registered landfill site. As much vegetation growth as possible should be promoted within the proposed development site in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during landscaping. In terms of the percentage of coverage required during rehab and also the grass mix to be used for rehab, the EMPr will be consulted for guidance. However, the plant material to be used for rehabilitation should be similar to what is found in the surrounding area. 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

19.5 Terrestrial Ecology – Fauna

19.5.1 Potential Impacts

Vulnerable species could occur within the study area and the construction of the proposed development will have a negative impact on the habitats of such species. Fauna could be adversely affected through construction-related activities (noise, illegal poaching, and habitat loss).

Riparian habitats were investigated for any signs or indications that the water system may be inhabited by Otters and only scats of Cape Clawless Otter (*Aonyx capensis*) were recorded on the proposed development site.

In order to protect habitat for the detected African/Cape Clawless Otter (Near Threatened), a buffer around riparian vegetation is recommended.

One endemic species recorded on the proposed development site was a Jackal Buzzard (*Buteo rufofuscus*).

19.5.2 Impact Assessment

The impact assessment below was extracted from the Terrestrial Ecological Impact Assessment (Phamphe, 2017):

FAUNA PRE – CONSTRUCTION PHASE						
Potential Impact			Mitigation			
Loss of animal species of conservation concern			<ul style="list-style-type: none"> Riparian habitat provides migratory corridors and in order to protect habitat for the detected African/Cape Clawless Otter, a buffer around riparian habitats is recommended. 			
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FAUNA PRE – CONSTRUCTION PHASE						
Potential Impact			Mitigation			
Loss and displacement of animals on site.			<ul style="list-style-type: none"> Any fauna (mammal and reptile) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be rescued and relocated by an experienced person. Training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily. The contractor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase. Vehicles must adhere to a speed limit, 30-40 km/h is recommended for light vehicles and a lower speed for heavy vehicles. All construction and maintenance vehicles must stick to properly demarcated and prepared roads. Off-road driving should be strictly prohibited. No fires should be allowed at the site No trapping or any other method of catching of any animal or bird may be performed on site No dogs or other domestic pets should be allowed at the site. 			
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FLORA AND FAUNA PRE – CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of Habitat & Habitat Fragmentation		<ul style="list-style-type: none"> The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining. No structures should be built outside the area demarcated for the development. Although it is unavoidable that sections of the road access and pipeline routes will need to traverse areas of potential sensitivity, the development should be constructed in such cases so as to avoid further impact to these areas. All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation. 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA AND FAUNA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Damage to plant and animal life outside of the proposed development area.		<ul style="list-style-type: none"> Any fauna (mammal, reptile and amphibian) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be rescued and relocated by an experienced person. Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent their spread. No unauthorised vehicles should be allowed to drive through the site during the construction activities. No trapping or any other method of catching of any animal may be performed on site. Illegal hunting is prohibited. No dumping of any form is permitted. No damage and/or removal/trapping/snaring of indigenous plant or animal material for cooking and other purposes will be allowed. All areas to be affected by the proposed development will be rehabilitated by indigenous vegetation. Construction activities should be restricted to the development footprint area and then the compliance in terms of footprint can be monitored by Environmental Control Officer (ECO). 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FAUNA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Disturbance to animals		<ul style="list-style-type: none"> Animals residing within the designated area shall not be unnecessarily disturbed. During construction, refresher training must be conducted to construction workers with regards to littering and poaching. The Contractor and his/her employees shall not bring any domestic animals onto site. Toolbox talks should be provided to contractors regarding disturbance to animals. Particular emphasis should be placed on talks regarding snakes. 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FAUNA OPERATIONAL PHASE						
Potential Impact		Mitigation				
Disturbance of faunal species		<ul style="list-style-type: none"> The disturbance of fauna should be minimized. Animals residing within the designated area shall not be unnecessarily disturbed. 				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

19.6 Heritage Resources

19.6.1 Potential Impacts

An abandoned house close to the remains of another structure was located. Close to the abandoned house, a potential grave site was found with a border made of rocks roughly cemented together. South-west of the proposed dam wall and falling within the buffer of the proposed access road is the grave of a member of the Mbele clan. The grave is not visible as it is heavily overgrown with vegetation and has no headstone or other marker. In addition, two grave sites were found during the site inspection by the Heritage Specialist.

There may be chance findings of heritage resources such as archaeological and cultural-historical sites or artefacts in or near the study area that could be destroyed during construction. Such heritage resources will need to be identified (if any) and protected (if required).

19.6.2 Impact Assessment

The impact assessment below was extracted from the HIA (JLB Consulting, 2017):

Configuration option 1		
	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Permanent	Permanent
Magnitude	Low	Low
Probability	Unlikely	Rare / remote
Status	Negative	Negative
Reversibility	No	No
Level of Significance	2 – if mitigation measures are not implemented	1 – no impact with implementation of mitigation measures
Can impacts be mitigated	Yes	
Mitigation		
<ul style="list-style-type: none"> • If, during excavation for and construction of the weir and abstraction works, there are chance finds of heritage resources (for example, graves, fossils) then work must stop immediately and a heritage specialist called to site to inspect the find and decide the way forward. No work may be undertaken until the heritage specialist allows this. • If any heritage resources are to be altered, removed or destroyed, then the correct permits must be obtained from Amafa prior to any action been undertaken. 		
Configuration option 2		
	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Permanent	Permanent
Magnitude	Low	Low
Probability	Moderate	Unlikely
Status	Negative	Negative
Reversibility	No	No
Level of Significance	2 – if mitigation measures are not implemented	1 – no impact after mitigation
Can impacts be mitigated	Yes	
Mitigation		
<ul style="list-style-type: none"> • If, during excavation for and construction of the weir and abstraction works, there are chance finds of heritage resources (for example, graves, fossils) then work must stop immediately and a heritage specialist called to site to inspect the find and decide the way forward. No work may be undertaken until the heritage specialist allows this. • If any heritage resources are to be altered, removed or destroyed, then the correct permits must be obtained from Amafa prior to any action been undertaken 		

19.7 Air Quality

19.7.1 Potential Impacts

Potential impacts during the construction phase include:

- Dust will be generated during the construction period from various sources, including blasting, earthworks, stockpiles, use of access roads, transportation of spoil material and general construction activities on site; and
- Exhaust emissions from vehicles and equipment.

Mitigation measures are included in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored (dust fallout and particulate matter) and managed and that regulated thresholds are not exceeded.

19.7.2 Impact Assessment

Air Quality							
Project Lifecycle:	Construction Phase						
Potential Impact:	Excessive dust levels as a result of construction activities						
Proposed Mitigation:	<ul style="list-style-type: none"> • Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area and access roads. Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of sensitive receptors. • Speed limits to be strictly adhered to. • The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties). • Air quality to be monitored (baseline and during construction) for dust fallout and particulate matter. Sampling locations to consider major sources of dust and sensitive receptors. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

19.8 Noise

19.8.1 Potential Impacts

During construction, localised increases in noise and vibration will be caused by the following:

- Operation of motorised vehicles for transportation of personnel, materials, and equipment to, from, and within the development site;
- Drilling operations;
- Operation of mobile and stationary motorised equipment within the site boundary (e.g. haul trucks, excavators, bulldozers, loaders, drill rigs, aggregate crushers, conveyor systems and generators);
- Operation of various auditory safety signals, alarms, or sirens (e.g. vehicle backup alarms and blast warning); and
- General construction activities on site.

During operation, the weir and abstraction works may increase the noise levels in the study area but minimally.

Noise that emanates from construction and operational activities will be addressed through targeted best practices for noise monitoring and management in the EMPr. The associated regulated standards need to be adhered to.

Project personnel working on the site will experience the greatest potential exposure to the highest levels of noise and vibration. Workplace noise and vibration issues will be managed as part of the Occupational Health and Safety Management System to be employed on site, which will include specific measures aimed at preventing hearing loss and other deleterious health impacts.

19.8.2 Impact Assessment

Noise							
Project Lifecycle:	Construction Phase						
Potential Impact:	Excessive noise levels as a result of construction activities						
Proposed Mitigation:	<ul style="list-style-type: none"> The provisions of SABS 1200A will apply to all areas within audible distance of residents. Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners/occupiers and community members. Construction activities generating output levels of 85 dB or more will be confined to normal working hours. Noise preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to be employed. Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. Noise to be monitored (baseline and during construction). Sampling locations to consider major noise sources and sensitive receptors. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

19.9 Aesthetic Quality

19.9.1 Potential Impacts

Potential visual impacts during the construction phase of the powerline will be caused by poor placement of the construction camp and equipment, as well as poor management of rubble, refuse and construction material on site. Additionally, destruction of the surrounding natural environment would decrease the aesthetic appeal of the area. Thus, the visual impacts should be minimised.

19.9.2 Impact Assessment

Aesthetics Quality	
Project Lifecycle:	Construction Phase
Potential Impact:	Reduction in visual quality due to construction activities
Proposed Mitigation:	<ul style="list-style-type: none"> On-going housekeeping to maintain a tidy construction area. Construction camp to be positioned to minimize its visual impacts. Damage to the natural environment should be minimised.

	<ul style="list-style-type: none"> Vegetation should be cut only if necessary. The clearing of all sites should be kept to a minimum and surrounding vegetation should as far as possible be left intact as a natural shield. The fragmentation of stands of indigenous vegetation and straight lines on trees should as far as possible be minimized. No painting or marking of natural features shall be allowed. Marking for surveying and other purposes shall only be with pegs and beacons. Trees and all woody shrubs should be protected from damage to provide a natural visual shield. Excavated material should not be placed on such plants and movement across them should not be allowed as far as practical. No construction rubble, construction material, refuse, litter or any other material not found naturally in the surroundings should be allowed at any time to be lying around on the construction site. Particular aspects of concern to landowners and local residents should be addressed during construction. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4
Project Lifecycle:	Operational Phase						
Potential Impact:	Reduction in visual quality due to the permanent weir and abstraction works						
Proposed Mitigation:	<ul style="list-style-type: none"> On-going housekeeping to maintain a tidy area. Rehabilitate and revegetate the area after construction. No painting or marking of natural features shall be allowed. Marking for surveying and other purposes shall only be with pegs and beacons. Trees and all woody shrubs should be protected from damage to provide a natural visual shield. Particular aspects of concern to landowners and local residents should be addressed. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

19.10 Safety and Security

19.10.1 Potential Impacts

During construction, there may be the potential for employees to be injured, as well as the safety of landowners and surrounding communities may be compromised. All environmental hazards and safety risks must be included in the employees' safety file for inclusion into the contractor's mitigation measures.

19.10.2 Impact Assessment

Safety and Security	
Project Lifecycle:	Construction Phase
Potential Impact:	<ol style="list-style-type: none"> Uncontrolled access to proposed boundary extension. Demolition activities. Construction employees getting injured. Open trenches and construction vehicles may pose a safety risk.
Proposed Mitigation:	<ul style="list-style-type: none"> Compliance with Occupational Health and Safety Act (Act No. 85 of 1993). Contractor to provide an Occupational Health and Safety Management Plan to the Construction Manager for approval prior to the commencement of works in terms of the Construction Regulations (2014). Proper supervision of employees at all times. Employees to be clearly identifiable. Employees to remain within the site boundary and no loitering to be allowed. Access into and out of the servitude must only be via existing access roads from local public roads. Contractor to prepare and submit, for approval, a rescue procedure for employees in the case of an injury. Any employees of the Contractor or his sub-contractors found to be in breach of any of the Environmental Protection specifications may be ordered to leave the site forthwith.

	<ul style="list-style-type: none"> Supervisory staff of the contractor, or sub-contractors shall not direct any person to undertake any activities, which would place such person/organization in contravention to any law, regulation or the EMPPr itself. Depending on the type of contravention or action it may also be necessary for the work to be called to a halt until such time as the contravention or action is corrected and investigated. When working in the area of encroachment is prevalent, all open excavated trenches and foundations should be clearly marked and secured to keep people and fauna from falling in. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Short	Unlikely	3	-36
With Mitigation	-	Local	High	Short	Rare	1	-9

19.11 Waste Management

19.11.1 Potential Impacts

Waste management aims to avoid waste pollution of land, air and water during and as a consequence of the construction of the Ngwadini scheme.

The following describes the impacts during the construction phase:

- Waste generated from site preparations (e.g. plant material);
- Domestic waste;
- Surplus and used building material;
- Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags);
- Wastewater (sanitation facilities, washing of plant, operations at the batching plant, etc.); and
- Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks.

Poor waste management and practices during construction including lack of proper waste disposal, littering, and burning of refuse should not be tolerated.

19.11.2 Impact Assessment

Waste Management	
Project Lifecycle:	Construction Phase
Potential Impact:	Land, air and water pollution through poor waste management practices
Proposed Mitigation:	<ul style="list-style-type: none"> Sufficient ablution facilities to be provided at the Construction Camp within the construction site. Suitable litter receptacles to be positioned strategically across the site at all working areas. Waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes). The Contractor shall dispose of all refuse generated on site or from the activities of construction or its related activities. The contractor shall on a weekly basis dispose of all refuse at an approved refuse disposal site. Proof of disposal must be kept on record. Littering by the workers is prohibited. Clearly marked litterbins must be provided on site. Monitor the presence of litter on site. All staff shall be sensitised to this effect. The entire site will be cleared of construction material, metal, tins, glass bottles, and food packaging or any other type of empty container or waste material or waste equipment used by the construction team on a daily basis. Waste material that may harm man or animals should be removed immediately.

	<ul style="list-style-type: none"> No hazardous materials e.g. oil, diesel and fuel should be disposed of in the surrounding environment. Any diesel, oil or petrol spillages are to be collected and stored in specially marked containers and disposed of at a permitted waste disposal site and must be treated as hazardous waste. No refuse or litter is allowed to be burnt on site. The recycling of all waste is to be encouraged of both the contractor and staff. All vehicle parking areas and vehicle servicing areas are to be inspected carefully for diesel, oil and other spillages weekly. Excess spoil material should be disposed of at a location identified by the Contractor and approved by the Engineer and ECO. Where possible spoil should be used to fill, shape and rehabilitate borrow pits. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	3	-36
With Mitigation	-	Local	Medium	Short	Unlikely	1	-8

19.12 Traffic

19.12.1 Potential Impacts

During the construction period, there will be an increase in traffic on the local road networks due to the delivery of plant and material, transportation of staff and normal construction-related traffic. Haul roads and access roads will also be created on site, within the construction domain.

As part of the construction phase, measures will be implemented for the selective upgrade of the roads (if necessary) and to render these roads safe for other users (amongst others). After the construction phase, the local roads will only need to be used for operation and maintenance purposes.

All the appropriate traffic safety measures and control must be implemented to minimise any potential impacts associated with the construction of the Ngwadini scheme. Any disruptions to the transportation network must be mitigated, and will be discussed in the EMPr.

19.12.2 Impact Assessment

Traffic							
Project Lifecycle:	Construction Phase						
Potential Impact:	<ul style="list-style-type: none"> Inadequate road conditions Disruptions to existing road users Safety risks Increase in dust levels 						
Proposed Mitigation:	<ul style="list-style-type: none"> Make provision for landowners and affected parties to access their properties. Speed limit of 40km/h on roads within the project area to be adhered to. Access roads to be maintained in a suitable condition. Suitable erosion protective measures to be implemented for access roads during the construction phase. Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented. Clearly demarcate all access roads. Clearly mark pedestrian-safe access routes. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	3	-36
With Mitigation	-	Local	Low	Short	Moderate	1	-5

19.13 Socio-Economic Environment

19.13.1 Potential Impacts

A positive impact could be the creation of short-term work opportunities for local communities during construction, as well as long-term work during the operation and maintenance of the Ngwadini scheme. In addition, the proposed project will result in a sustained economic and social beneficiation from the water services.

There are also negative impacts associated with the construction of the Ngwadini scheme and are as follows:

- Traffic disruptions;
- Dust, noise and visual impacts;
- Proximity to construction work and associated inconvenience and dangers; and
- Sense of place.

19.13.2 Impact Assessment

Traffic							
Project Lifecycle:	Construction Phase						
Potential Impact:	<ul style="list-style-type: none"> • Direct Employment 						
Proposed Mitigation:	<ul style="list-style-type: none"> • Where feasible introduce a programme to transfer skills particularly during the construction phase of the project. • Employment opportunities to be created for women. • A CLO should be appointed by the Contractor to effectively manage the employment process. • The selection process should be transparent and must include both men and women. • The project proponent should designate a person to ensure that employment is handled correctly, transparently and is not disruptive to the project. All evidence of the labour process must be stored by the project proponent. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	+	Local	Low	Short	Almost certain	2	+14
With Mitigation	+	Local	Medium	Short	Almost certain	3	+49
Project Lifecycle:	Construction and Operational Phases						
Potential Impact:	Poor communication with adjacent landowners and affected parties						
Proposed Mitigation:	<ul style="list-style-type: none"> • A CLO must be appointed on the project to manage the stakeholder engagement process during the construction phase. • Establish lines of communications with affected parties, adjacent landowners, and community members, particularly the adjacent school and residential complexes. • Establish processes and procedures to effectively verify and address complaints and claims received. • Provide the relevant contact details to affected parties, adjacent landowners, and community members for queries / raising of issues or complaints. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Medium	Almost Certain	2	-48
With Mitigation	+	Local	High	Medium	Almost Certain	2	+48
Project Lifecycle:	Construction						
Potential Impact:	Health and safety on site						
Proposed Mitigation:	<ul style="list-style-type: none"> • Contractor to appoint a CLO, or to assign such responsibilities to a competent staff member who will have adequate time to fulfil relevant functions. 						

	<ul style="list-style-type: none"> The Contractor must submit a Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval prior to the commencement of work. These requirements are aligned with the Construction Regulations (2003). Construction related material should kept in access controlled area. The requirements of the Occupational Health and Safety Act (Act 85 of 1993) and related regulations shall be adhered to. Maintain access control to prevent access of the public to the construction areas. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Low	Short	Likely	2	-12
With Mitigation	-	Local	Medium	Short	Rare	1	-6
Project Lifecycle:	Construction						
Potential Impact:	Nuisance factors such as noise and dust						
Proposed Mitigation:	<ul style="list-style-type: none"> Construction activities to remain within the designated construction areas. The provisions of SANS 10103:2008 will apply to all areas at the perimeter of the site, within audible distance of residents. Working hours to be agreed upon with Project Manager, so as to minimise disturbance to adjacent landowners and community members. Where possible, noise disturbance should be at times after school hours. Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area, access roads, site yard, etc. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Low	Short	Likely	2	-12
With Mitigation	-	Local	Medium	Short	Rare	1	-6
Project Lifecycle:	Construction						
Potential Impact:	Traffic disruptions						
Proposed Mitigation:	<ul style="list-style-type: none"> Before any work can start, the Local Traffic Department must be consulted about measures to be taken regarding pedestrian and vehicular traffic control. Undertake negotiations and confirm arrangements with the adjacent landowners regarding the use of traffic arrangements. Ensure appropriate traffic safety measures are implemented. Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Low	Short	Likely	2	-12
With Mitigation	-	Local	Medium	Short	Rare	1	-6

19.14 Cumulative Impacts

According to GN No. R. 982 of the amended EIA Regulations (07 April 2017), a “**cumulative impact**”, in relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Cumulative impacts can be identified by combining the potential environmental implications of the proposed project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

The following cumulative impacts are anticipated:

- Loss of sensitive vegetation types;
- Encroachment of alien vegetation;

- Damage to wetland habitat; and
- Traffic impacts.

Cumulative Impacts							
Potential Impact:	Loss of sensitive vegetation types						
Proposed Mitigation:	<ul style="list-style-type: none"> • Appropriate measures should be implemented in order to prevent potential soil pollution through fuel and oil leaks and spills and then compliance monitored by an appropriate person. • Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks. • Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Drip-trays must be placed under vehicles and equipment when not in use. • Implement suitable erosion control measures. • All conditions of the EMPr must be adhered to. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Long Term	Likely	2	-32
With Mitigation	-	Local	Low	Long Term	Unlikely	1	-6
Potential Impact:	Encroachment of alien vegetation						
Proposed Mitigation:	<ul style="list-style-type: none"> • Rehabilitation measures must be implemented once construction activities are complete to ensure that alien vegetation will be controlled during the construction and operational phases. • All conditions of the EMPr must be adhered to. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Moderate	2	-20
With Mitigation	-	Local	Low	Short	Unlikely	1	-4
Potential Impact:	Damage to wetland habitat						
Proposed Mitigation:	<ul style="list-style-type: none"> • Keep all demarcated sensitive zones outside of the construction area off limits during the construction and rehabilitation phases of the development. • Monitor all systems for erosion and incision. • Revegetate all disturbed areas with indigenous riparian species. • All conditions of the EMPr must be adhered to. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4
Potential Impact:	Construction-related traffic disruptions and deterioration of road conditions						
Proposed Mitigation:	<ul style="list-style-type: none"> • Ensure that the necessary signage and traffic measures are implemented for safe and convenient access to the site. • Suitable erosion protective measures to be implemented for access roads during the construction phase. • Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented • All conditions of the EMPr must be adhered to. 						
	Nature +/-	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

20 ANALYSIS OF ALTERNATIVES

Alternatives are the different ways in which the project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project. By conducting the comparative analysis, the BPEOs can be selected with technical and environmental

justification. Münster (2005) defines BPEO as the alternative that “provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term”.

20.1 No-go Alternative

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the project is included in the evaluation of the alternatives.

As a result of the Ngwadini weir, abstraction works and pipeline not being built, the OSC Ngwadini Dam will not be filled, therefore there would not be the much needed increase in water supply to the South Coast of KwaZulu-Natal. In addition, the projected 30-year water demands will not be met. If future water requirements are not met, severe and frequent restrictions of water supply may need to be implemented in the region. These restrictions would be in effort to support the projected growth and water requirements in the water supply area of the South Coast.

20.2 Comparative Analysis of Alternatives based on Impact Assessment

Table 33 summarises and compares the findings of the various relevant specialists in terms of their respective preferences for the project alternatives based on the outcome of the specialist studies and impact assessment.

Table 31: Summary of the Specialists' preferred options

Environmental Feature/Attribute	Layout of Abstraction Works	
	Option 1	Option 2
Terrestrial Ecology	X	
Riparian Habitat and Wetland	No Preference	
Heritage	X	
Technical		X

From an ecological perspective, Option 2 covers larger footprint and more riparian vegetation will be cleared for construction activities as compared to Option 1 and therefore Option 1 will be more preferred. Riparian vegetation helps in preventing erosion and also traps sediment and pollutants, helping to keep the water clean.

The Aquatic and Wetland Specialist stated that the abovementioned proposed design options will not differ significantly in their potential impacts. Additionally, both options include provisions for a fishway. Hydraulic components of the proposed fishways are anticipated to be of a similar nature, although differences may be anticipated.

As described in the mitigation action connectivity component of the Water Resources Assessment various fishway concepts were presented. The option which presents the closest match to these concepts is the preferred option for the abstraction works design.

From a heritage perspective, the assessment of the two options indicates that due to the larger size of the option 2 it could have a higher impact on heritage resources than option 1, therefore, option 1 is the preferred option for the proposed weir and abstraction works.

20.3 Best Practicable Environmental Option (BPEO)

Based on the recommendations of the specialists, technical considerations and the comparison of the impacts associated with the two abstraction works layouts, Layout Option 2 was selected.

Layout Option 2 was selected as the BPEO due to the following reasons:

- The trashracks are protected, which will require less frequent cleaning and maintenance compared to the unprotected trashracks of Option 1;
- The high wall and submerged inlets included in Option 1, directs debris away from the trashracks and reduces the accumulation thereof;
- The high wall allows easier cleaning of the trashrack during floods as the flow is less turbulent behind the wall;
- Jet pumps, as included in Option 2, are not preferred due to the reliability issues;
- Less pumps are required for Option 2 and subsequently less maintenance and operational effort, especially with regards to the exclusion of jet pumps;
- The availability of submersible pumps capable of meeting the required pump head of 81.5m and the associated flow capacity is very limited and specialised. Dry well high lift pumps are more commonly available and have the advantage that they can be visually inspected during operation;
- The double gravel traps and sand traps or pump canals of Option 2 allows for more sediment to be deposited before the sediment laden water reaches the pumps and subsequently Ngwadini Dam; and
- The overall layout contributes to a more robust design and lower risk of failure.

21 CONCLUSIONS AND RECOMMENDATIONS

21.1 Sensitive Environmental Features

Within the context of the project area, cognisance must be taken of the following sensitive environmental features, attributes and aspect, for Layout Option 2 for which mitigation measures are included in the BAR and EMP_r (**Figure 48**):

- The existing structures and infrastructure in the area, including the road network.
- The proposed development site falls entirely within the KZN ESA.
- One protected species recorded along the pipeline route was *Sclerocarya birrea* subsp. *caffra* (Marula tree).
- A number of Specially Protected Indigenous Plants (Natal Nature Conservation Ordinance, 15 of 1974) were identified on site.
- One plant species of conservation concern was observed in the study area, namely *Hypoxis hemerocallidea* (Star flower/African potato).
- The riparian habitats were investigated for any signs or indications that the water system may be inhabited by Otters and only scats of Cape Clawless Otter (*Aonyx capensis*) were recorded on the proposed development site.
- An abandoned house close to the remains of another structure was located. Close to the abandoned house, a potential grave site was found with a border made of rocks roughly cemented together.
- South-west of the proposed dam wall and falling within the buffer of the proposed access road is the grave of a member of the Mbele clan.
- Two FEPA systems of some importance (AB rating) were identified within the assessment boundary.
- Two channelled valley bottom systems with several drainage lines are affected by the proposed development.

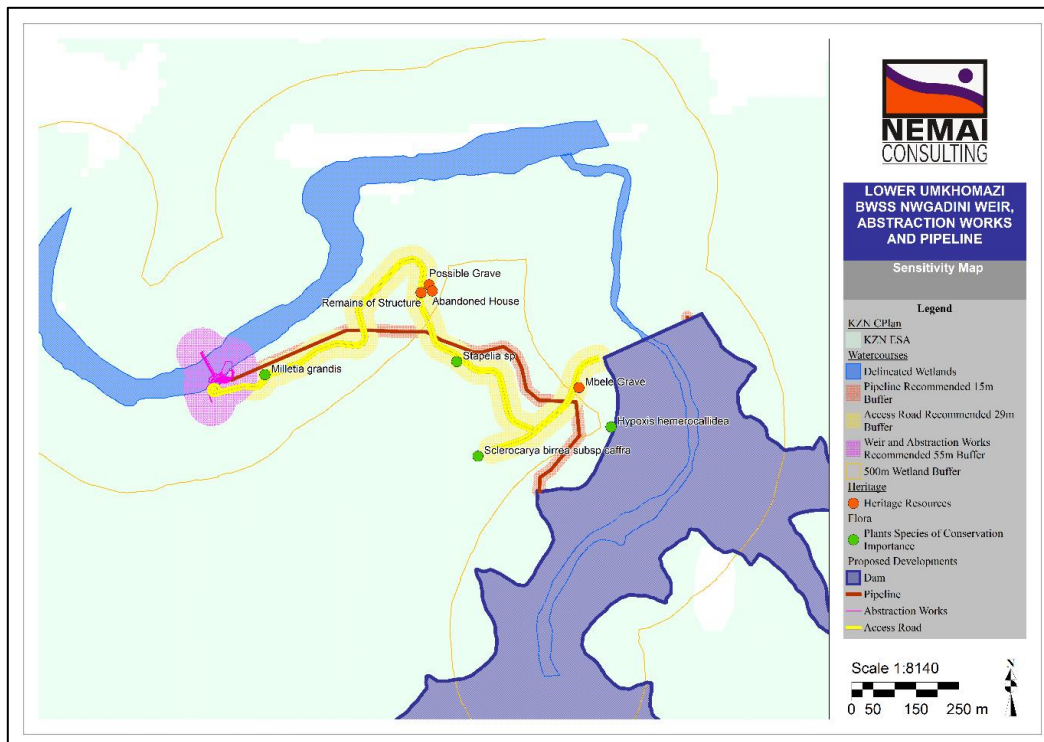


Figure 48: Sensitivity Map for Layout Option 2

21.2 Environmental Impact Statement

The current water resources supplying the South Coast of KwaZulu-Natal are insufficient to meet the projected water demands. The Lower uMkhomazi Bulk Water Supply System is the recommended augmentation option for the existing Upper and Middle South Coast Supply area. Therefore, Umgeni Water propose to construct the Lower uMkhomazi Bulk Water Supply System in order to increase the assurance of water supply.

Therefore, Nema Consulting has been appointed by Umgeni Water to undertake the Basic Assessment process for the proposed Ngwadini weir, abstraction works and pipeline in accordance with NEMA and the 2014 EIA Regulations, as amended (07 April 2017).

Based on the location and nature of the proposed development, the following environmental specialist studies were conducted:

1. Terrestrial Ecological Assessment Report;
2. Riparian Habitat and Wetland Delineation Impact Assessment; and
3. Phase 1 Heritage Impact Assessment.

In addition, a number of technical studies were required including:

- Geotechnical Investigation; and
- Technical Drawings.

A Terrestrial Flora and Fauna Assessment was undertaken as part of the BA process in order to assess the impacts that the proposed development will have on the flora and fauna on site.

According to the Ezemvelo KZN Wildlife (2016), the proposed development site does not fall within the KZN CBA Irreplaceable areas but entirely falls within the KZN ESA. The Department of Agriculture, Forestry and Fisheries developed a list of protected tree species in the Act. One such species recorded along the pipeline route was *Sclerocarya birrea* subsp. *caffra* (Marula tree). A permit for either removing or disturbing this plant will be required from Department of Agriculture, Forestry and Fisheries before any construction commences.

The following Genera and/or species are listed under Schedule 12 as Specially Protected Indigenous Plants (Natal Nature Conservation Ordinance, 15 of 1974):

- All *Stapelia*;
- *Hypoxis hemerocallidea* (Star flower/African potato); and
- *Millettia grandis* (Kaffir ironwood).

A permit to remove these plant species will need to be obtained from Ezemvelo KZN Wildlife. During the field surveys, only one plant species of conservation concern was observed in the study area, namely *Hypoxis hemerocallidea* (Star flower/African potato) and this plant species is listed as *Declining* and it is thus recommended that a Search, Rescue and Relocation Plan be developed that takes into consideration species of conservation concern.

The riparian habitats were investigated for any signs or indications that the water system may be inhabited by Otters and only scats of Cape Clawless Otter (*Aonyx capensis*) were recorded on the proposed development site. In addition, one endemic species recorded on the proposed development site was a Jackal Buzzard (*Buteo rufofuscus*).

From an ecological perspective, Option 2 covers larger footprint and more riparian vegetation will be cleared for construction activities as compared to Option 1 and therefore Option 1 will be more preferred. Riparian vegetation helps in preventing erosion and also traps sediment and pollutants, helping to keep the water clean.

The wetland assessment indicated two FEPA systems of some importance (AB rating) within the assessment boundary. The field assessment showed two channelled valley bottom systems with several drainage lines on the steeper slopes. The channelled valley bottom systems were assessed as two HGM units, with both systems having a PES rating of largely natural (B). The Eco-Services for these were rated as Intermediate. The EIS for HGM 1 was rated as Very High (A) and the EIS for HGM 2 was rated as High (B).

The results of the PES assessment for aquatic ecology derived largely natural (class B) conditions in the river reach considered for this assessment. This result was in agreement with the desktop data. Based on the overall results, the attainable ecological class was currently not being achieved. The established PES will be used to guide the potential impacts of the proposed project.

The construction of the weir will require that activities take place within the river channel and the river will be diverted in some form. The aspects as listed in the tables above will impact on the following:

- The alteration of flow volumes and patterns (Construction and Operation Phases);
- The increased sediment and turbidity (Construction Phase);
- The risk of hydrocarbon contamination (Construction Phase); and
- The increase in water temperature (Operation Phase).

During the construction phase, many of the moderate risks can be mitigated to low risks by implementing the mitigation measures. Several mitigation actions have been provided with the most important mitigation action being the incorporation of an appropriately designed fishway.

From an aquatic perspective, the proposed design options will not differ significantly in their potential impacts. Additionally, both options include provisions for a fishway. Hydraulic components of the proposed fishways are anticipated to be of a similar nature, although differences may be anticipated.

The Heritage Specialist located an abandoned house close to the remains of another structure was located in an open area with an existing gravel track and cattle path. Close to the abandoned house, a potential grave site was found with a border made of rocks roughly cemented together. It appears to be a single grave and is situated about 12m east of the proposed access road and on the outer edge of the buffer area demarcated for the road. The

abandoned house is located 10m east of the buffer area for the road. The remains of the structure referred to fall within the access road.

Due to the very thick vegetation making access difficult to almost impossible in some sections, it is possible that other graves and remains of structures were not found during the site inspection. Many graves were pointed out in the proposed Ngwadini Dam site hence it is likely that more graves may be found along the proposed route for the pipeline and access road. It is therefore recommended that a Phase 2 HIA is undertaken when the area for the access road and pipeline area are cleared of vegetation to allow access to the areas. The Specialist recommended that graves are not moved and where possible, the route for infrastructure (pipelines and roads) is adjusted to avoid such sites.

The assessment of the two options indicates that due to the larger size of the option 2 it could have a higher impact on heritage resources than option 1, therefore, from a heritage perspective, option 1 is the preferred option for the proposed weir and abstraction works.

Based on the recommendations of the specialists, technical considerations and the comparison of the impacts, the following was identified as the BPEO for the related project components:

- Layout Option 2.

With the selection of the BPEO (Layout Option 2), the adoption of the mitigation measures included in the BAR and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

21.3 Recommendations

Based on the information contained in this report, and taking into account the outcome of the impact assessment, opinions and recommendations included in the specialist studies as well as all supporting documentation, it is the recommendation of the practitioner that EA be granted by the DEA for the proposed Ngwadini Weir, Abstraction Works and Pipeline.

The following key recommendations, which may also influence the conditions of the EA (where relevant), accompany the BAR for the proposed Ngwadini Weir, Abstraction Works and Pipeline:

1. Layout Option 2 is recommended.
2. Appointment of an ECO to monitor compliance with the EA and the approved EMPr.
3. As discussed in the EMPr, various forms of monitoring are required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and

to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project. The types of monitoring to be undertaken include:

- a. Baseline Monitoring needs to be undertaken to determine to the pre-construction state of the receiving environment, and serves as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects;
 - b. Environmental Monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded; and
 - c. Compliance Monitoring and Auditing for the independent ECO to monitor and audit compliance against the EMPr and EA, if granted.
4. All mitigation measures provided in the Specialist Studies in **Appendix G** of the BAR are to be adhered to, specifically the following:
- Restrict construction activities to footprint area.
 - For any chance finds of heritage resources, all work must cease in the area affected and the Contractor will immediately inform the Project Manager. A registered heritage specialist / palaeontologist must be called to site for inspection. Amafa must be informed about any finds.
 - All heritage resources found close to the construction area must be protected by a 10m buffer in which no construction can take place. The buffer material (danger tape, fencing, etc.) must be highly visible to construction crews.
 - A Phase 2 HIA is to be undertaken when the area for the access road and pipeline area are cleared of vegetation to allow access to them. It is recommended that a heritage specialist with experience with grave relocations should undertake the Phase 2 HIA.
 - The recommended buffer zones should be strictly adhered to during the construction phase of the project, with exception of the activities and structures required to traverse a watercourse.
 - In order to facilitate the movement of fish species, a fish ladder is recommended as the mitigation action.
 - Quarterly vegetation rehabilitation surveys need to be conducted of the vegetation within the project footprint.
 - An alien invasive plant management plan needs to be compiled and implemented prior to construction to control and prevent the spread of invasive aliens.
 - Prior to construction, the *Hypoxis hemerocallidea* plant species recorded must be searched and rescued and then following construction activities, they can be re-established at the site.

- A permit to remove Specially Protected Indigenous Plants (Natal Nature Conservation Ordinance, 15 of 1974) will need to be obtained from Ezemvelo KZN Wildlife.
- A Permit to either cut, destroy, disturb and /or transplant the protected Marula tree must be obtained from DAFF.
- Given that the species of conservation importance were observed, it is important that a walk-down survey be conducted for plant species of conservation importance and threatened species which may occur on the project area and are addressed through a search and rescue plan.
- Riparian habitat provides migratory corridors and in order to protect habitat for the detected African/Cape Clawless Otter, a buffer around riparian habitats is recommended.
- All areas to be affected by the proposed project will be rehabilitated after construction and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed registered landfill site.

22 OATH OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

I (name and
surname)

Jamantha Gerber

Of (address)

147 Bram Fischer Drive

ID No.

9004010057084

Contact
No.

011 791 1730

I hereby make an oath and state that:

In accordance with Appendix 1 of Government Notice No. R. 982 of the amended 2014 EIA Regulations (07 April 2017), this serves as an affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

Section 1(j) -

1. The correctness of the information provided in this report(s);
2. The inclusion of comments and inputs from stakeholders and interested and affected parties;
3. The inclusion of inputs and recommendations from the specialist reports where relevant; and
4. Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.

Section 1(k) -

The level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment.

1. I know and understand the contents of this declaration.
2. I do not have any objection in taking prescribed oath.
3. I consider the prescribed oath to be binding on my conscience.

Signature

Date:

02 / 02 / 2018

I certify that the deponent has acknowledged that he/she knows and understands the contents of the statement and the deponent signature was placed there on in my presence.

CERTIFIED A TRUE COPY OF THE ORIGINAL DOCUMENT
GESERTIFISEER IN WAAR AF-SKRIF VAN
OORSPRONKELIKE DOKUMENT

BRENDA PERUMAL

MALANI PADAYACHEE AND ASSOCIATES (PTY) LTD

REG. NO. 197/009113/07
JOHANNESBURG, NORTH MAGISTRICAL DISTRICT,
HANDRUG

REF No. 12/01/2018

EX-OFFICIO COMMISSIONER OF OATHS

FINANCIAL MANAGER

DESIGNATION



SIGNED BY

DATE

02/02/2018

23 REFERENCES

- AECOM. 2016a. Lower uMkhomazi Bulk Water Supply Scheme Detailed Feasibility Study and Preliminary Design.
- AECOM. 2016b. Lower uMkhomazi Bulk Water Supply Scheme Feasibility Design of Ngwadini Dam, Ngwadini Abstraction Works and Goodenough Abstraction Work.
- AECOM. 2016c. Environmental Screening Report for the uMkhomazi River System.
- AECOM. 2016d. Lower uMkhomazi Bulk Water Supply Scheme Detailed Feasibility Study and Preliminary Design: Geotechnical Investigation for Water Conveyance Infrastructure and Treatment Facilities.
- AECOM. 2016e. Landowner Identification, Access to Properties and Landowner Engagement Report.
- DEAT, 2002. Scoping, Integrated Environmental Management, Information Series 2, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT. 2002. "Integrated Environmental Management Information Series: Ecological Risk Assessment." Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT. 2005a. Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005. Integrated Environmental Management Guideline Series. Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT. 2005b. Guideline 4: Public Participation, in terms of the EIA Regulations. Integrated Environmental Management Guideline Series. Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT. 2006. "Integrated Environmental Management Information Series 23: Risk Management." Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEA&DP. 2009. Guideline on Need and Desirability, NEMA EIA Regulations Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP), Cape Town.
- DEA&DP. 2011. Western Cape Integrated Water Resource Management Action Plan. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP), Cape Town.
- DNA Consulting Engineers and Project Managers. 2016. Lower Umkhomazi Bulk Water Supply Scheme: Detailed Feasibility Study and Preliminary Design: Bulk Electrical Services.
- DWA. 2004. Internal Strategic Perspective: Mvoti to Mzimkulu Water Management Area. DWAF Report No. P WMA 11/000/00/0304.
- DWA. 2012. The uMkomazi Water Project Phase 1: Module 1: Technical Feasibility Study: Raw Water.
- DWA, South Africa, June 2013. Classification of Water Resources and Determination of the Comprehensive Reserve and Resource Quality Objectives in the Mvoti to Umzimkulu WMA: Desktop Estuary EcoClassification and Ecological Water Requirement. Prepared by: Rivers for Africa eFlows Consulting (Pty) Ltd.

DWA. 2014. The uMkhomazi Water Project Phase 1: Module 1: Technical Feasibility Study Raw Water Hydrological Assessment of the uMkhomazi River Catchment.

eWISA. 2004. Water Institute for South Africa – report on Mkomazi River.

Karssing, R., 2012. Red Data Fish Species information for the uMkhomazi River. Ezemvelo KZN.

Mucinia, L., and Rutherford, M. (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19.