water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Environmental Impact Assessment for the Augmentation of the Lusikisiki Regional Water Supply Scheme: Draft Environmental Impact Assessment Report

P WMA 12/T60/00/5414/2

June 2015

AUGMENTATION OF THE LUSIKISIKI REGIONAL WATER SUPPLY SCHEME, EASTERN CAPE PROVINCE, SOUTH AFRICA

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DEA Reference: **14/12/16/3/3/2/714**

Prepared for:	Prepared by:
water & sanitation Department: Water and Sanitation REPUBLIC OF SOUTH AFRICA	EOH Coastal & Environmental Services
Department of Water and Sanitation Private Bag X313 Pretoria 0001	**EOH Coastal & Environmental Services** EAST LONDON P.O. Box 8145, Nahoon East London 5210 043 726 7809 www.cesnet.co.za

June 2015

This Report should be cited as follows: EOH Coastal & Environmental Services, June 2015: Lusikisiki Regional Water Supply Scheme*, Draft Environmental Impact Assessment Report*, EOH CES, East London.

REVISIONS TRACKING TABLE

EOH Coastal and Environmental Services

Report Title: AUGMENTATION OF THE LUSIKISIKI REGIONAL WATER SUPPLY SCHEME, EASTERN CAPE PROVINCE, SOUTH AFRICA: ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Report Version: Draft

Project Number: 237

Name	Responsibility	Signature	Date
Caitlin Smith	Report Writer		June 2015
Roy de Kock	Project Manager		June 2015
Alan Carter	Reviewer		June 2015

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF ACRONYMS

BID:	Background Information Document
CBA:	Critical Biodiversity Areas
CITES:	Committee for International Trade in Endangered Species
DEA:	Department of Environmental Affairs
DWS:	Department of Water and Sanitation
EAP:	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA:	Environmental Impact Assessment
EIR:	Environmental Impact Report
EMPr:	Environmental Management Programme
EOH CES:	EOH Coastal & Environmental Services
FSL	Full Supply Level
GNR:	Government Notice Regulation
ha:	Hectare
I&APs:	Interested and Affected Parties
IDP:	Integrated Development Plan
Ltd:	Limited
LRWSS	Lusikisiki Regional Water Supply Scheme
MAR	Mean Annual Runoff
NEMA:	National Environmental Management Act 107 of 1998 as amended
PoS:	Plan of Study
PAES	Protected Areas Expansion Strategy
PPP:	Public Participation Process
RDB:	Red Data Book
SSC:	Species of Special Concern
ToR:	Terms of Reference

LIST OF UNITS

ha	hectare
l	litre
l/s	litre per second
m/s	metres per second
m^3/s	cubic metre per second
masl	metres above sea level
million m^3	million cubic metres

million m^3/a	million cubic metres per annum
Ml/day	megalitre per day

1 INTRODUCTION

1.1 Environmental authorisation in South Africa

EOH Coastal & Environmental Services (EOH CES) has been appointed by the Department of Water and Sanitation (DWS) to undertake the Environmental Impact Assessment (EIA) for the proposed Lusikisiki Regional Water Supply Scheme (LRWSS) and to obtain environmental approval in terms of the National Environmental Management Act (1998).

The LRWSS has been under consideration since the 1970's when it was recommended that a regional water supply scheme based on a dam on the Xura River and a main bulk supply reservoir close to Lusikisiki would provide potable water supply for the entire region between Lusikisiki and the coast, extending from the Mzimvubu River in the south west to the Msikaba River in the north east. Some areas up to 15 km inland of Lusikisiki would also be supplied.

A White Paper describing the scheme was tabled by the Transkei Government in 1979. In 1994 the DWS took over responsibility for further development of the scheme. The Directorate: National Water Resource Planning commissioned the Eastern Pondoland Basin Study (EPBS) in 1999 to further investigate the water supply situation in the area, with a specific focus on further development in the area originally earmarked for the Lusikisiki Regional Water Supply Scheme (LRWSS). This detailed investigation was undertaken for surface and groundwater sources, which re-affirmed that the Zalu Dam was the preferred source of surface water and recommended further investigation of groundwater sources to augment water supply to the entire area or to sub-areas. In 2007, SRK Consulting undertook the Lusikisiki Groundwater Feasibility Study to investigate groundwater potential and compare the new data with data produced by earlier studies. This study reported that there is a relatively strong possibility of finding high yielding boreholes, and that a combination of surface water (Zalu Dam) and groundwater would be the most feasible solution for the LRWSS.

This EIA process involves the assessment of the proposed Zalu Dam on the Xura River as well as the bulk water distribution infrastructure connecting the LRWSS to users in the area around Lusikisiki, extending from the Mzimvubu River in the south west to the Msikaba River in the north east.

In accordance with the requirements of the National Environmental Management Act No. 107 of 1998 (NEMA), and relevant Environmental Impact Assessment (EIA) regulations made in terms of this Act (Government Notice No R.543) and promulgated in 2010, the proposed project requires a full Scoping and EIA.

1.2 The Mzimvubu Water Project

The Mzimvubu Water Project (approximately 17 km west of the LRWSS) has also been commissioned by DWS. The Mzimvubu Water Project is a Strategic Integrated Project aimed at socio-economic upliftment of communities within the Mzimvubu River catchment area. The project consists of two multi-purpose dams on the Tsitsa River, a major tributary to the Mzimvubu River. The two dams will be built and operated as one integrated scheme. There is no link between the LRWSS and the Mzimvubu Water Project.

1.3 The Environmental Impact Assessment Process

The EIA process is guided by regulations made in terms of Chapter 5 of NEMA, published as Government Notice No R.543 in Government Gazette No 33306 of 2 August 2010.The regulations set out the procedures and criteria for the submission, processing and consideration of decisions on applications for environmental authorisation.

Three lists of activities, published on 21 April 2006 and amended 2 August 2010, as Government Notice Numbers R.544, R.545, and R.546 define the activities that require, respectively, a Basic Assessment (applies to activities with limited environmental impacts), or a Scoping and Environmental Impact Assessment (applies to activities which are significant in extent and duration).

Please note that the 2010 NEMA Regulations have been replaced by the revised 2014 NEMA Regulations (implemented from the 8th December 2014). However, the authorisation for the LRWSS is subject to the 2010 NEMA Regulations as the application was submitted in June 2014.

The activities triggered by the proposed development are listed in Table 1-1 below.

Table 1-1: Listed activities triggered by the proposed LRWSS

Government Notice	Activity Number	Activity Description	Relevance to this project
GNR 544	(9)	The construction of facilities or infrastructure exceeding 1000m in length for the bulk transportation of water with - (i) an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more.	Construction of bulk reticulation infrastructure: • Portions of the pipelines will exceed 0.36 m in diameter (steel pipeline sizes will have a diameter of 0.4 to 0.45 m). The total length of uPVC pipelines is approximately 178km and the length of steel pipelines is about 4km. • The peak throughput will be approximately 171 litres per second.
	(11)	The construction of: iii. bridges; iv. dams; v. weirs; xi. infrastructure or structures covering 50 square meters or more Where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse.	• Possible upgrade of two bridges near Palmerton Mission. • Construction of the Zalu Dam and associated infrastructure over an area of approximately 150 hectares. • Possible upgrade of the existing Abstraction Weir on the Xura River. • Construction of reticulation pipelines (that cross watercourses) covering a total area of approximately 91m^2.
	(18)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from: i. a watercourse.	• Construction of the Zalu Dam will require both excavation and infilling of material of more than 5 cubic metres into the Xura River. Approximately 500 000 m^3 of material will be removed from the dam basin. • Pipelines will cross various watercourses and excavation in rivers will exceed 5 cubic metres of material.
GN R No. 545	(15)	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more.	• The Zalu Dam is anticipated to inundate an area of approximately 150 hectares of undeveloped land.
	(19)	The construction of a dam, where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of	• Construction of the Zalu Dam on the Xura River. It is estimated that the Zalu Dam wall will be 44

Government Notice	Activity Number	Activity Description	Relevance to this project
		the wall, is 5 meters or higher or where the high water mark of the dam covers an area of 10 hectares or more.	m high and will inundate an area of approximately 150 hectares.
GN R No. 546	(2)	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic meters. (a) In Eastern Cape, iii. outside urban areas, in: (dd) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. iv. In urban areas: (aa) Areas zoned for use as public open space.	• Upgrade of existing reservoirs (31) and construction of new reservoirs each with a capacity of approximately 500m^3. • Some of the reservoirs will be located in rural areas, in critical biodiversity areas (CBA 1 & 2) as identified by the Eastern Cape Biodiversity Conservation Plan (ECBCP). • Some of the reservoirs may be located in urban areas zoned as public open space.
	(4)	The construction of a road wider than 4 meters with a reserve less than 13.5 meters. (a) In Eastern Cape, ii. outside urban areas, in: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	• A formal access road approximately 1km in length (wider than 4 m) to the dam wall will be constructed. The road will be located in a critical biodiversity area (CBA 2) as identified by ECBCP.
	(13)	GNR 546 (13) The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, in: (a) Critical Biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority.	• The Zalu Dam will inundate approximately 150 hectares of Ngonigoni Veld. • This area is identified as a critical biodiversity area (CBA 2) in terms of ECBCP.
	(16)	The construction of: iii. buildings with a footprint exceeding 10 square meters or more; iv. infrastructure covering 10 square meters or more. Where such construction occurs within a watercourse, measured from the edge of a watercourse. (a) In Eastern Cape ii. outside urban areas, in: (ff) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; iii. In urban areas: (aa) Areas zoned for use as public open space.	• The Zalu Dam and associated buildings/infrastructure will inundate an area of approximately 150 hectares. This area is located in a critical biodiversity area, as identified by ECBCP. • Pipelines (91m^2) and reservoirs (greater than 10m^2) will be constructed in critical biodiversity areas (CBA1 and CBA 2) and in urban areas zoned as public open space.

Since the proposed development triggers a listed activity from GNR.545 a full Scoping and EIA is required. This process (Figure 1-1) is regulated by Chapter 3, Part 3 of the EIA regulations.

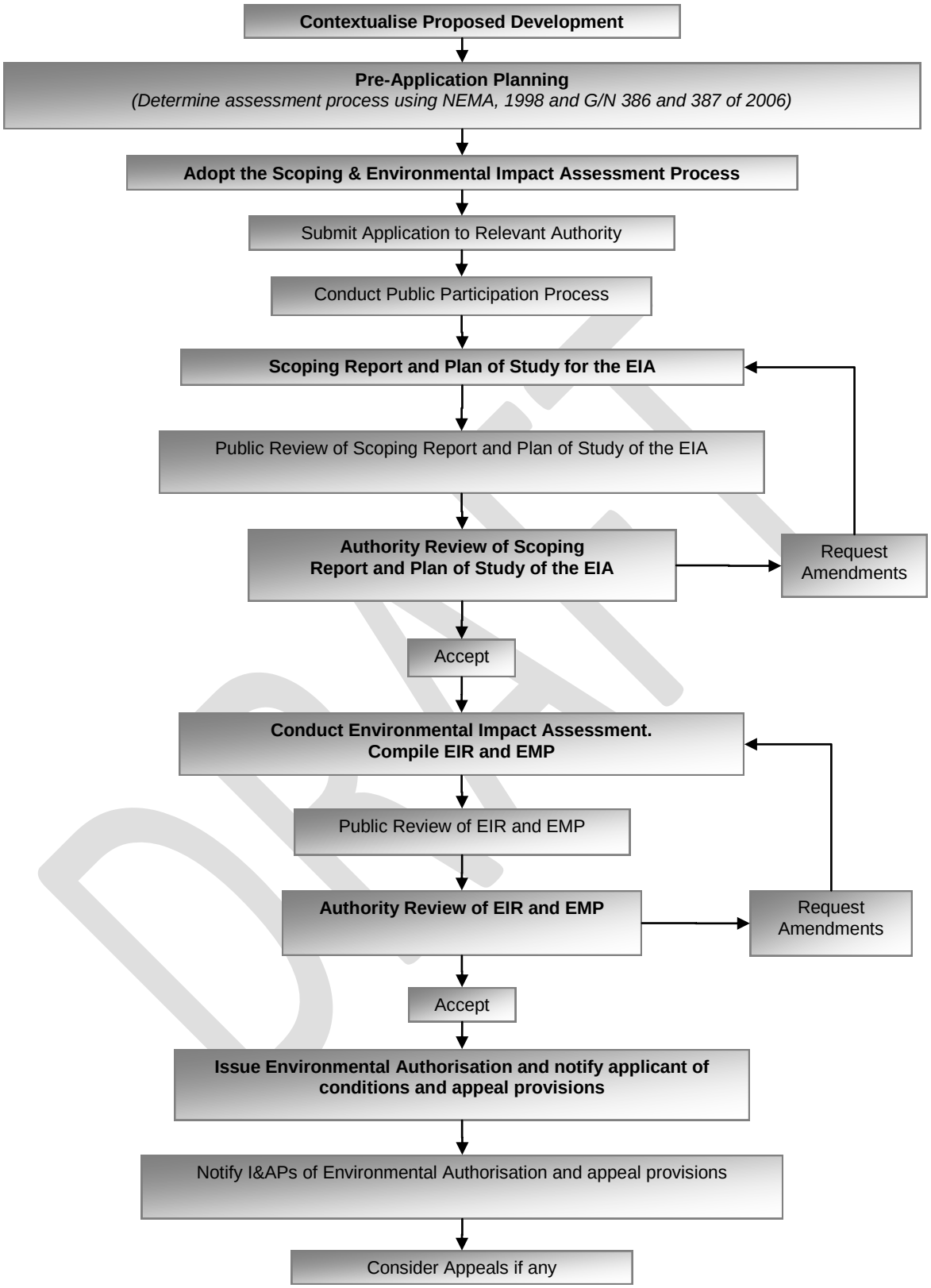


Figure 1-1. The EIA process (NEMA regulations 2010).

1.3.1 The Scoping Phase

A detailed description of the Scoping Phase for the proposed development and the outcomes thereof is included in: "Augmentation of the Lusikisiki Regional Water Supply Scheme, Eastern Cape Province, South Africa: Final Scoping Report (PWMA 12/T60/00/5414/1)".

A Plan of Study (PoS) for the detailed EIA phase was submitted together with the Final Scoping Report (FSR), in fulfilment of section 28 (1) (n) of the EIA Regulations (2010). The PoS and FSR was accepted by DEA on 20 November 2014.

1.3.2 The Environmental Impact Assessment Phase

The Environmental Impact Assessment (EIA) is a comprehensive evaluation and study phase that addresses all the issues raised in the Scoping Phase. It is a substantial phase that has seven key objectives:

- Describe the biophysical and socio-economic environment that is likely to be affected by the proposed development.
- Undertake specialist studies to address the key biophysical and socio-economic issues.
- Assess the significance of impacts that may occur from the proposed development.
- Assess the alternatives proposed during the Scoping Phase.
- Provide details of mitigation measures and management recommendations to reduce the significance of impacts.
- Provide a framework for the development of Environmental Management Programmes.
- Continue with the public participation process.

This EIA phase includes the following steps:

1. Specialist studies

Specialist studies are undertaken to provide a detailed and thorough examination of key issues and environmental impacts. Specialists gather relevant data to identify and assess environmental impacts that might occur on the specific component of the environment that they are studying (for instance waste management, air quality, noise, vegetation, water quality, pollution, waste management). Once completed, these studies are synthesised in, and presented in full as volumes to the Environmental Impact Report (EIR).

2. The Public Participation Process

The public participation process (PPP) initiated at the beginning of the Scoping Phase continues into the EIA Phase. Once again the PPP process provides a platform from which all I&APs are able to voice their concerns and raise issues regarding the project. The feasibility stage also includes a limited PPP process. The objective of the PPP process in the feasibility stage was to facilitate the establishment of a stakeholder committee, engage stakeholders and provide information about the proposed project.

3. Assessment of the Significance of Impacts

It is necessary to determine the significance, or seriousness, of any impacts on the natural or social environment. It is common practice in the EIA Phase to use a significance rating scale that determines the spatial and temporal extent, and the severity and certainty of any impact occurring, including impacts relating to any project alternatives. This allows the overall significance of an impact or benefit to be determined.

The overall intent of undertaking a significance assessment is to provide the competent authority with information on the potential environmental impacts and benefits, thus allowing them to make an informed, balanced and fair decision.

4. Mitigation Measures and Recommendations

Critical to any EIA is the recommendation of practical and reasonable mitigation measures and recommendations. These recommendations relate to the actions that are needed in order to avoid, minimise or offset any negative impacts from the development.

5. Planning input

An effective EIA process should actively engage and contribute to the project planning process so as to mitigate environmental impacts through improved design and layout.

6. Environmental Impact Report

The above-mentioned tasks are synthesised in an Environmental Impact Report (EIR). This will allow the assessment of the relationship of environmental impacts to project actions, as well as to assess the overall significance of these impacts. The EIR will also provide sufficient information to allow the competent authority to make an informed decision.

The competent authority that must consider and decide on the application for authorisation in respect of the GNR 544-546 activities listed in Table 1-1 is DEA, and is the relevant authority that reviewed and approved the Scoping Report and subsequently will review the Environmental Impact Report (EIR) and issue the environmental authorisation.

1.4 Water Use Licence Application

During the implementation phase an application for a Water Use Licence in terms of the National Water Act (Act No. 36 of 1998) will be submitted to DWS for the following water uses as defined in Section 21 of the Act:

(a) Taking water from a water resource;
(b) Storing water;
(c) Impeding or diverting the flow of water in a watercourse;
(i) Altering the bed, banks, course or characteristics of a watercourse;

It should be noted that Section 27(2) of the National Water Act states that a responsible authority may not issue a licence to itself without the written approval of the Minister.

1.5 Mining Right Application

DWS is exempted from the application for a Mining Right/Permit for borrow pits, but is not exempted from the application for Environmental Authorisation for the borrow pits. The borrow pits will require an application for environmental authorisation in terms of NEMA (Act 107 of 1998) and in terms of the MPRDA (No. 28 of 2002). The application will include a Full Scoping and EIA for the borrow pits which will be submitted to the Department of Mineral Resources.

1.6 Details and Expertise of the Environmental Assessment Practitioner

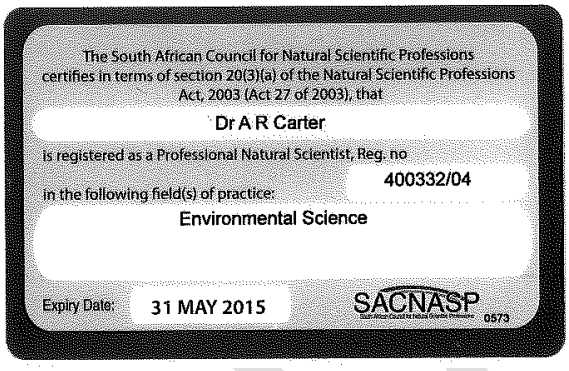
In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(a) Details of–
(i) The EAP who compiled the report; and
(ii) The expertise of the EAP to carry out an Environmental Impact Assessment.

In fulfilment of the above-mentioned legislative requirement the details of the Environmental Assessment Practitioner (EAP) who compiled the report as well as the expertise of the individual members of the study team are provided below.

1.6.1 Details of the EAP

Dr Alan Carter
EOH Coastal and Environmental Services (EOH CES)
Physical Address: 16 Tyrell Street, Berea, East London 5241
Postal Address: P.O. Box 8145, Nahoon, East London 5210
Telephone: +27 43 726 7809
Fax: +27 43 726 8352
Website: www.cesnet.co.za
Email: alan.carter@eoh.co.za


The South African Council for Natural Scientific Professions
certifies in terms of section 20(3)(a) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003), that
Dr A R Carter
is registered as a Professional Natural Scientist, Reg. no
400332/04
in the following field(s) of practice:
Environmental Science
Expiry Date: 31 MAY 2015
SACNASP
0573


The Interim Certification Board
for
Environmental Assessment Practitioners
of
South Africa
Alan Robert Carter
was certified as an
ENVIRONMENTAL ASSESSMENT PRACTITIONER
on this 1st day of March 2012
Chairperson
Secretary

1.6.2 Expertise of the EAP

Short *curriculum vitae* (CVs) of each of the team members involved in the EIA are provided below.

Dr Alan Carter (*Project Leader and EAP*)
Director of the East London Office, has extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He is a member of the American Institute of Certified Public Accountants and holds a PhD in Plant Sciences. He is also a certified ISO14001 EMS auditor with the American National Standards Institute and the British Standards Institute.

Mr Roy de Kock (Project Manager)
Roy is a Senior Consultant holding a BSc Honours in Geology and an MSc in Botany from the Nelson Mandela Metropolitan University in Port Elizabeth. His MSc thesis focused on Rehabilitation Ecology using an open-cast mine as a case study. He has been working for CES since 2010, and is based at the East London branch where he focuses on Ecological and Agricultural Assessments, Geological and Geotechnical analysis, Environmental Management Plans, mining applications and various environmental impact studies. Roy has worked on numerous projects in South Africa, Mozambique and Malawi.

Ms Caitlin Smith (Report Generator, Aquatic Specialist)
Environmental Consultant**.** Caitlin holds a BSc degree in Geology and Geography and a BSc Honours Degree (with distinction) in Geology both obtained from Nelson Mandela Metropolitan University. Caitlin has 4 years' experience as a mining geologist in the heavy mineral sand mining industry. Caitlin has a keen interest in the water sector.

Dr Cherie-Lynn Mack (Aquatic Specialist)
Principal Environmental Consultant, holds a PhD and MSc (with distinction) degrees in Environmental Biotechnology, with a BSc degree in Microbiology and Biochemistry. She has postgraduate research experience in industrial and domestic wastewater treatment technologies, with particular emphasis on the coal and platinum mining industries. Her interests lie in the water sector, with experience in ecological reserve determination and water quality monitoring and analysis. She has experience in water quality analysis and industrial wastewater treatment research.

Mr Lungisa Bosman (Public Participation)
Senior Environmental Consultant, holds a Bachelor of Social Science (1993) from UCT, with majors in Public Administration & Sociology, and a Post Graduate Diploma in Organisation and Management. Lungisa has gained considerable experience in social facilitation and community education and has been involved in a number of projects where he has brought his facilitation skills to bear. These include the ADM and Chris Hani State of Environment studies.

Dr Greer Hawley (Social Specialist)
Principal Consultant, has a BSc degree in Botany and Zoology and a BSc Honours in Botany from the University of Cape Town. She completed her PhD thesis (Microbiology) at Rhodes University. Greer has been involved in a number of diverse activities. The core academic focus has been directed in the field of taxonomy both in the plant and fungal kingdom. Greer's research ranges from studying fresh and marine algae, estuarine diatoms, Restio species classification in the fynbos and forest vegetation and fungal species identification and ecology. Greer's study of fungi have also contributed towards an understanding of soil ecology and "below ground" ecology. She is currently working on numerous impact assessments at the East London branch.

Ms Rosalie Evans (Visual Specialist, Public Participation)
Environmental Consultant. Rosalie holds a BA Social Dynamics degree with majors in Geography and Psychology, as well as BA (Hons) in Geography and Environmental Studies - both from Stellenbosch University. Rosalie's honours dissertation analysed the role of small grains in soil carbon sequestration in the agricultural sector of the Western Cape. Her academic focuses include renewable energy, sustainable development and the interactions between humans and their environment.

Ms Nande Suka (Public Participation)
Environmental Consultant. Holds a BSc degree with majors in Botany and Zoology (2010) and BSc Honours in Terrestrial Botany (2011), both obtained at the Nelson Mandela Metropolitan University in Port Elizabeth. Her academic focus was in the broad field of Environmental Management and with great interest on impact assessments, environmental planning and conservation.

Ms Tarryn Martin (Ecological Specialist)
Tarryn holds a BSc (Botany and Zoology), a BSc (Hons) in African Vertebrate Biodiversity and an MSc with distinction in Botany from Rhodes University. Tarryn's Master's thesis examined the impact of fire on the recovery of C3 and C4 Panicoid and non-Panicoid grasses within the context of climate change for which she won the Junior Captain Scott-Medal (Plant Science) for producing the top MSc of 2010 from the South African Academy of Science and Art as well as an Award for Outstanding Academic Achievement in Range and Forage Science from the Grassland Society of Southern Africa. She conducts vegetation assessments including vegetation and sensitivity mapping to guide developments and thereby minimise their impacts on sensitive vegetation. Tarryn has conducted a number of vegetation and impact assessments in Mozambique (to IFC standards) which include the Lurio Forestry Project in Nampula, the Syrah Graphite Mine in Cabo del Gado and the Baobab Iron Ore Mine in Tete, Mozambique. Tarryn has also co-designed and implemented the Terrestrial Monitoring Program for Kenmare, MOMA, a heavy minerals mine in Mozambique. This monitoring program includes an assessment of forest health. She has also worked on the Lesotho Highlands Development Authority botanical baseline survey for phase 2 of the Lesotho Highlands Water Project.

Ms Ayanda Zide (Ecological Specialist)
Environmental Consultant, holds a BSc in Botany, Microbiology and Chemistry and a Bsc (Hons) in Botany where her thesis focused on identifying and characterising galls and gall forming insects and associated pathogens (Fungi) on the mangrove species Avicennia marina. Courses in her honours year included Diversity Rarity and Endemism (DRE), Pollination Biology, Estuarine Ecology, Rehabilitation Ecology, a Stats course and a short GIS course. Her research interests lie in biological invasion, conservation, rehabilitation ecology, plant biotechnology and water research. Ayanda conducts vegetation and impact assessments that guide proposed developments to reduce their impacts on sensitive vegetation. As part of these surveys she identifies and maps the vegetation communities and areas of high sensitivity. She has worked as a botanical assistant on the Lesotho Highlands Development Authority botanical baseline survey and has conducted groundtruthing surveys for developments in the Eastern Cape.

1.6.3 Expertise of company

Coastal & Environmental Services (CES) was established in 1990 as a specialist environmental consulting company. Recently EOH Group of Companies acquired the shares in CES. EOH is the largest provider of enterprise applications, technology, outsourcing, cloud and managed services. The group is active in South Africa, Africa and the United Kingdom and has a strong Black Economic Empowerment profile. This integration will allow CES to combine EOH's great reach and reputation with CES's recognised excellence in environmental and social advisory services, thus maximising CES's strengths and comprehensive offerings in the environmental and social fields.

2 PROJECT DESCRIPTION

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(b) A detailed description of the proposed activity;
(c) A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is–
  (i) A linear activity, a description of the route of the activity; or
  (ii) An ocean-based activity, the coordinates where the activity is to be undertaken.

2.1 Project Locality

The study area for the EIA falls within the OR Tambo District Municipality and comprises the entire region between Lusikisiki (up to about 15 km inland) and the coast, extending from the Mzimvubu River in the south-west to the Msikaba River in the north-east (Figure 2-1). This area includes the Zalu Dam site and its catchment in the Xura River, conveyance routes between the dam and control reservoirs, as well as borehole sites that could be developed for augmentation of water supplies from groundwater and the routes of the main pipelines from the boreholes to control reservoirs. Property details and 21 Digit SG codes of the affected farms are illustrated in Table 2-1 and Table 2-2 below. Coordinates of the dam site are illustrated in Table 2-3.

Table 2-1. Property Details

Province	Eastern Cape
District Municipality	OR Tambo District Municipality
Local Municipality	Ingquza Hill Local Municpality & Port St Johns Local Municpality
Ward number(s)	13,20
Farm numbers	No names F49/0, F89/0, F89/2, F90/0, F91/0, F96/0, F100/0, F106/0, F114/0, F111/0, F115/0, F116/0, F117/0, F118/0, F119/0, F120/0, F121/0, F122/0, F125/0, F132/0

Table 2-2. 21 Digit SG Codes of affected farms

C	0	9	6	0	0	0	0	0	0	0	0	0	0	4	9	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	0	8	9	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	0	8	9	0	0	0	0	2
C	0	9	6	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	0	9	1	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	0	9	6	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	0	6	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	1	4	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	1	5	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	1	6	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	1	7	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	1	8	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	1	9	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0
C	0	9	6	0	0	0	0	0	0	0	0	0	1	2	5	0	0	0	0	0

C	0	9	6	0	0	0	0	0	0	0	0	0	1	3	2	0	0	0	0	0
1	**2**			**3**				**4**								**5**				

Table 2-3. Corner points of the proposed Zalu Dam site.

	Latitude (S) (DDMMSS)			Longitude (E) (DDMMSS)		
Coordinates of corner points of dam area	31°	18'	50.37"	29°	28'	34.33"
	31°	18'	14.33"	29°	28'	30.92"
	31°	18'	08.04"	29°	27'	40.41"
	31°	17'	41.91"	29°	26'	55.91"
	31°	18'	23.50"	29°	27'	34.60"
	31°	18'	57.35"	29°	27'	52.50"

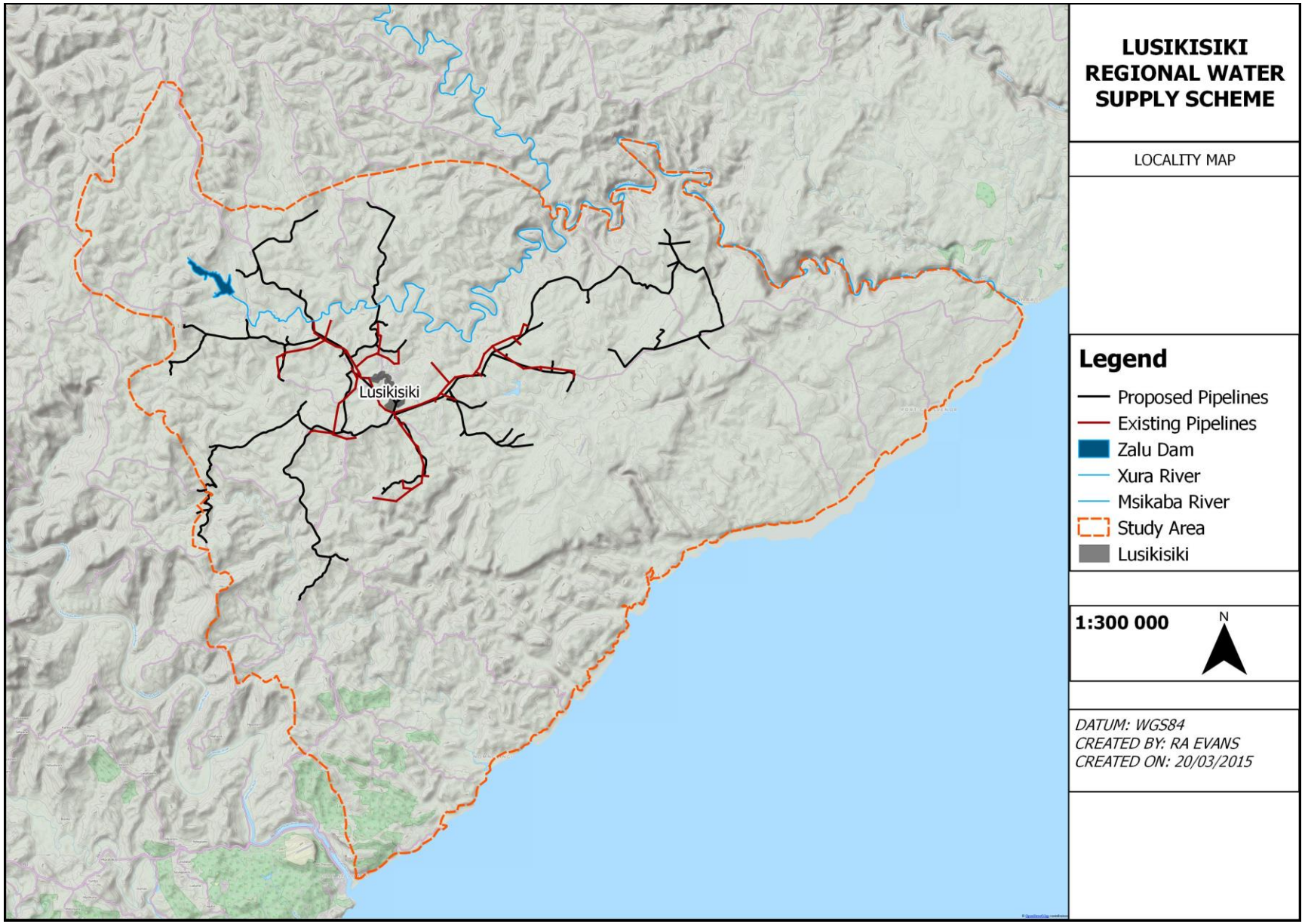


Figure 2-1. Locality map illustrating the LRWSS study area.

2.2 Proposed Activity

The LRWSS is intended to supply the expected water requirements for domestic use up to the planning horizon of 2040 (5.4 million m^3/a) as well as to provide approximately 1.45 million m^3/a of water for new irrigation development. A total of about 6.85 million m^3/a will be required for distribution through the LRWSS. The various components of the LRWSS are discussed below.

2.2.1 Zalu Dam

The proposed dam site is located about 0.5 km northeast of the Ndimbaneni Village and is illustrated in Plate 2-1 below. Approximately 150 hectares of land will be inundated by the Zalu Dam. Coordinates of the point where the centre line of the proposed dam will intersect the river are:

31°18'55.4"S, 29°28'37.3"E.

Zalu Dam inundation area

Zalu Dam inundation area

The peg on the right bank of the Xura River identifying the site for Zalu dam wall.

The peg on the left bank of the Xura River identifying the site for Zalu dam wall.

Plate 2-1. Photographs of the proposed Zalu Dam site.

Dam Types and Sizes

Construction material and geotechnical investigations show that the following low cost dam types can be accommodated:

- Roller Compacted Concrete (RCC) Gravity Dam with a central spillway.
- Earth Core Rockfill (ECR) Dam with a spillway excavated in dolerite, located on the right bank.

- Concrete Faced Rockfill (CFR) Dam with a spillway excavated in dolerite located on the right bank.
- Asphalt Core Rockfill (ACR) Dam with a spillway in dolerite located on the right bank.

CFR and ACR dams tend to be more expensive to construct and were therefore excluded. Only an **RCC Gravity** and an **ECR dam** were evaluated in the feasibility study.

- *Earth Core Rockfill Dam* (preferred option)

  The Earth Core Rockfill Dam layout has a side channel spillway on the right bank (excavated in dolerite) with outlet works on the left bank next to the main river section. Shale material on top of the weathered dolerites on the right bank can be used to construct a zoned rockfill dam (Figure 2-2 illustrates a cross section of the proposed ECR Dam's embankment).

  The outlet works (consisting of a dual outlet system) will be located on the left bank next to the river which is closest to the access road. The outlet system will consist of an **intake structure**, a **conduit** through the embankment and **downstream sleeve valves** to control river releases.

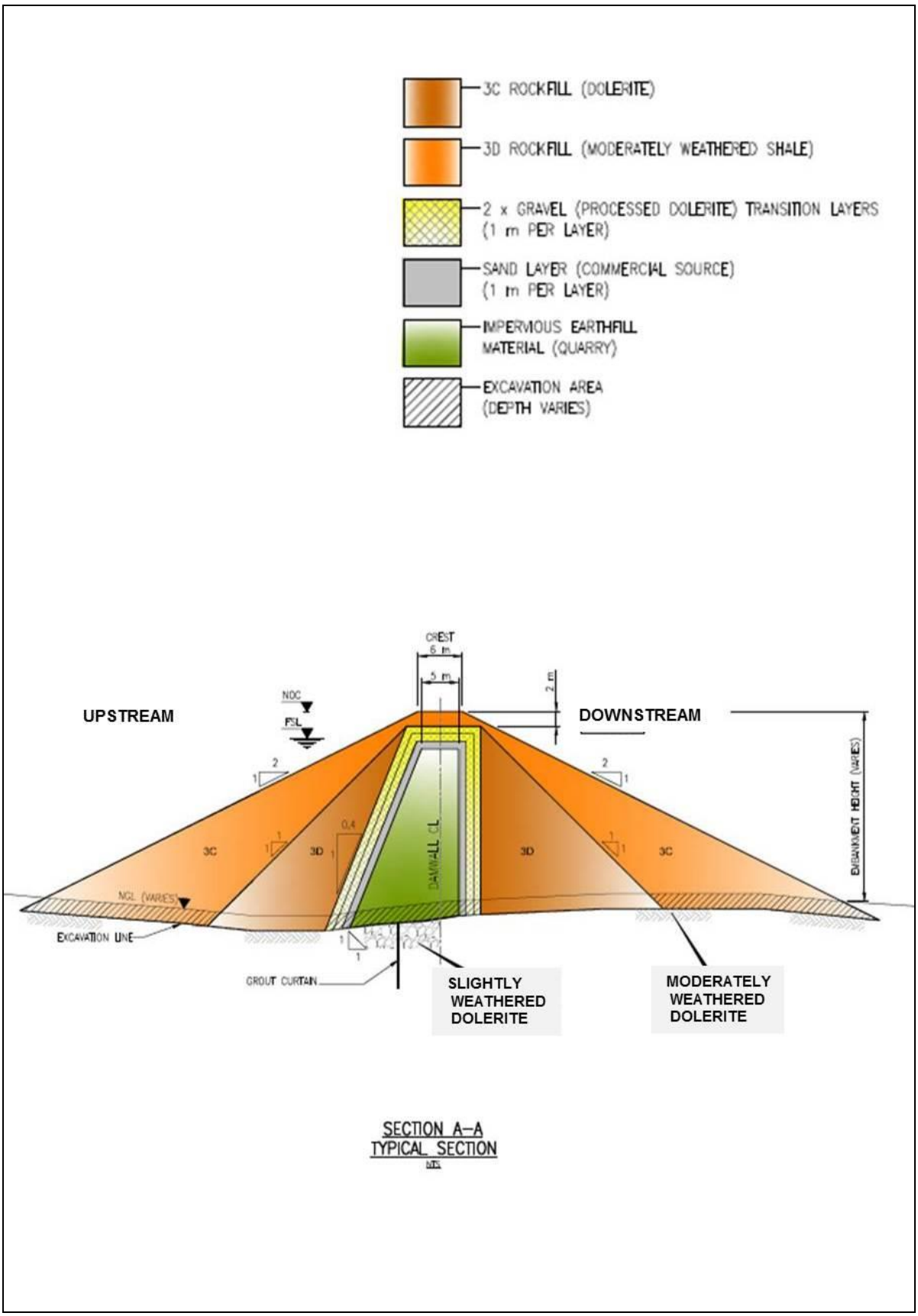


Figure 2-2. Earth Core Rockfill Dam Zoned Embankment (*Adapted from* Feasibility Study for the Augmentation of the Lusikisiki Regional Water Supply Scheme: Zalu Dam Feasibility Design, February 2014).

- *Concrete Gravity Dam*

  A Roller Compacted Concrete (RCC) gravity dam consists of a spillway and an outlet works. The spillway is located across the river and the outlet works is located left of the spillway structure and close to the access road (Figure 2-3).

  Aggregates and crushed sand for the RCC gravity dam can be sourced from identified quarries upstream of the dam.

  The outlet works (dual outlet system) consists of an intake **structure** with multi-level intakes and **sleeve valves** in a downstream valve house for controlling the river releases.

- *1.5 MAR Earth Core Rockfill Dam*

  A 1.5 MAR ECR dam is the preferred dam size (Figure 2-4). It has a FSL of 622.6 masl and is 44 m high.

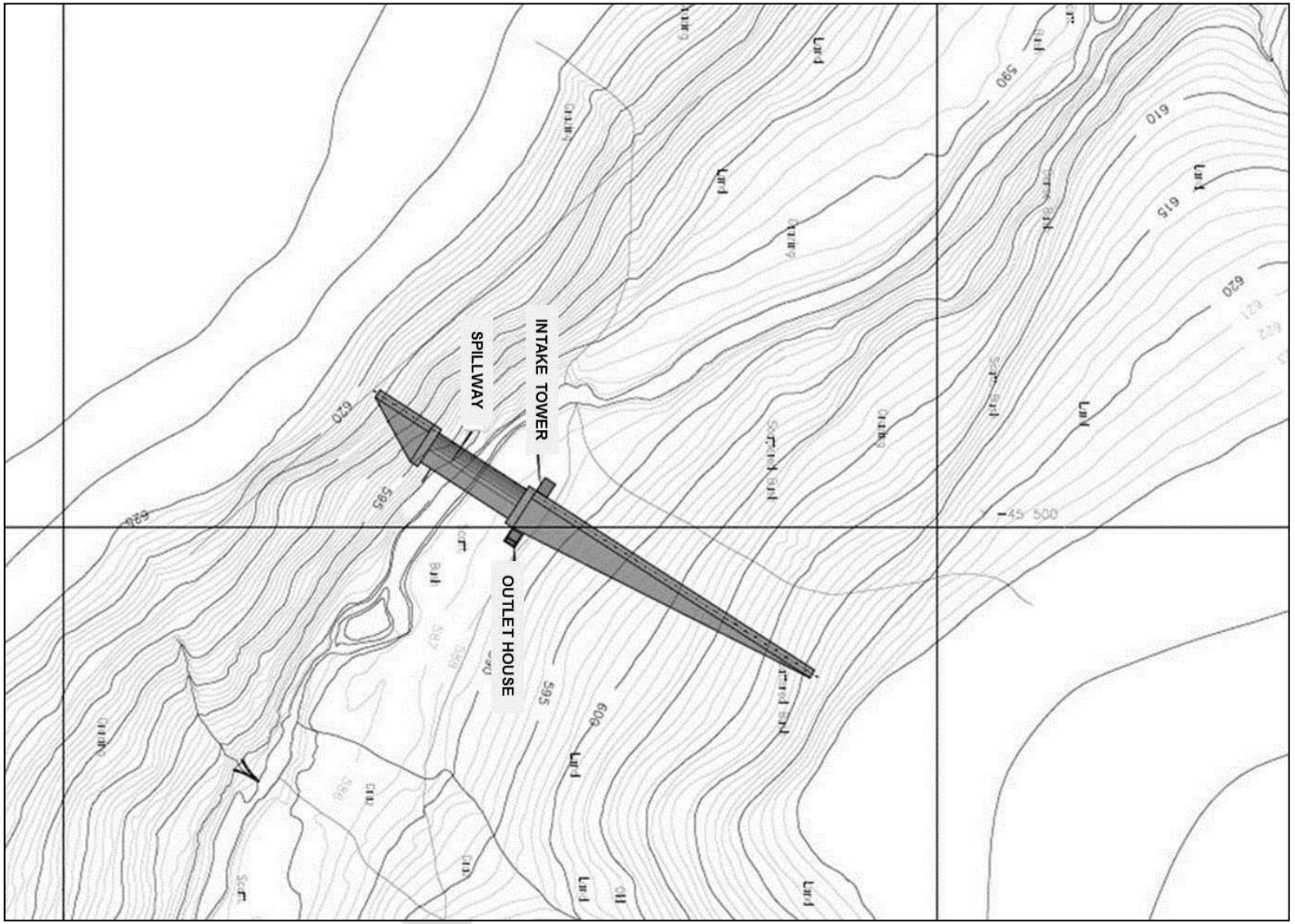


Figure 2-3. Layout of Roller Compacted Concrete Dam. (Source: *Adapted from* Feasibility Study for the Augmentation of the Lusikisiki Regional Water Supply Scheme: Zalu Dam Feasibility Design, February 2014.)

Borrow areas for dam construction

The dam site and surrounding area is underlain by horizontally bedded shale into which a thick dolerite sill had intruded concordantly.

Borrow areas within the dam basin (BA1, BA9, BA10) cannot provide sufficient impervious material for the clay core of an embankment dam, but large quantities of impervious material (BA3 and BA5) are available in borrow areas located within a 2 km radius downstream of the dam (Figure 2-5).

Since the hard rock in the quarries is covered by considerable quantities of a.) *moderately weathered shale*, b.) *highly weathered shale and dolerite* and c.) r*esidual and completely weathered shale and dolerite* these materials might be considered for use as 1.) "*soft rockfill*", 2.) *semi-pervious fill* and 3.) *impervious fill* in a zoned embankment comprising of hard rock outer shells with soft rock and earth inner zones. Good quality concrete aggregate can be obtained from the bottom portions of the rockfill quarries.

Filter materials for an embankment dam can be produced by crushing dolerite or can be obtained from a commercial source from Ifafa, 140 km away from the dam site by road.

An application will be made with the Department of Mineral Resources for authorisation of the proposed borrow areas (the environmental impacts of these borrow areas will be assessed as part of the mining application submitted to DMR and will not be assessed in this EIR).

Figure 2-4. General layout of 1.5 MAR ECR Zalu Dam (Source: Feasibility Study for the Augmentation of the Lusikisiki Regional Water Supply Scheme: Zalu Dam Feasibility Design, February 2014).

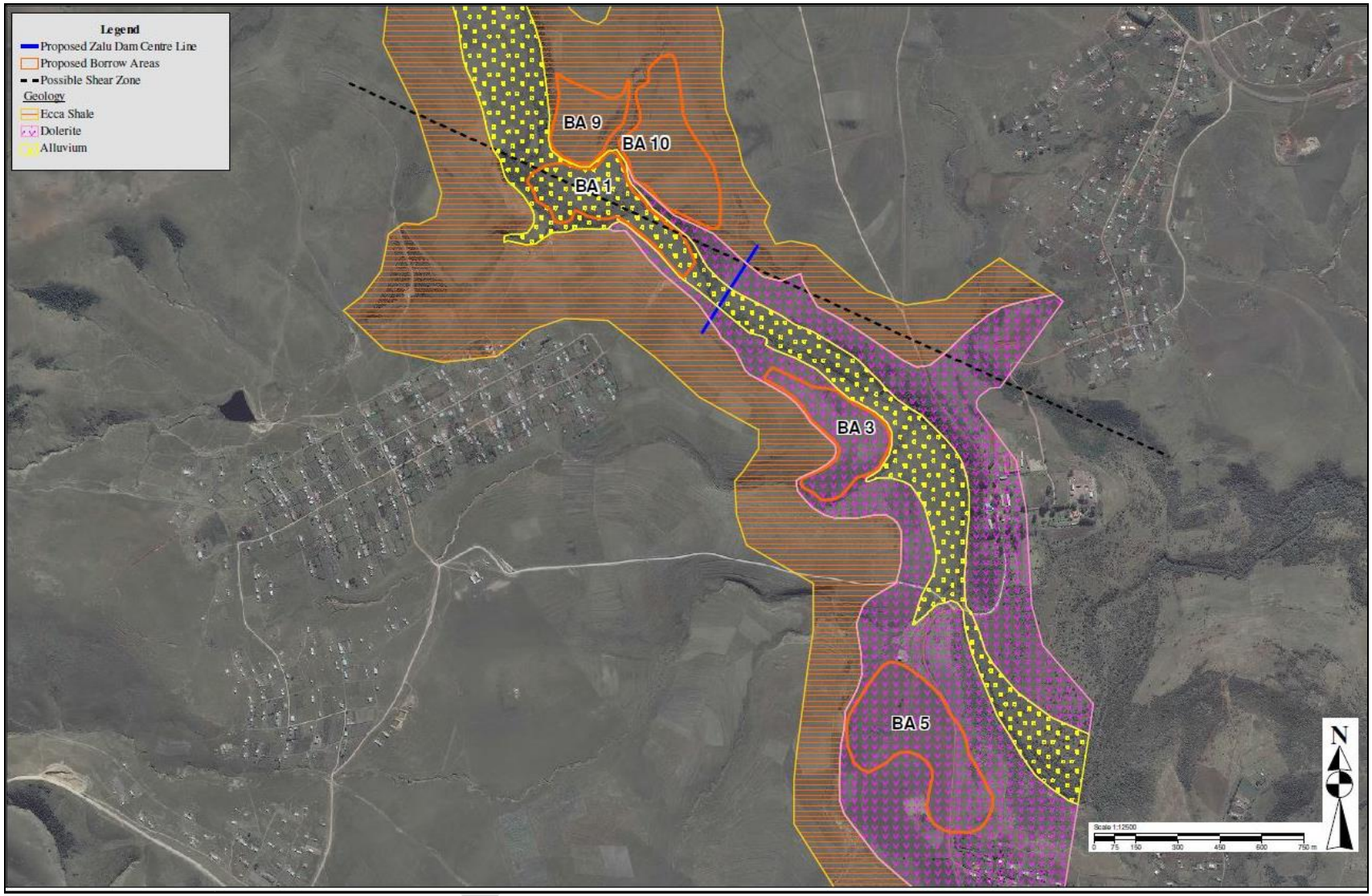


Figure 2-5. Borrow areas for dam construction (Source: Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme: Materials and Geotechnical Investigations, October 2013).

River Diversion

River diversion for construction of the dam is planned in three stages:

- Stage 1: No cofferdam is required for the period when the outlet conduit is constructed.
- Stage 2: Diversion of the river flow through the outlet conduit which will be made possible with a coffer dam.
- Stage 3: Plug the opening to the conduit with concrete.

The upstream coffer dam level is designed for a 5-year flood level and will be used while the upstream section of the embankment in the river is constructed to the required water head to divert the 20-year flood through the conduit.

2.2.2 Bulk distribution infrastructure

The available data in terms of the existing water supply infrastructure is limited. No as-built drawings could be sourced. An existing infrastructure map was obtained from UWP Consulting Engineers for the Feasibility Study. The existing pipeline route and the proposed new pipeline route are illustrated in Figure 2-6.

Due to the uncertainties in the allocation of the water from the proposed Zalu Dam, the assessment of the recommended bulk supply options was performed for two scenarios:

- **Scenario 1**: for an annual supply of 5.4 million m^3/a from the proposed Zalu Dam and 0.95 m^3/a from groundwater sources, solely for domestic use.

- **Scenario 2**: for an annual supply of 7.2 m^3/a from the proposed Zalu Dam and 0.95 m^3/a from groundwater sources for domestic use, should irrigation not be implemented.

Pipelines

Two proposed bulk supply pipeline alternatives were assessed:

- Option 1: refurbishing the existing domestic bulk supply system and building a new extended domestic bulk supply system parallel to the existing system.

- Option 2 (preferred): decommissioning of the existing bulk supply system and building a new extended system in its place, which will follow the same routes as the original system as well as spread out further to cover a broader range than the original system.

Option 1 is not ideal for the following reasons:

- The poor and neglected state of the existing scheme.

- Asbestos Cement pipes of the existing pipelines that are deemed to be a health risk and their impacts on community health in the area.

The total length of uPVC (sizes range from 63mm to 315mm) and steel pipelines (sizes range from 400 to 450mm) is 178 km (174 km for **scenario 2** – 7.2 million m^2/a) and 4 km (7.5 km for **scenario 2** - 7.2 million m^3/a), respectively.

Reservoirs

The existing reservoirs are in a poor state. Some of the reservoirs are completely dry while others are overflowing. The total estimated storage volume of the existing reservoirs is estimated at 5 335 m^3. The existing reservoirs in the study area are illustrated in Figure 2-7. The required storage volumes were taken as two times the water requirements. The total required storage volume is 78 521 m^3 (106 575 m^3 for scenario 2).

The following two options were analysed for reservoirs:

- Option 1 (preferred option): The refurbishment of the existing storage reservoirs, with additional new storage reservoirs.

- Option 2: New reservoirs and the total decommissioning of the existing reservoirs.

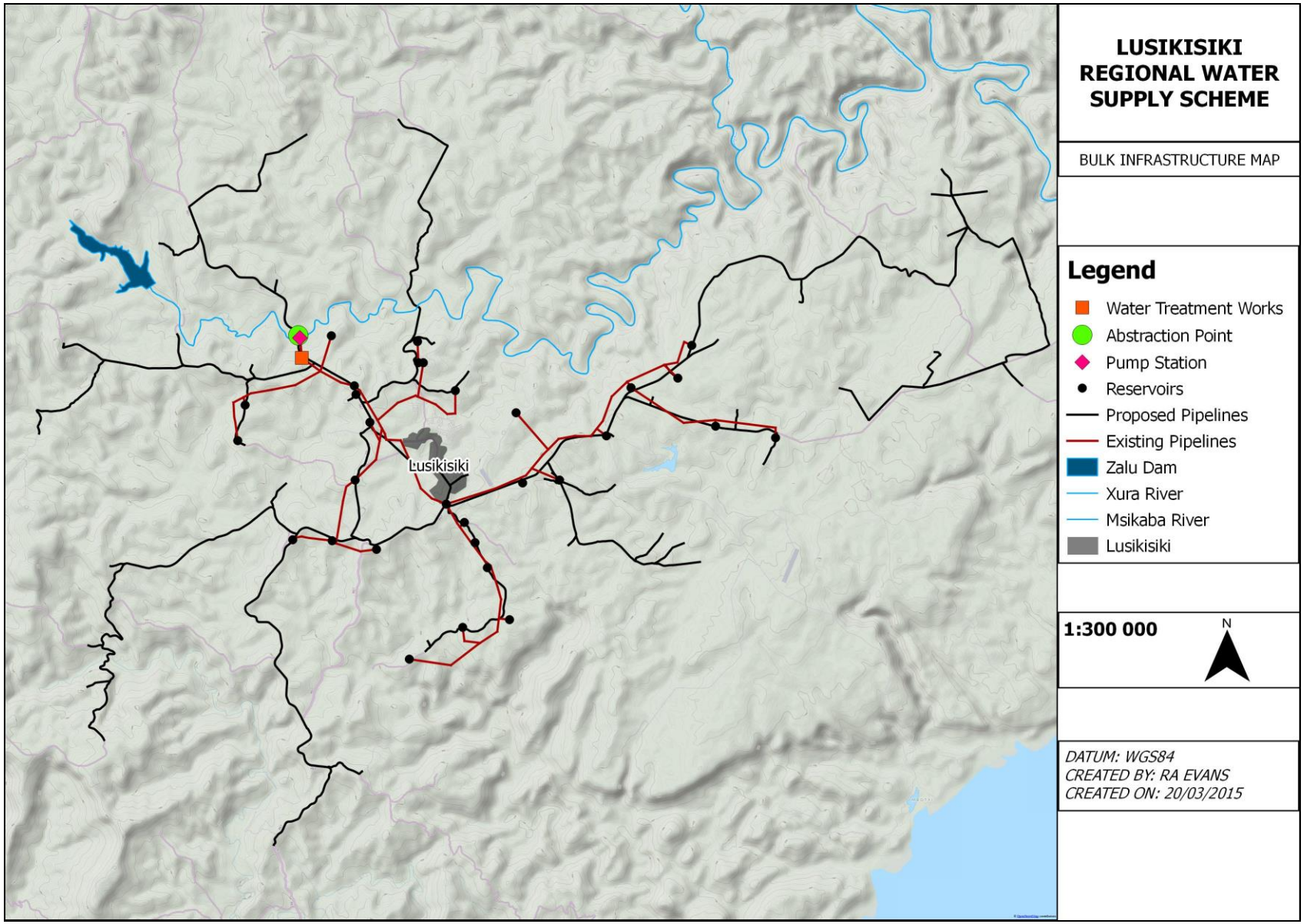


Figure 2-6. Bulk Infrastructure Map illustrating existing and proposed pipelines for the LRWSS.

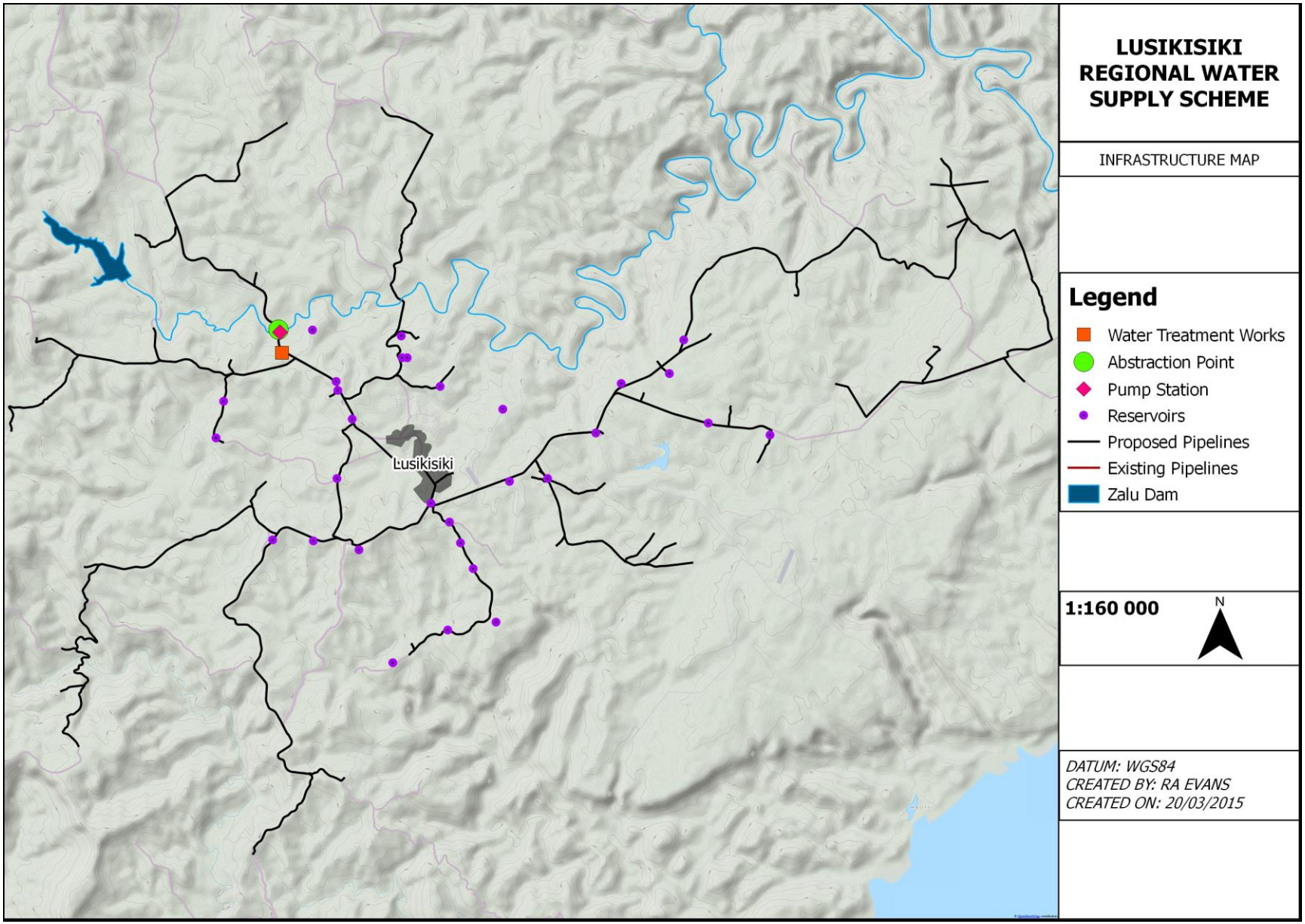


Figure 2-7. Infrastructure map illustrating the existing reservoirs, existing pump station and the existing water treatment plant.

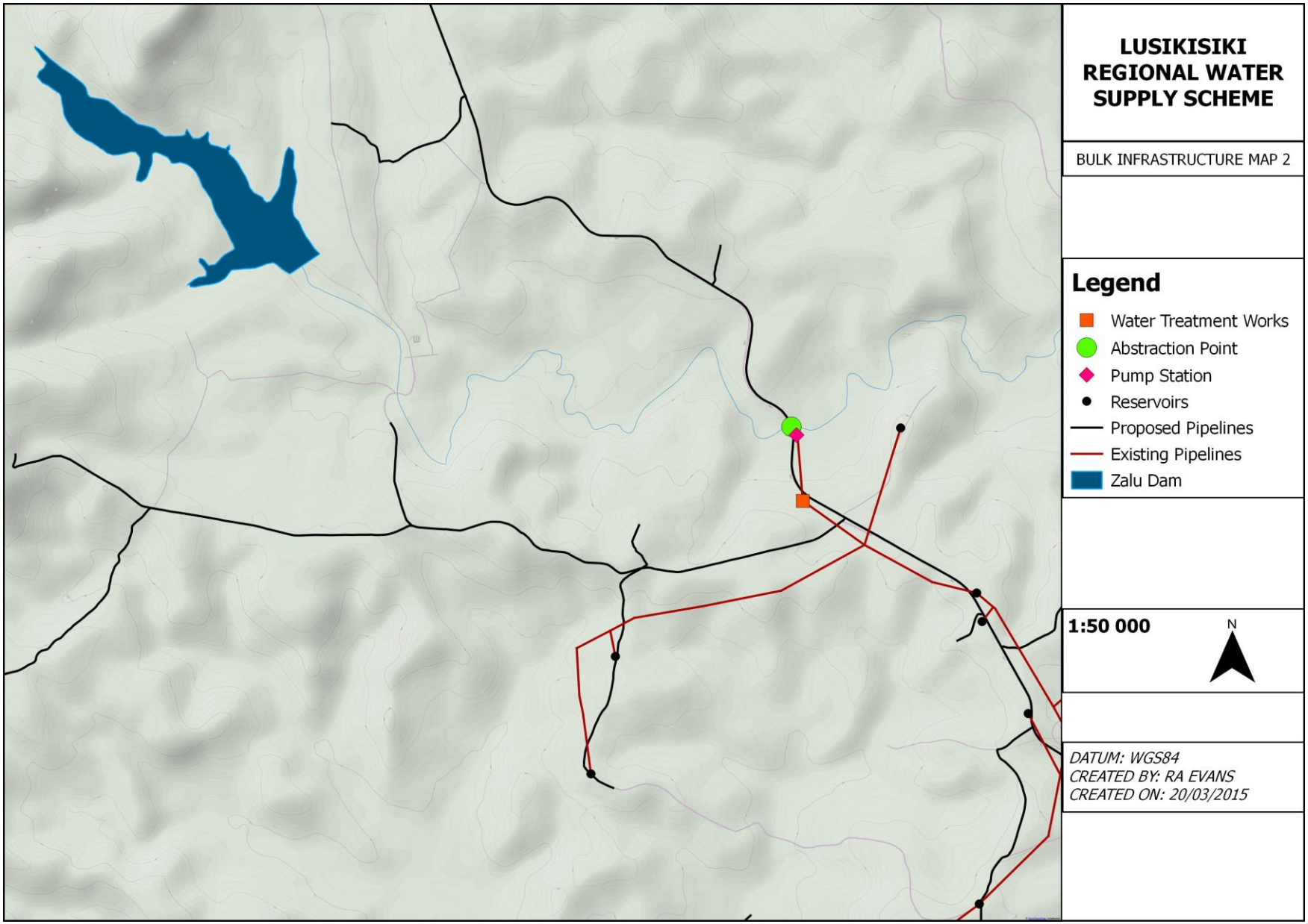


Figure 2-8. Bulk infrastructure map illustrating the location of the existing abstraction weir.

2.2.3 Water treatment plant

Existing Water Treatment Plant

The existing Lusikisiki Water Treatment Plant (WTP) is located about 6 km north-west of Lusikisiki town centre, next to the R61 (Figure 2-8). The current capacity of the WTP is 2.76 Ml/day; however, the demand is far greater than 2.76 Ml/day. The WTP consists of the following treatment processes and ancillary works:

- Chemical dosing (Coagulant, polyelectrolyte);
- Mixing and flocculation;
- Sedimentation;
- Pressurised sand filtration;
- Disinfection (Chlorination);
- Sludge pond; and
- Backwash water storage dams.

The clear water pump station, located within the WTP has two operational pumps and one standby pump. The pump station delivers the treated water to a 1 300 m^3 bulk storage reservoir. The existing WTP is in a well maintained condition, but the dosing systems and sludge handling systems require maintenance. The potable water produced by the WTP is of acceptable quality except for periodic non-compliance with colour, turbidity and alkalinity standards.

Water requirements

The plant will have to treat as much water is being used in the system per day (i.e.14.8 Ml/day).

If irrigation is not developed the amount supplied will increase to 19.7 Ml/day. The WTP will also need to be designed to accommodate possible upgrades.

Upgrade of the WTP

Two options for the upgrading of the WTP were identified:

- Option 1 (preferred option): refurbishment of the existing 2.76 Ml/day WTP and construction of a new 12.03 Ml/day WTP adjacent to the existing works.
- Option 2: decommissioning of the existing 2.76 Ml/day WTP and the construction of a completely new 14.79 Ml/day WTP at the existing WTP site, or at Zalu Dam.

The clear water pumping station (within the WTP) will also require upgrading.

2.2.4 Abstraction Weir

The flow gauging weir T6H004 on the Xura River (Plate 2-2) is used as the abstraction weir for the LRWSS. The weir is located underneath the bridge where the main road between Flagstaff and Lusikisiki (R61) crosses the Xura River (Figure 2-8). The weir is a crump gauging structure and consists of two portions of 5.677 m and 5.647 m respectively. The intake structure consists of a metal grid with a 500 mm diameter pipe and a 300 mm diameter valve.

OR Tambo District Municipality have not confirmed whether abstraction will occur at the current abstraction weir (and this weir will be upgraded) or whether a new weir will be constructed.

Plate 2-2. The existing abstraction weir on the Xura River.

2.2.5 Raw water pump station and rising main

The raw water pump station is located approximately 90 m south of the abstraction weir (Figure 2-8). Raw water is gravity fed to the raw water pump stations by means of a 300 mm diameter pipe. The raw water pump station functions on two centrifugal pumps (with an additional one on standby), with a combined capacity and head of 32 l/s and 60 m respectively. The water is pumped from the pump station to the WTP. The rising main is a 650 m long asbestos cement pipe. Raw water is pumped directly into the Lusikisiki WTP at the chemical dosing point.

The raw water pumping station will have to be upgraded to accommodate future water from the Zalu Dam. Ideally a new raw water pumping station should be constructed utilising the existing structure if possible. The required pump station capacities for **Scenario 1** (discussed in section 2.2.2) would be 171.2 l/s and for **Scenario 2** would be 228.3 l/s.

2.2.6 Groundwater Abstraction

Groundwater sources are to be used in areas of considerable distance from the planned Zalu Dam and where topography is unfavourable for pipeline infrastructure. Where high yielding groundwater sources exist, they will be linked into the planned bulk water reticulation network.

Augmentation of the LRWSS with groundwater (serving mostly Ingquza Hill and a small portion of PSJ LM)

It has been recommended that 9 previously drilled boreholes be equipped and an additional 8 conceptual boreholes be drilled and equipped to abstract 2 533 m^3/day from the Regional Well-field Area (RWA). This is the total volume of groundwater that is available for augmentation to the surface water supply scheme from the RWA (Figure 2-9).

Stand-alone schemes

Numerous communities fall outside of the RWA and will need to be served by stand-alone schemes (Figure 2-9). These schemes are still only planned at a high level and will serve either single communities or small clusters of communities depending on local groundwater conditions. Water sources will involve springs as well as new boreholes that will need to be developed.

Several zones of higher groundwater potential were delineated outside the RWA. These zones were used to cluster individual communities together where possible to minimise the number of stand-alone schemes. Six such clusters could be identified.

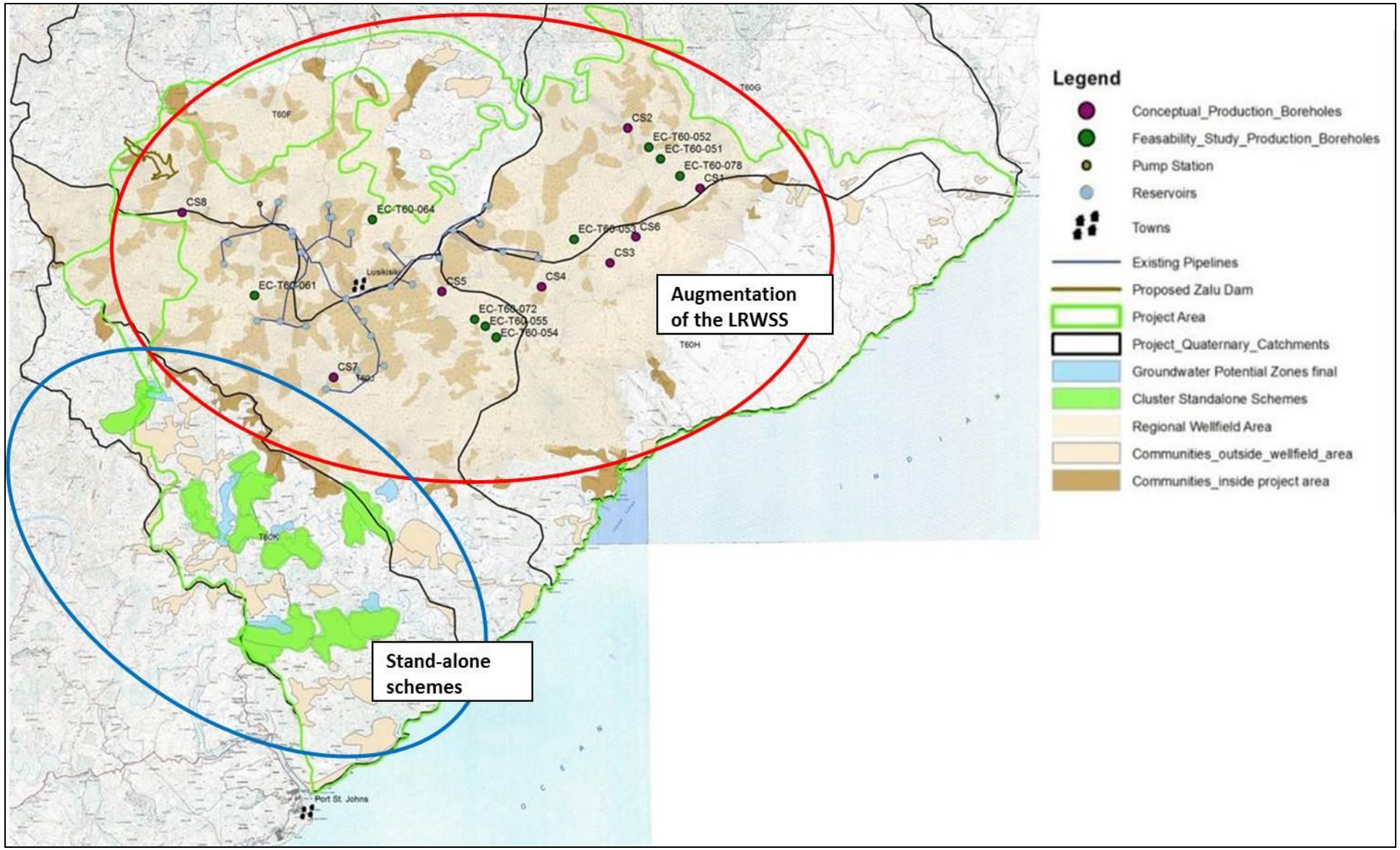


Figure 2-9. Regional Integrated Groundwater Supply. (*Adapted from* Feasibility Study for the Augmentation of the Lusikisiki Regional Water Supply Scheme: Assessment of Augmentation from Groundwater, November 2013).

3 PROJECT NEED & DESIRABILITY

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(f) A description of the need and desirability of the proposed activity

The proposed LRWSS is situated in two local municipalities within the OR Tambo District Municipality (ORTDM), namely the Ingquza Hill Local Municipality (IHLM) and to a lesser degree, Port St Johns Local Municipality (PSJLM).

ORTDM is one of the most densely populated regions within the country with a population of 1, 364,943. The IHLM accounts for about 20% of this population (Table 3-1) and the PSJLM accounts for about 11% of this population (StatsSA, 2011).

Table 3-1. Populations of the affected municipalities (StatsSA, 2011).

Municipality	Population
ORTDM	1, 364, 943
IHLM	278, 481
PSJLM	156, 136

3.1 Access to water and sanitation

3.1.1 Port St Johns Local Municipality

According to StatsSA, in 2011 65.3% of the PSJLM population did not have access to piped/tap water. Only 2.7% of the population have piped water inside their homes and 59.8% rely on rivers/streams for water (Figure 3-1).

The bulk of the PSJLM population (54.2%) uses pit toilets, only 3% have flush toilets that are connected to a sewerage system and 31.1% of the population does not have access to toilet facilities.

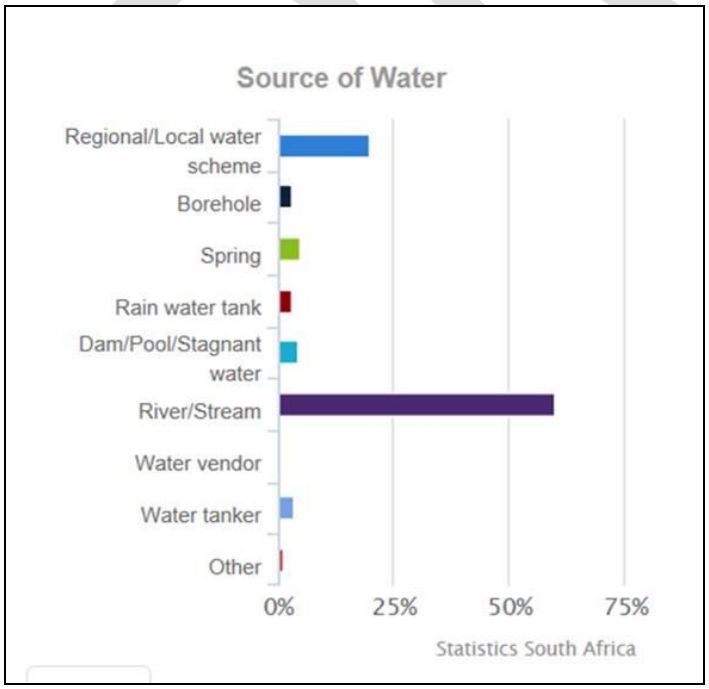


Figure 3-1. Sources of water for the PSJLM (StatsSA, 2011).

3.1.2 Ingquza Hill Local Municipality

In 2011 the percentage of the population in the IHLM with no access to piped water was 69.2%. Only 3.7% of the population have piped water in their homes and 63.4% of the population use rivers/streams for water (Figure 3-2).

A large percentage of the population uses pit latrines (66.7%) and 19.2% of the population have no toilets. Only 2.4% of the population have flush toilets connected to the sewerage system (StatsSA, 2011).

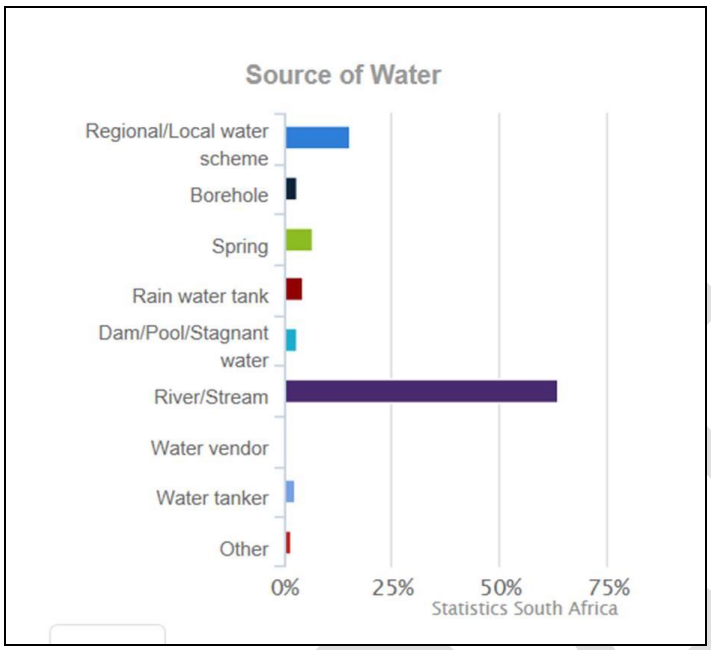


Figure 3-2. Sources of water for the IHLM (StatsSA, 2011).

3.1.3 Ward level

The "project area" for the LRWSS consists of wards 4,12,13,14,15,16,17,18,19,20,21,22,23 and 24 in the IHLM and wards 13,14,15,19 and 20 in the PSJLM.

According to StatsSA (2011), an alarming percentage of the population in the project area have no access to piped water (61.28%). While this figure has dropped in the past decade, this remains a serious challenge in the area. Figure 3-3 shows access to different sources of water within the project area.

There are a number of rivers running through the project area, which extends from the Mzimvubu River in the south-west to the Msikaba River in the north-east. The Zalu dam will be located along the Xura River. Most of the communities within the project area receive water from natural sources especially rivers and streams.

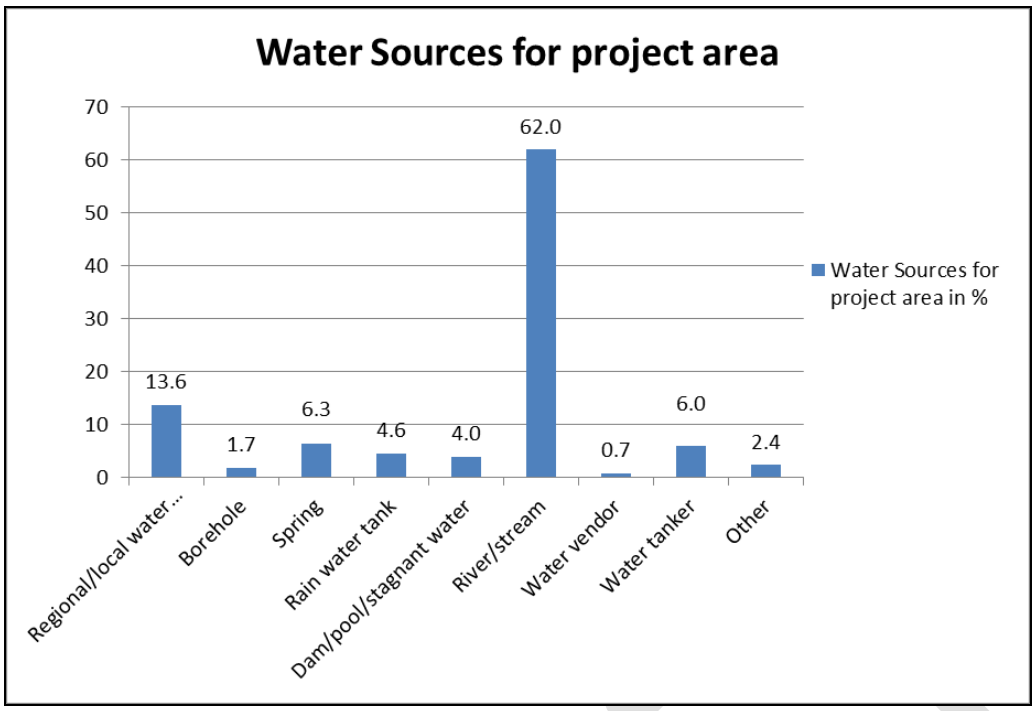


Figure 3-3. Sources of water for the project area.

According to StatsSA only 2% of the population in the project area have flush toilets and a further 12% use chemical toilets. As shown in Figure 3-4, 12% of the population have no access to sanitation services. The majority of the population use pit toilets without ventilation (38%).

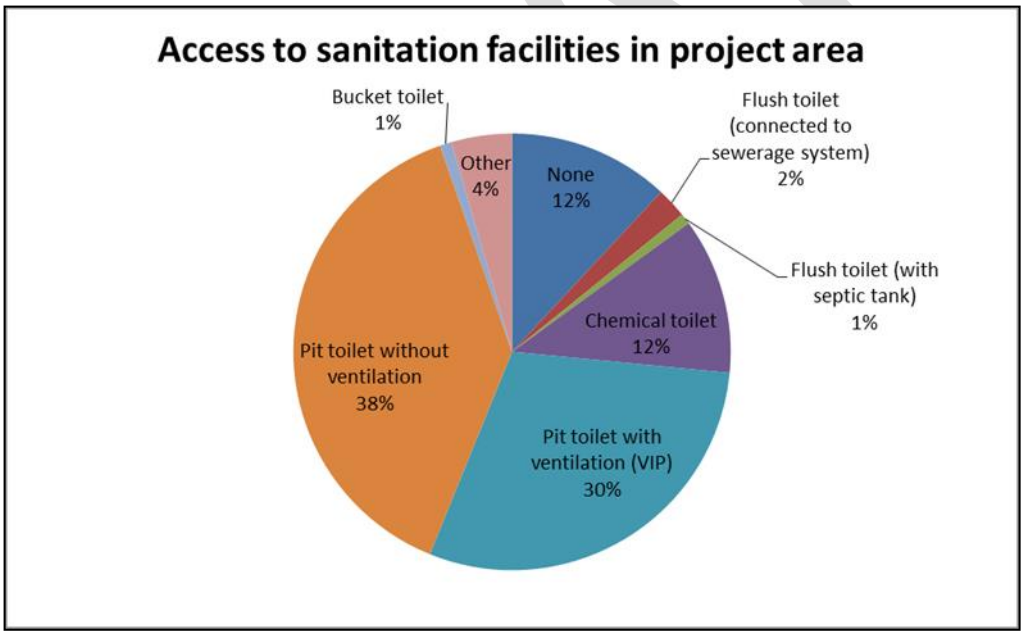


Figure 3-4. Access to sanitation services within the project area.

Clearly, there is a need to provide not only potable water services to more households within the area, but also to assist the municipalities with sustainable and clean water provision. At present, the ORTDM has a number of water schemes under its area of jurisdiction. In order to deal with the need for water supply, boreholes are used in some areas. Water is pumped from the borehole into a rainwater tank and is then collected in buckets (Figure 3-5). In most instances these systems are poorly maintained and non-functional.

Figure 3-5. Borehole used for water supply (tank supplied by ORTDM).

3.2 The constitution

The Constitution places the responsibility on government to ensure that basic services are progressively expanded to all, within the limits of available resources. These basic services include:

- Housing,
- Education,
- Health care,
- Social welfare,
- Transport,
- Electricity and energy,
- **Water**,
- Sanitation and Refuse and waste removal.

Without the construction of the proposed LRWSS, it is unlikely that the state will be able to fulfil this responsibility.

3.3 National Infrastructure Plan

In 2012, the South African Government adopted a National Infrastructure Plan. The objectives of the plan are to identify and implement key infrastructure projects that will stimulate the economy by infrastructure development that will combine the goals of ensuring service delivery and at the same time creating jobs.

The investment projects are anticipated to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification, whilst the construction of ports, roads, railway systems, electricity plants, hospitals, schools and dams will contribute to faster economic growth.

In order to implement the goals and objectives of the National Infrastructure Plan, a number of Strategic Infrastructure Projects (SIPs) have been developed. The construction of the proposed LRWSS forms part of SIP 18 which speaks directly to Water and Sanitation infrastructure. SIP 18 involves a 10 year plan to address the estimated backlog of adequate water to supply 1.4 m households and basic sanitation to 2.1 m households. The project will involve provision of sustainable supply of water to meet social needs and support economic growth. These projects include provision for new infrastructure, rehabilitation and upgrading of existing infrastructure, as well as improve management of water infrastructure.

Without the construction of the proposed LRWSS, it is unlikely that the state will be able to fulfil the objectives within the project area in question.

4 ALTERNATIVES

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(g) A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;
(i) A description and comparative assessment of all alternatives identified during the environmental impact assessment process

One of the requirements of an EIA is to investigate alternatives associated with a proposed project.

4.1 Reasonable and feasible alternatives

Alternatives should include consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The no-go alternative must also in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The determination of whether site or activity (including different processes etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment.

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—
(a) the property on which or location where it is proposed to undertake the activity.
(b) the type of activity to be undertaken.
(c) the design or layout of the activity.
(d) the technology to be used in the activity.
(e) the operational aspects of the activity.
(f) the option of not implementing the activity.

4.2 Fundamental, incremental and no-go alternatives

4.2.1 Fundamental alternatives

Fundamental alternatives are developments that are totally different from the proposed project description and usually include the following:
- Alternative property or location where it is proposed to undertake the activity.
- Alternative type of activity to be undertaken.
- Alternative technology to be used in the activity.

4.2.2 Incremental alternatives

Incremental alternatives relate to modifications or variations to the design of a project that provide different options to reduce or minimise environmental impacts. There are several incremental alternatives that can be considered, including:
- Alternative design or layout of the activity.
- Alternative technology to be used in the activity.
- Alternative operational aspects of the activity

4.2.3 No-go alternative

It is mandatory to consider the "no-go" option in the EIA process. The "no-go" alternative refers to the current status quo and the risks and impacts associated to it. Some existing activities may carry risks and may be undesirable (e.g. an existing contaminated site earmarked for a development). In the case of the current proposed water supply scheme, the main "no-go" activity is:

- No construction of the water supply scheme and associated infrastructure in the proposed project area.

4.3 Analysis of alternatives

Table 4-1 to 4-5 illustrate the methodology used to assess the identified alternatives. The table assesses the advantages and disadvantages, and provides further comments on the selected alternatives.

The categories of alternatives that are assessed include:

- Location;
- Associated technology;
- Design and layout; and
- No-go alternative.

Table 4-1. The alternatives for the proposed Zalu Dam.

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
Property or location (Fundamental location alternative)	**Alternative location 1** - Current proposed site (Preferred site alternative). The LRWSS has been under consideration since the 1970's. A number of investigations have been undertaken by Hill Kaplan Scott (1979), Council for Geoscience (1999), SRK Consulting (2009) as well as investigations by AECOM SA (Pty) for DWS as part of the Feasibility Study for the LRWSS. In light of the considerable amount of work already undertaken to determine the position of the proposed dam no location alternatives will be considered.	- Dam site is located where the water resources of the Xura River could be developed as a reliable source for meeting estimated water requirements for domestic use in Lusikisiki and surrounding settlements – Availability of construction materials (borrow areas) close by – Socio-economic development in the region will be stimulated	– Potential visual intrusion to surrounding communities – Potential impacts on fauna and flora – Potential impact on Msikaba River and estuary – Safety hazard for local communities	YES	YES	This is the preferred option and the only location alternative that will be assessed.
	Alternative location 2 - None identified	– N/A	– N/A	N/A	N/A	The location for the Zalu Dam site has been under investigation since

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
						the 1970's and an alternative site will not be investigated in the impact assessment process.
Design alternative (Incremental alternative)	**Alternative dam type 1** - Earth Core Rockfill Dam (ECR) (Preferred alternative)	– Significantly cheaper to build – Most of the construction materials are readily available within or nearby the dam site	– Large volume of various types of construction materials required	YES	YES	This is the preferred dam alternative.
	Alternative dam type 2 – Concrete Gravity Dam	– Only concrete is required for dam construction, smaller volume of construction material required	– Significantly more expensive to construct than an ECR dam – Use of large volumes of concrete to construct the dam, potentially has a larger environmental impact	YES	NO	This dam type will not be assessed further in the impact assessment process.
	Alternative dam size 1 – 1.5 Mean Annual Runoff (MAR) ECR Dam with a FSL of 622.6 masl. Dam wall height of 44m (preferred alternative)	– This dam size would accommodate a large population.	– Possibly a larger drowning risk.	YES	YES	This is the preferred dam size alternative.

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
	Alternative dam size 2 – 0.6 (MAR) ECR Dam with a FSL of 612 masl. Dam wall height of 35m	– Cheaper to construct than a 1.5 MAR dam	– Less people will have access to potable water	YES	NO	This dam size is not the preferred alternative and will not be assessed further in the impact assessment process.

Table 4-2. The alternatives of the proposed pipelines.

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
Layout alternative (Incremental alternative)	**Alternative pipeline layout 1 –** Decommissioning of existing pipelines and building new extended system in its place which will follow the same routes of the original system as well as spread out further (preferred alternative)	– All new infrastructure	– Asbestos is dangerous to remove, it requires specific and expensive mitigation measures to remove it.	YES	YES	This is the preferred pipeline layout alternative.
	Alternative pipeline layout 2 – refurbishing the existing pipeline system and building a new extended system parallel to the existing system	– Lower cost	– The required capacity of a new scheme is much higher than the capacity of the existing scheme and therefore the same pipe diameters will be required for a new scheme	YES	NO	This is not the preferred pipeline layout alternative and will not be assessed further in the impact assessment process because the preferred layout alternative is a new pipeline.

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
			to run parallel to the existing scheme – Poor state of existing scheme – Asbestos cement pipes of the existing scheme are a health risk to the community in the area			
Technology alternative (Incremental alternative)	**Technology alternative 1** – buried pipelines i.e. trenching	– No additional surface support required	– Trenching is more invasive to the environment – If leaks occur pipe will have to be excavated to repair leaks – Leaks are not easily detectable	YES	YES	This alternative will be assessed further in the impact assessment process.
	Technology alternative 2 - pipelines above ground at river crossings i.e. pipe bridge across water crossing	– Less damage to the environment as trenching is not required – Minimal leakage as pipe can be repaired easily and leaks are easily detected	– Pipeline is easily damaged – Sagging of pipeline – Illegal connections – Vulnerable to vandalism	YES	YES	This alternative will be assessed further in the impact assessment process.
	Technology alternative 3 – trenchless buried	– Significantly less environmentally invasive on the	– Significantly more expensive – Less labour	YES	YES	This alternative will be assessed further in the impact

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
	pipelines i.e. horizontal directional drilling	surface – Less labour intensive	intensive – less job creation			assessment process.

Table 4-3. Alternatives of proposed reservoirs.

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
Layout alternative (Incremental alternative)	**Alternative reservoir layout 1 –** Refurbishment of the existing reservoirs with additional new storage reservoirs (preferred alternative)	– Cost saving	– Old infrastructure being utilised	YES	YES	This is the preferred reservoir layout alternative.
	Alternative reservoir layout 2 – New reservoirs and the total decommissioning of the existing reservoirs	– New infrastructure	– Slightly more expensive – Longer construction period	YES	NO	This is not the preferred reservoir layout alternative and will not be assessed further in the impact assessment process due to cost implications.

Table 4-4. Alternatives of Water Treatment Plant.

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
Layout alternative (Incremental alternative)	**Alternative WTP layout 1 –** Refurbishment of the existing WTP and construction of a new WTP adjacent to the existing one (preferred alternative)	– Cost saving	– Longer construction period – Bigger footprint thus a larger impact on the environment	YES	YES	This is the preferred WTP layout alternative.

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
	Alternative WTP layout 2 - Decommissioning of the existing WTP and construction of a completely new WTP at the existing site or at the Zalu Dam	– Smaller footprint	– More expensive – Possible land availability issues	YES	NO	This is not the preferred WTP layout alternative and will not be assessed further in the impact assessment process due to cost implications.

Table 4-5. No-go option for proposed LRWSS

Alternative level	Alternatives	Advantages	Disadvantages	Reasonable and feasible	Further assessment	Comment
No-go option This refers to the current status quo and the risks and impacts associated with it.	**Current land use in the proposed LRWSS area**- communal grazing, limited agriculture in the area (mostly subsistence agriculture)	– Less change or damage to the environment	– Will affect socio-economic development in the region – Limited access to potable water/irrigation in the study area	YES	YES	Assessed in the impact assessment process.

5 RELEVANT LEGISLATION

The development of the proposed water supply scheme will be subject to the requirements of various items of South African legislation. These are described below.

5.1 The Constitution Act (No. 108 of 1996)

This is the supreme law of the land. As a result, all laws, including those pertaining to the proposed development, must conform to the Constitution. The Bill of Rights - Chapter 2 of the Constitution, includes an environmental right (Section 24) according to which, everyone has the right:

a) To an environment that is not harmful to their health or well-being.
b) To have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that:
   (i) Prevent pollution and ecological degradation.
   (ii) Promote conservation.
   (iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Relevance to the proposed water supply scheme:

- Obligation to ensure that the proposed development will not result in pollution and ecological degradation; and
- Obligation to ensure that the proposed development is ecologically sustainable, while demonstrating economic and social development.

5.2 National Environmental Management Act (NEMA) (No.107 of 1998, revised 2010)

The objective of NEMA is: "*To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith*."

Please note that the 2010 NEMA Regulations have been replaced by the revised 2014 NEMA Regulations (implemented from the 8th December 2014), however, the review and decision for this project (which started in 2013) will be based on the 2010 NEMA Regulations.

A key aspect of NEMA is that it provides a set of environmental management principles that apply throughout the Republic to the actions of all organs of state that may significantly affect the environment. Section 2 of NEMA contains principles (see Table 5-1) relevant to the proposed project, and likely to be utilised in the process of decision making by DEA.

Table 5-1. NEMA Environmental Management Principles

(2)	Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
(3)	Development must be socially, environmentally and economically sustainable.
(4)(a)	Sustainable development requires the consideration of all relevant factors including the following: i. That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ii. That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied; iii. That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner.
(4)(e)	Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.

(4)(i)	The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.
(4)(j)	The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.
(4)(p)	The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
(4)(r)	Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

As these principles are utilised as a guideline by the competent authority in ensuring the protection of the environment, the proposed development should, where possible, be in accordance with these principles. Where this is not possible, deviation from these principles would have to be very strongly motivated.

NEMA introduces the duty of care concept, which is based on the policy of strict liability. This duty of care extends to the prevention, control and rehabilitation of significant pollution and environmental degradation. It also dictates a duty of care to address emergency incidents of pollution. A failure to perform this duty of care may lead to criminal prosecution, and may lead to the prosecution of managers or directors of companies for the conduct of the legal persons.

In addition NEMA introduces a new framework for environmental impact assessments, the EIA Regulations (2010) discussed previously.

Relevance to the proposed water supply scheme:

- The developer must be mindful of the principles, broad liability and implications associated with NEMA and must eliminate or mitigate any potential impacts.
- The developer must be mindful of the principles, broad liability and implications of causing damage to the environment.

5.3 National Environment Management: Biodiversity Act (No. 10 of 2004)

This Act provides for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act 107 of 1998 (see Table 5.2 below). In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Table 5-2. Management and Conservation of South Africa's Biodiversity within the framework of NEMA.

CHAPTER 4	
	Provides for the protection of species that are threatened or in need of national protection to ensure their survival in the wild; o to give effect to the Republic's obligations under international agreements regulating international trade in specimens of endangered species; and o ensure that the commercial utilization of biodiversity is managed in an ecologically sustainable way.
CHAPTER 5 (Part 2)	
Section	A person who is the owner of land on which a listed invasive species occurs must:

73	a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land; b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and c) take all required steps to prevent or minimise harm to biodiversity.
Section 75	• Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs. • Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. • The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

The objectives of this Act are to provide, within the framework of the National Environmental Management Act, for:

- The management and conservation of biological diversity within the Republic;
- The use of indigenous biological resources in a sustainable manner.

The Act's permit system is further regulated in the Act's Threatened or Protected Species Regulations, which were promulgated in February 2007.

Relevance to the proposed water supply scheme:

- The proposed development must conserve endangered ecosystems and protect and promote biodiversity;
- The impacts of the proposed development on endangered ecosystems must be assessed;
- No protected species may be removed or damaged without a permit;
- The proposed site must be cleared of alien vegetation using appropriate means.

5.4 National Forests Act (No. 84 of 1998)

The objective of this Act is to monitor and manage the sustainable use of forests. In terms of Section 12 (1) (d) of this Act and GN No. 1012 (promulgated under the National Forests Act), no person may, except under licence:

- Cut, disturb, damage or destroy a protected tree; or
- Possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree.

Relevance to the proposed water supply scheme:

- If any protected trees in terms of this Act occur on site, the developer will require a licence from the DAFF to perform any of the above-listed activities.

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

The protection of archaeological and paleontological resources is the responsibility of a provincial heritage resources authority and all archaeological objects, paleontological material and meteorites are the property of the State. "*Any person who discovers archaeological or paleontological objects or material or a meteorite in the course of development must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority*".

Relevance to the proposed water supply scheme:

ECPHRA needs to be informed of the project and EIA process.
- A heritage impact assessment (HIA) must be undertaken.
- A paleontological impact assessment (PIA) must be undertaken.
- No person may alter or demolish any structure or part of a structure, which is older than 60 years or disturb any archaeological or paleontological site or grave older than 60 years without a permit issued by the relevant provincial heritage resources authority.
- No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter or deface archaeological or historically significant sites.

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

The objective of the Air Quality Act is to protect the environment by providing the necessary legislation for the prevention of air pollution.

Relevance to the proposed water supply scheme:

- The "best practicable means" for the abatement of dust during construction, if approved, have to be undertaken.

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

The objective of this Act is to provide for the health and safety of persons at work (See Table 5.3 below). In addition, the Act requires that, "*as far as reasonably practicable, employers must ensure that their activities do not expose non-employees to health hazards*". The importance of the Act lies in its numerous regulations, many of which will be relevant to the proposed water supply scheme. These cover, among other issues, noise and lighting.

Relevance to the proposed water supply scheme:

- The developer must be mindful of the principles and broad liability and implications contained in the OHSA and mitigate any potential impacts.

5.8 National Water Act (No. 36 of 1998)

5.8.1 Purpose of the Act (Section 2)

The purpose of the Act is to ensure that the nation's water resources are protected, managed and controlled in ways which take into account:

a) Meeting the basic human needs of present and future generations;
b) Promoting equitable access to water;
c) Redressing the results of past racial and gender discrimination;
d) Promoting the efficient, sustainable and beneficial use of water in the public interest;
e) Facilitating social and economic development;
f) Providing for growing demand for water use;
g) Protecting aquatic and associated ecosystems and their biological diversity;
h) Reducing and preventing pollution and degradation of water resources;
i) Meeting international obligations;
j) Promoting dam safety;
k) Managing floods and droughts.

Protection of water resources (Section 12-18)

Provides details of measures intended to ensure the comprehensive protection of all water resources, including the water reserve and water quality.

Pollution prevention (Section 19)

The person (including a municipality) who owns, controls occupies or uses the land in question, is responsible for taking reasonable measures to prevent pollution of water resources. If the measures are not taken, the catchment management agency concerned, may itself do whatever is necessary to prevent the pollution or remedy its effects and recover all reasonable costs from the persons responsible for the pollution.

The use of water (Section 21)

Section 21 (a-k) describes activities defined as a water use under the act. These activities may only be undertaken subject to the application for, and issue of, a water use licence.

Relevance to the proposed water supply scheme:

- The following activities associated with the LRWSS will require an application for a water use licence as stipulated in Section 21 of the Act:

  (a) Taking water from a water resource;
  (b) Storing water;
  (c) Impeding or diverting the flow of water in a watercourse;
  (i) Altering the bed, banks, course or characteristics of a watercourse.

- Appropriate measures must be taken to prevent the pollution of watercourses.
- Riparian zones must be protected.
- Construction within a watercourse or within 500 m of a wetland will require a water use licence (section 21(c) and (i)).

5.9 Hazardous Substances Act (No. 15 of 1973)

The Act aims to manage hazardous substances. It is the principal national legislation that controls the transportation, and manufacturing, storage, handling, treatment or processing facilities for any substance that is dangerous or hazardous (Groups I-IV). Specific regulations governing the conveyance of hazardous substances, including Group I substances, by road may also be relevant.

Relevance to the proposed water supply scheme:

- Manage the hazardous waste in such a manner that it does not endanger human health or the environment.
- Prevent the waste from being used for an unauthorised purpose.

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

The Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA) makes provision for equitable access to and sustainable development of South Africa's mineral and petroleum resources and to provide for matters connected therewith.

The objects of this Act are (amongst others) to:

- Give effect to the principle of the State's custodianship of the nation's mineral and petroleum resources.
- Promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa.
- Give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development.

There are two categories of permission relevant to borrow pits and hard rock quarries, namely; "Mining Permits" and "Mining Rights." As is reflected in the table below, these categories are linked to the size of the proposed operation and the proposed operational period.

Table 5-3. Categories of permission required for a borrow pit/ quarry

Category	Size	Period of operation	DMR Requirement
Mining Permit	< 1.5ha	< 2 years	Environmental Management Plan (EMP) BAR
Mining Right	Not specified	Not specified	Scoping and EIA Environmental Management Programme Report

Relevance to the proposed water supply scheme:

- DWS is exempted from the application for a Mining Permit/Right, but are not exempted from an application for Environmental Authorisation.
- Any activities requiring extraction of sand or hard rock for construction purposes will require the submission of an application to DMR for Environmental Authorisation.

5.11 Conservation of Agricultural Resources Act (No. 43 of 1983)

The purpose of this Act is to provide for control over the utilization of the natural agricultural resources in order to promote the conservation of the soil, the water sources, the vegetation and the combating of weeds and invader plants.

This is achieved by:

- Maintaining the production potential of the affected land,
- Preventing and combating erosion,
- Preventing and combating weakening or destruction of the water sources, and
- Protecting vegetation and combating of weeds and invader plants.

The Act provides a list of declared weeds and invader plants as well as indicators of bush encroachment.

In terms of weeds and invader plants:

- A land user shall control any category 1 plants that occur on any land or inland water surface.
- No person shall, except in or for purposes of a biological control reserve –
    - Establish, plant, maintain, multiply or propagate weeds and invader plants;
    - Import or sell propagating material of category weeds and invader plants; and
    - Acquire propagating material of weeds and invader plants.

Relevance to the proposed water supply scheme:

- If any declared weed and/or invader species listed in terms of this Act is present on site, it must be removed.

5.12 National policy

5.12.1 National Infrastructure Plan

In 2012, the South African Government adopted a National Infrastructure Plan. The objectives of the plan are to identify and implement key infrastructure projects that will stimulate the economy by infrastructure development that will combine the goals of ensuring service delivery and at the same time creating jobs.

The investment into infrastructure projects is anticipated to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification, whilst the construction of ports, roads, railway systems, electricity plants, hospitals, schools and dams will contribute to faster economic growth.

In order to implement the goals and objectives of the National Infrastructure Plan, a number of Strategic Infrastructure Projects (SIPs) have been developed. The construction of the proposed LRWSS forms part of **SIP 18** which speaks directly to Water and Sanitation infrastructure. SIP 18 involves a 10 year plan to address the estimated backlog of adequate water to supply 1.4 m households and 2.1 m households to basic sanitation. The project will involve provision of sustainable supply of water to meet social needs and support economic growth. These projects include provision for new infrastructure, rehabilitation and upgrading of existing infrastructure, as well as improve management of water infrastructure.

5.13 Municipal by-laws and planning

Certain activities related to the proposed development may, in addition to National legislation, be subject to control by municipal by-laws. These will need to be confirmed with the Ingquza Hill and Port St Johns LM prior to construction.

5.13.1 The Ingquza Hill Local Municipality IDP (2014/2015)

According to the IHLM Integrated Development Plan (IDP), the Municipality is faced with huge household, community and economic infrastructure backlogs. Major challenges include lack of access roads, incomplete roads and poor road maintenance. Water infrastructure is highlighted as a major challenge.

No recent published IDP for the Port St Johns Local Municipality was available at the time that this report was written.

5.14 Possible benefits of the development to the local community

The development is expected to supply various wards within the PSJLM and IHLM with potable water. Furthermore, various employment opportunities will be created for local labourers during both the construction and operation phases of the proposed development.

6 DESCRIPTION OF THE AFFECTED ENVIRONMENT

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(d) A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;

6.1 Bio-physical environment

6.1.1 Current land use

The majority of the project area, particularly the dam inundation area, has been transformed by anthropogenic activities such as overgrazing and active clearing/burning for improved pastures. The area is used for communal grazing (Plate 6-1) and the site visit indicates that this area is generally overgrazed by livestock such as cattle, goats and sheep. There is limited agriculture in the area and what does exist occurs mostly near homesteads (Figure 6-1).

Plate 6-1. Current land use of the study area.

6.1.2 Climate

The project area is generally located in a summer rainfall area and is characterised by a warm, temperate and humid climate. Data taken from Lusikisiki town and Port St Johns indicate that the area receives an average of between 950 and 1 250 mm of rainfall per annum (Buhmann et al., 2006) with the highest rainfall occurring in November and March and the lowest rainfall occurring in June (www.saexplorer.co.za). Temperatures range from 27º C in February to 15º C in July.

6.1.3 Topography

The project area is characterised by coastal plateaus that are deeply incised by numerous rivers, creating deep gorges. These areas are associated with the underlying Natal Group Sandstones and hard quartzitic rock (Figure 6-2).

Further inland, where the dam will be located, the project area is characterised by gentle, undulating hills associated with the underlying Dwyka and Ecca groups (Plate 6-2).

Plate 6-2: Topography of the dam inundation area.

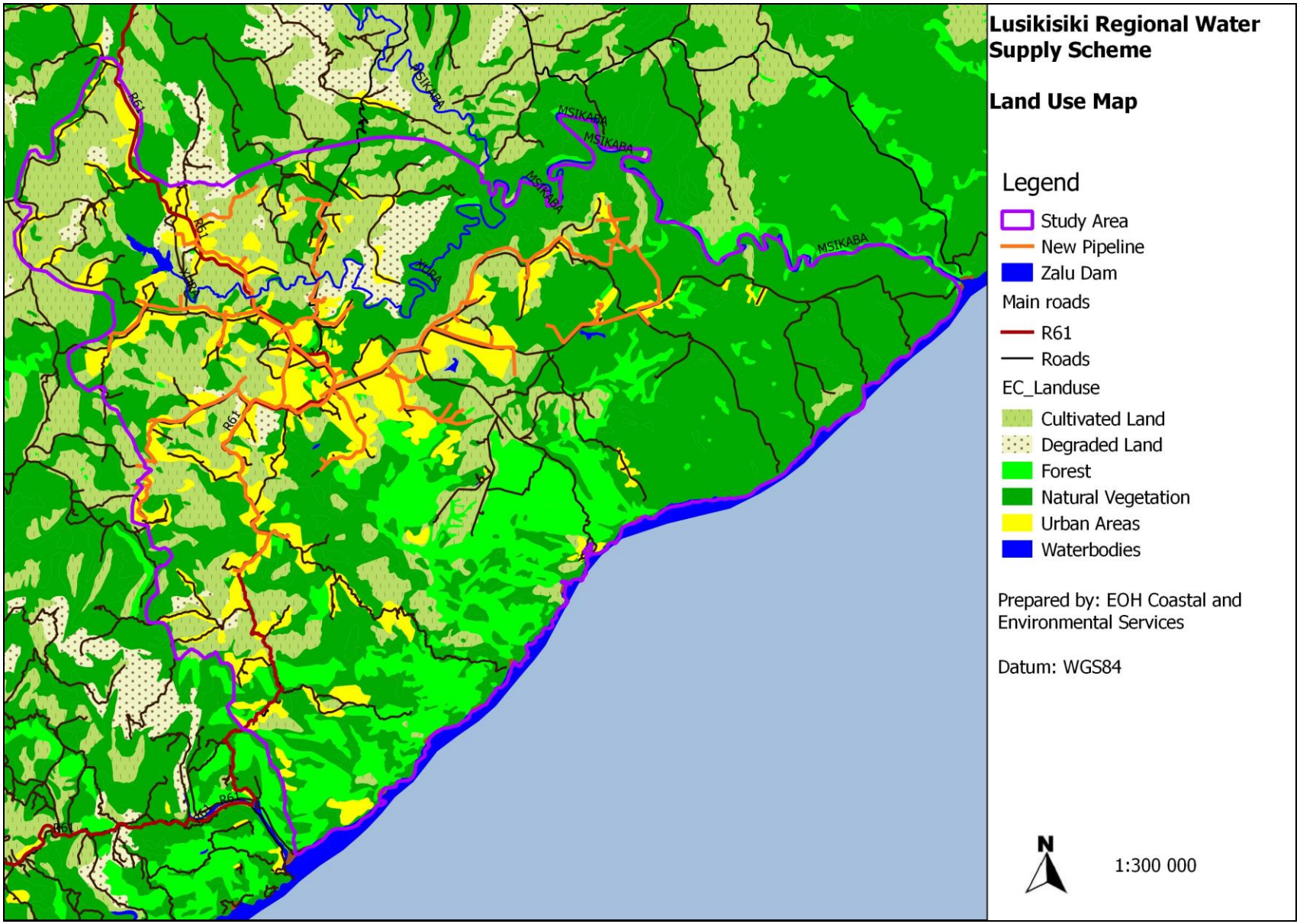


Figure 6-1. Land use map for the LRWSS study area.

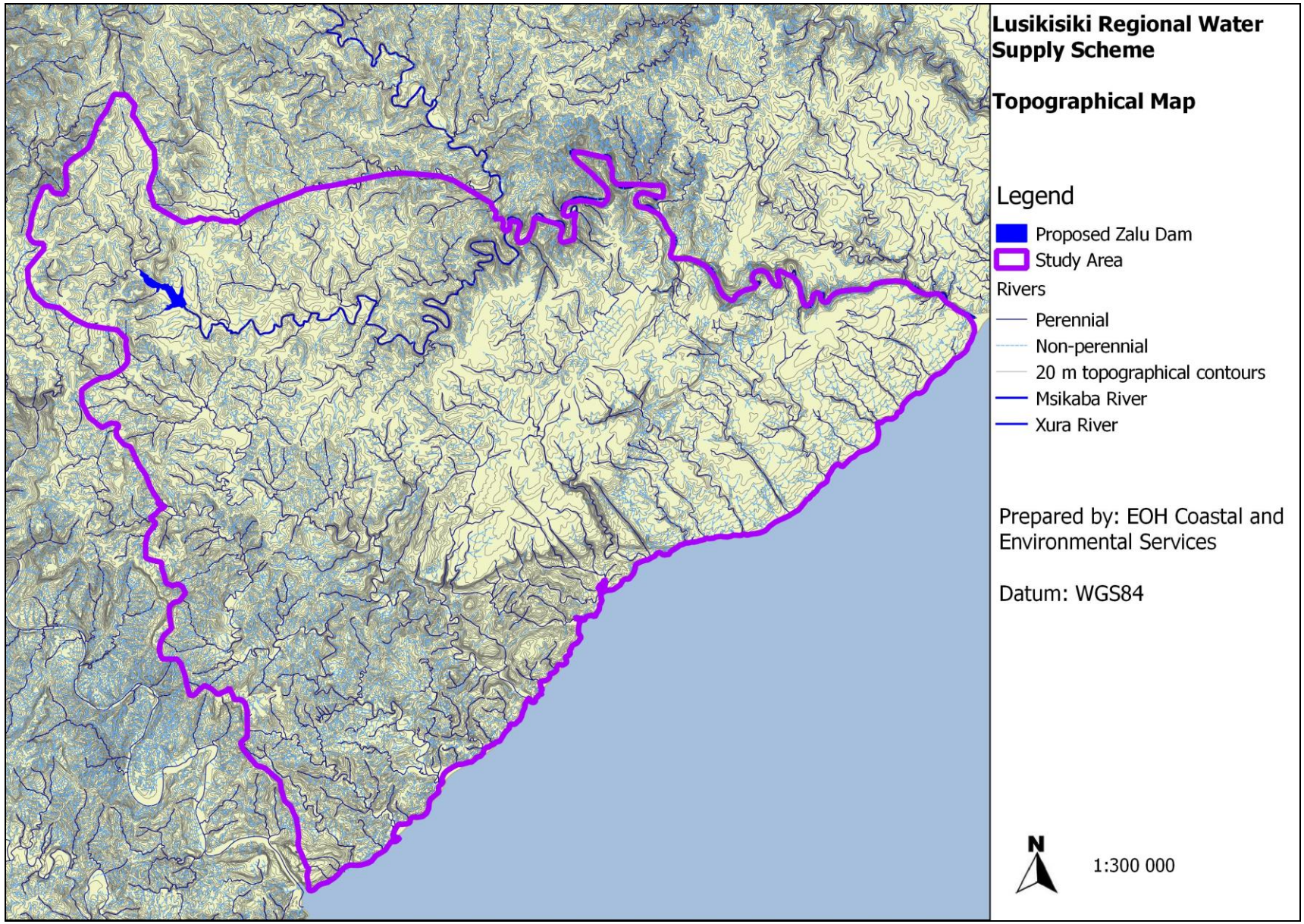


Figure 6-2. The topography of the LRWSS study area.

6.1.4 Geology and Soils

The underlying geology of the general project area can be described as being a combination of hard quartzite rock of the Natal Group Sandstones and tillite, shale, mudstone and sandstone of the Karoo Supergroup. Sedimentary rocks have been intruded by thick dolerite sills (Figure 6-3). The Natal Group Sandstone gives rise to sandy, highly leached and relatively shallow soils which are not suitable for intensive agriculture (Nicolson, 1993). Soils associated with the Karoo Supergroup are characterised as being acidic, leached, heavy soils (Mucina and Rutherford, 2006).

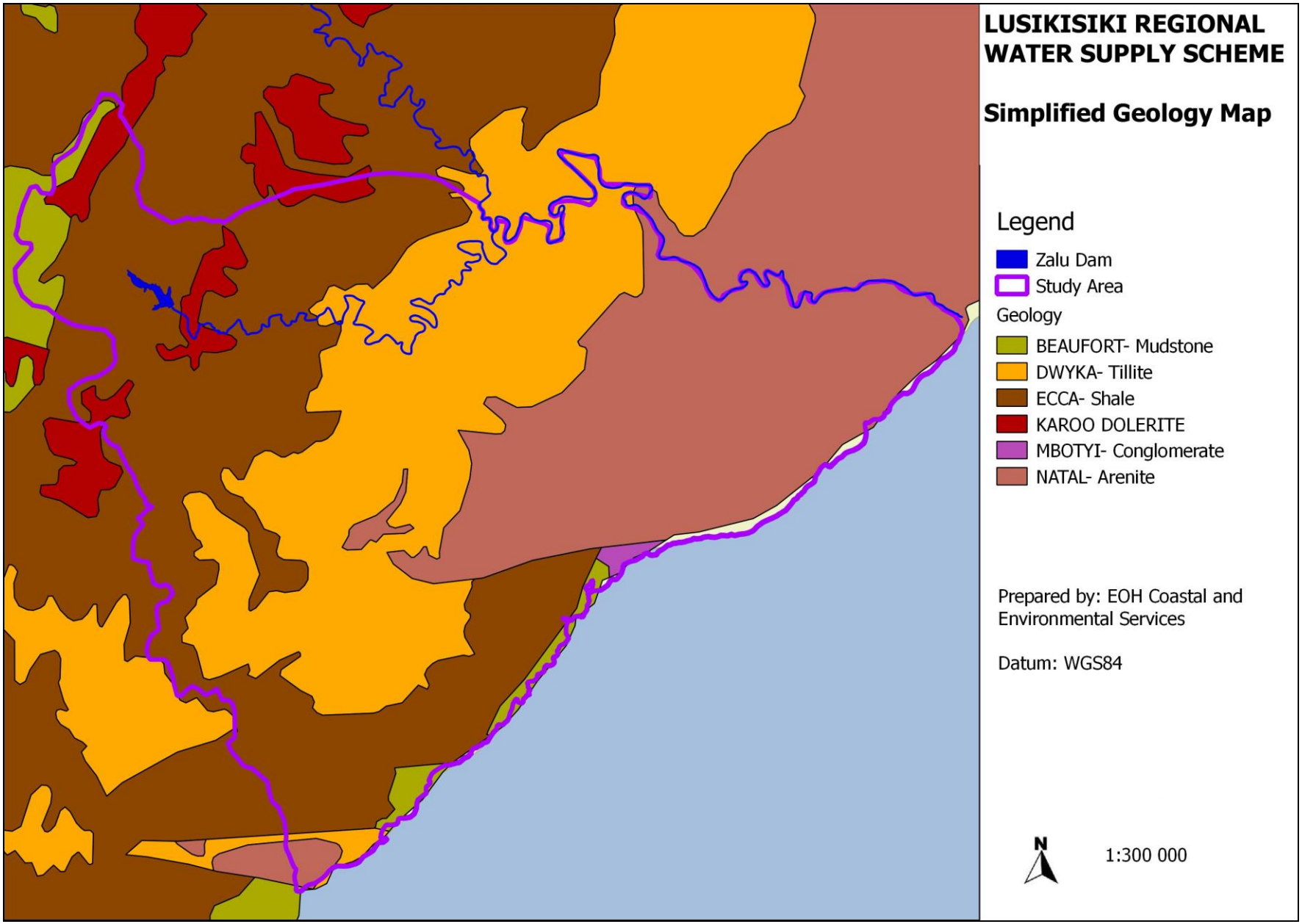


Figure 6-3. The geology of LRWSS study area.

6.1.5 Vegetation of the study area

Mucina and Rutherford

Mucina and Rutherford (2006) have developed the National Vegetation map as part of a South African National Biodiversity Institute (SANBI) funded project: "to provide floristically based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before." The map was developed using a wealth of data from several contributors and has resulted in the best national vegetation map to date, the previous being that of Adcocks developed over 50 years ago. This map forms the base of finer scale bioregional plans such as Sub-tropical Thicket Ecosystem Plan (STEP).

The map and accompanying book describe each vegetation type in detail, along with the most important species including endemic species and those that are biogeographically important and is the most comprehensive data for vegetation types in South Africa.

Mucina and Rutherford (2006) define the following vegetation types that occur within the project area (Figure 6-4):

Midlands Mistbelt Grassland
This vegetation type occurs in KwaZulu-Natal and the Eastern Cape Provinces. It is characterised by a hilly and rolling landscape mainly associated with discontinuous east-facing scarp formed from dolerite intrusions. This vegetation type is dominated by forb-rich, tall sour *Themeda triandra* grasslands that have been transformed by the invasion of *Aristida junciformis* subsp. *junciformis.* Only a few patches of the original species-rich grassland remain. This vegetation type is classified as **Endangered** with a conservation target of 23%. Only 0.5% is statutorily conserved.

No inundation or infrastructure occurs within this vegetation type. The project is therefore unlikely to impact on it.

Ngongoni Veld
Ngonigoni veld occurs in the KwaZulu-Natal and Eastern Cape Provinces from Melmoth in the north to Libode in the former Transkei. It is characterised as being dense, tall grassland dominated by *Aristida junciformis* and a low species diversity. This vegetation type is classified as **Vulnerable** with a conservation target of 25%. Less than 1% is statutorily conserved in the Opathe and Vernon Crookes Nature Reserves. Approximately 39% has been transformed for cultivation, plantations and urban development.

The dam and the majority of the pipelines will be located within this vegetation type and it will therefore be impacted by loss through inundation and vegetation clearing. It is estimated that 171 ha of Ngonigoni Veld could be impacted by the project.

Pondoland-Ugu Sandstone Coastal Sourveld
This vegetation type occurs in both KwaZulu-Natal and the Eastern Cape from Port St. Johns to Port Shepstone. It is characterised by coastal peneplains and gentle undulating hills with flat table-lands and very steep river gorges. This vegetation type is usually rich in grassland species diversity and is punctuated with scattered low shrubs and small trees. The conservation status of this vegetation type is **Vulnerable** with a conservation target of 25%. Only 7% is statutorily conserved in the Mkambati Wildlife Reserve and Marine Sanctuary and Umtamvuna, Mbumbazi and Oribi Gorge Nature Reserves.

This vegetation type may be impacted by a small section of the pipeline.

Transkei Coastal Belt
This vegetation type occurs as a narrow strip along the Wild Coast of the former Transkei in the Eastern Cape. It is characterised as being highly dissected and hilly with alternating steep slopes of low-reach river valleys and coastal ridges. It is comprised of a mosaic of grassland on the higher lying areas such as the hill tops and upper slopes and alternates with bush clumps and small forests. This vegetation type is classified as **Vulnerable** with a conservation target of 25%. Only 1 % is statutorily conserved and 20% has been transformed for cultivation.

This vegetation type may be impacted by a small section of the pipeline.

Scarp Forest
Scarp Forest is found from the Eastern Cape to KwaZulu-Natal, Mpumulanga and Swaziland. This vegetation type occurs as scattered patches of forest often associated with krantzes, scarps and coastal platforms. This vegetation type is usually found at low altitudes of between 50 and 600 m. Scarp Forests generally have a high biodiversity and are structurally diverse, multi-layered forests with well-developed canopy and understory tree layers but a poorly developed herb layer. This vegetation type is classified as **Least Threatened** in protected areas but vulnerable to over exploitation elsewhere. The conservation target is 40% and 20% is statutorily conserved in various reserves. Although not indicated in the SANBI vegetation map, patches of scarp forest were observed within the proposed dam inundation area.

Although the map shows that a very small section of this vegetation type will be impacted on by the pipeline, the groundtruthing study indicated that this patch of forest has been disturbed by the creation of a road and is dominated by a number of alien species, some of which are invasive.

Eastern Valley Bushveld
This vegetation type occurs in KwaZulu-Natal and the Eastern Cape Provinces and occurs in deeply incised valleys of rivers. It is characterised as being a mosaic of semi deciduous savannah woodlands and thickets dominated by succulent species such as *Euphorbia* and *Aloe* species. Eastern Valley Bushveld is classified as **Least Threatened** with a conservation target of 25%. Only 0.8% is statutorily conserved in the Luchaba Wildlife reserve and the Oribi Gorge Nature reserve. 15% has been transformed by cultivation.

This vegetation type is unlikely to be impacted on by the project activities.

Southern Mistbelt Forest
This vegetation type occurs in Kwa-Zulu Natal and Eastern Cape Provinces as forest patches that occur in fire-shadow habitats on south and southeast facing slopes Mucina and Geldenhuys, 2006). This occurs as forest patches of varying size and are characterised as tall (15-20m tall) and multi-layered (having two layers of trees, a dense shrubby understory and well-developed herb layer). This vegetation type is classified as **Least Threatened** with a conservation target of 30%. Eight percent has been statutorily conserved however uncontrolled harvesting and the mismanagement of fire and burning regimes are considered as current major threats.

This vegetation type is unlikely to be impacted on by the project activities.

Subtropical Dune Thicket
Subtropical Dune Thicket occurs in the Eastern Cape and Kwa-Zulu Natal Provinces and is comprised of very dense shrubby thickets of spiny shrubs, large-leaved mega-herbs (such as *Strelitzia nicolai*), dwarfed trees, abundant vines and poorly developed undergrowth. This vegetation type is classified as **Least Threatened** with a conservation target of 20%. Twenty-seven percent is statutorily conserved.

This vegetation type is unlikely to be impacted on by the project activities.

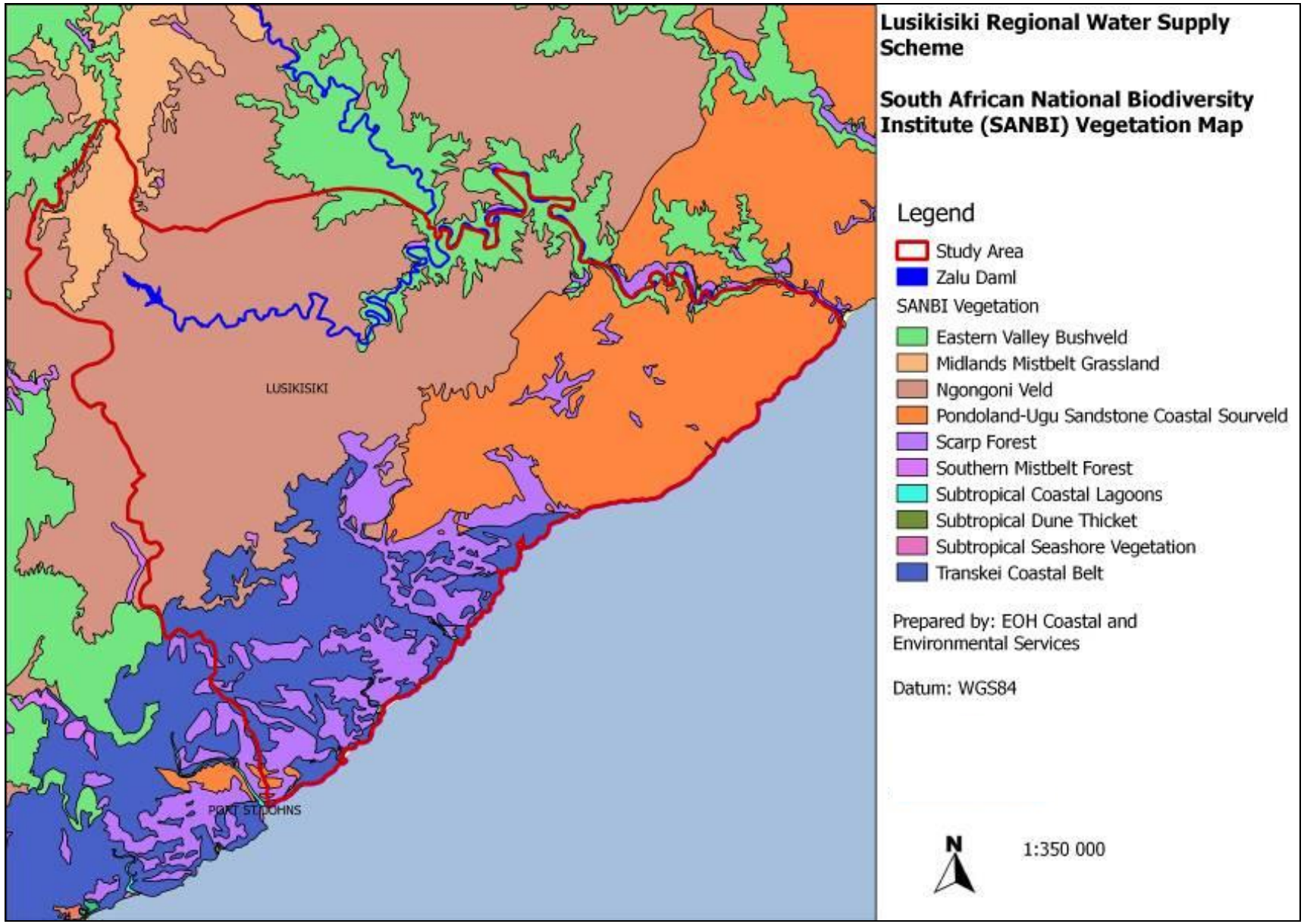


Figure 6-4. SANBI vegetation map of the LRWSS study area.

6.1.6 Floristics

Flora refers to the particular plants that occur in an area, with reference to not only the species which it contains, but also the genera or families. Plants are not evenly distributed, as they are confined to defined geographical ranges, and botanists classify the different ranges of species into regions, referred to as phytogeographic regions. These are very often associated with biophysical features such as geology, aspect, soils, climate and topography. Plants endemic to the Cape region are thus those that form the natural characteristics of the Cape flora and are confined to this region.

White (1983) defined regional centres of endemism as geographical regions with a particular combination of endemic plant species. White's regions (1983) of particular concern in this study area are the Maputuland-Pondoland region, stretching down the coast of south-east Africa and the Afromontane region, which extends down the mountainous areas of Africa into southern Africa.

Species endemic to the area are described by Mucina and Rutherford (2006). In addition to the endemic taxa, a number of protected species were found in the study area. The list of species requiring protection is not complete as many species and taxa require additional study. The taxa with deficient data include specifically members of the *Amaryllidaceae* (Amaryllids), *Iridaceae* (Irises), *Orchidaceae* (Orchids) and *Apocynaceae* (Lianas), as well as members of the genus *Aloe*.

Potential Species of Conservation Concern (SCC) identified on site include all those plants listed in terms of the IUCN, CITES and both national and provincial legislation that may occur in the area of study.

6.1.7 Plant biodiversity and protected species

A total of 97 species were positively identified to occur within the project site. Ngonigoni veld, the dominant vegetation type, typically has a low species diversity. It is therefore not surprising that the number of recorded species was low. Of these 97 species, only three are listed as species of conservation concern (Table 6-1). These three species are all schedule 4 species on the Provincial Nature Conservation Ordinance Act 19 of 1974. The implication is that these species will require a permit for their removal or transplant prior to construction. No protected tree species were observed.

Table 6-1. Plant species of conservation concern in the project area.

Family	Species	IUCN	SA RED LIST	PNCO	Protected Tree list	NEMBA
APOCYNACEAE	*Asclepias cf gibba*	-	Least Concern	Schedule 4	-	-
IRIDACEAE	*Dietes grandiflora*	-	Least Concern	Schedule 4	-	-
IRIDACEAE	*Moraea huttonii*	Least Concern	Least Concern	Schedule 4	-	-

6.1.8 Alien species

There are a number of alien species present within the study area, particularly along drainage lines. Alien species present on site and their category according to the Alien and Invasive Species Regulations (published 1 August 2014) are presented below (Table 6-2). It is advised that an alien invasive management plan is created and implemented during the construction phase and that active clearing of alien species listed as category 1b and 2 in impacted areas is carried out.

Table 6-2. Alien invasive species present on site

Species	Comment
Category 1b	
Agave sp. *Cirsium vulgare* *Tecoma capensis* *Cereus jamacaru* *Opuntia stricta* *Cuscuta campestris* *Acacia cyclops** *Acacia longifolia* *Caesalpinia decapetala* *Senna didymobotrya* *Plectranthus comosus* *Solanum mauritianum* *Solanum eloeagnifolium* *Lantana camara*	1) According to NEM:BA category 1b Listed species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be contained. 2) A landowner upon whose land a Category 1 b Listed Invasive Species occurs and which species is under the landowner's control must: (a) comply with the provisions of section 73(2) of the Act; and (b) contain the listed invasive species in compliance with section 75 (1), (2) and (3) of the Act; 3) If an Invasive Species Management Programme has been developed in terms of regulation 7, a landowner must control the listed invasive species in accordance with such programme. 4) A landowner contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the containment of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in regulation 7.
Category 2	
Acacia dealbata *Acacia mearnsii* *Psidium guajava*	1) Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. 2) Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit. 3) A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit. 4) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme. 5) Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3.
Uncategorised	
Bidens pilosa	Although classified as weed species, these species don't occur on the Alien and

Species	Comment
Taraxacum officinale	Invasive Species Regulations List.
Hypochaeris radicata	
Verbena aristigera	
Verbena bonariensis	

6.1.9 Fauna

Amphibians and Reptiles

Amphibians and reptiles are well represented in sub-Saharan Africa. However, distribution patterns in southern Africa are uneven both in terms of species distribution and in population numbers (du Preez and Carruthers, 2009). Climate, centres of origin and range restrictions are the three main factors that determine species distribution. The eastern coast of South Africa has the highest amphibian diversity and endemicity while reptile diversity is generally highest in the north eastern extremes of South Africa and declines to the south and west (Alexander and Marais, 2010).

Amphibians

Amphibians are important in wetland systems, particularly where fish are excluded or of minor importance. In these habitats, frogs are dominant predators of invertebrates. Reports of declining amphibian populations continue to increase globally, even in pristine protected areas (Phillips 1994). These declines are not simple cyclic events; for example, frogs have been identified as bio-indicator species that reflect the wellbeing of aquatic ecosystems (Poynton and Broadley 1991). Frog abundance and diversity is a reflection of the general health and well-being of aquatic ecosystems. According to historical records, 23 species of frog have been documented in the Quarter Degree Squares that the study area falls in. One of these species is listed as **Endangered** (*Natalobatrachus bonebergi – Boneberg's Frog/ Natal Diving Frog)* and one is listed as **Vulnerable** (*Afrixalus spinifrons* – Natal Banana Frog).

Boneberg's Frog/Natal Diving Frog/ Kloof Frog has a distribution that ranges from Dwesa Nature Reserve in the Eastern Cape Province east to southern and central Kwa-Zulu Natal (SA-FROG, 2012). Its Area of Occupancy is estimated to be 150km^2 (and declining). It occurs in nine locations, all between 50 and 900masl. Its habitat preference is in coastal forests and gallery forests along streams. It is unlikely that this species will occur within the project area as it is too far inland and the level of degradation due to the current land use is likely to preclude this species from the area (Conradie, pers. comm).

The **Natal Banana Frog** is associated with low growing vegetation in shrubland and dry forest and breeds in vleis (including dams) and temporary pools and dams (SA-FROG, 2012). It creates egg nests on emergent vegetation within these areas. This species is endemic to South Africa and occurs as two subspecies. *A.s. spinifrons* occurs in the Kwa-Zulu Natal lowlands and the Eastern Cape coast of South Africa at low to intermediate altitudes. Based on habitat preference and distribution it is likely that this species will occur within the project area.

Reptiles

South Africa has 350 species of reptiles, comprising 213 lizards, 9 worm lizards, 105 snakes, 13 terrestrial tortoises, 5 freshwater terrapins, 2 breeding species of sea turtle and 1 crocodile (Branch, 1998). Of those 350 reptile species, the Eastern Cape is home to 133 which include 21 snakes, 27 lizards and eight chelonians (tortoises and turtles). The majority of these are found in Mesic Succulent Thicket and riverine habitats. Consultation of the Animal Demography Unit historical records indicates that 37 species of reptiles are likely to occur in the project site. One of these (Bradypodion caffer – Pondo Dwarf Chameleon) is classified as **Endangered** and one is listed as **Vulnerable** (Bradypodion melanocephalum – KwaZulu Dwarf Chameleon) (SARCA 2014). Dwarf chameleons usually occur in isolated populations within small patches of suitable habitat.

Birds

Nine bird species are endemic to South Africa, but there are no Eastern Cape endemics. However, there are 62 threatened bird species within the Eastern Cape Province (Barnes, 2000). Most of these species occur in grasslands or are associated with wetlands, indicating a need to conserve what is left of these ecosystems (Barnes, 2000). Historical records indicate that there are three **Endangered** species, eight **Vulnerable** species and eight **Near Threatened** species likely to occur in the project area (Table 6-3).

Three Southern Ground Hornbills (*Bucorvus leadbeateri)* were noted on a site visit at an abandoned house located directly above the planned inundation area and eleven Cape Vultures (*Gyps coprotheres)* were counted soaring over the inundation area. It is likely that the Hornbills have a roost in the immediate area however Cape Vultures have colony roosts and can fly long distances in search of carrion. Their presence is therefore not indicative of a nearby roost. Migratory birds may not have been observed at the time of the site visit, therefore species absence as reported in this study is not definitive.

Table 6-3. Threatened bird species that are likely to occur in the project area (BirdlifeSA, 2012).

Scientific Name	Common name	Red List status	NEM:BA	Noted on Site
Balearica regulorum	Grey Crowned Crane	Endangered	Endangered	
Zoothera guttata	Natal Thrush	Endangered	-	
Campethera notata	Knysna Woodpecker	Near Threatened	-	
Neotis denhami	Denham's Bustard	Near Threatened	Protected	
Polemaetus bellicosus	Martial Eagle	Near Threatened	-	
Coracias garrulus	European Roller	Near Threatened	-	
Phalacrocorax capensis	Cape Cormorant	Near Threatened	-	
Puffinus griseus	Sooty Shearwater	Near Threatened	-	
Stephanoaetus coronatus	Crowned Eagle	Near Threatened	-	
Bradypterus sylvaticus	Knysna Scrub-Warbler	Near Threatened	-	
Bucorvus leadbeateri	Southern Ground-hornbill	Near Threatened	-	X
Geronticus calvus	Southern Bald Ibis	Near Threatened	Vulnerable	
Gyps coprotheres	Cape Vulture	Near Threatened	Endangered	X
Morus capensis	Cape Gannet	Near Threatened	-	
Procellaria aequinoctialis	White-chinned Petrel	Near Threatened	-	
Circus maurus	Black Harrier	Vulnerable	-	

Scientific Name	Common name	Red List status	NEM:BA	Noted on Site
Sagittarius serpentarius	Secretary Bird	Vulnerable	-	

Mammals

Large game makes up less than 15% of the mammal species in South Africa and a much smaller percentage in numbers and biomass. In developed and farming areas, this percentage is greatly reduced, with the vast majority of mammals present being small or medium-sized. The conservation status of South African mammals has recently been re-assessed and a number of species have been downgraded, for example, the African wild cat, Aardvark, Blue duiker, and Honey badger are no longer considered threatened.

It is unlikely that there are any large mammals remaining in the project area. Mammals that still occur in the area are likely to be limited to small (e.g. rodents) and the occasional medium sized animals such as duiker in forest patches.

6.1.10 Conservation and Spatial Planning Tools

Several conservation planning tools are available for the area. These tools allow for the determination of any sensitive and important areas from a vegetation and faunal perspective.

The tools used are outlined in Table 6-4 below.

Table 6-4. Conservation and planning tools considered for the proposed Lusikisiki Regional Water Supply Scheme

Tool	Motivation	Relevancy
Protected Areas	Protected areas are areas that are already conserved. The study area lies adjacent to the Mkambati Nature Reserve and the Pondoland Marine Protected Area	**Not relevant.** The study site lies adjacent to the Mkambati Nature Reserve and the Pondoland Marine Protected Area (Figure 6-5). The project infrastructure and activities will not impact on either protected area.
National Protected Areas Expansion Strategy (NPAES)	A National Spatial Biodiversity Assessment was conducted in 2004, revealing a lack of protection for a representative sample of the country's biodiversity, and poor conservation of adequate process areas. The Protected Areas Expansion Strategy allows for increased conservation of these aspects of the country in order to meet national biodiversity targets. The study area falls within a section of the Pondoland focus area.	**Relevant.** Although a few of the southern sections of the pipelines will impact on a small section of the Pondoland NPAES, this infrastructure is unlikely to contribute to further degradation since it follows existing roads and is therefore located in areas that are already severely degraded from an ecological perspective. (Figure 6-5).
National Freshwater Ecosystem Priority Areas (NFEPA)	The National Freshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas, or 'FEPAs'.	**Relevant**. A portion of the Xura river (Figure 6-6) as well as the Xurana River are classified as an Upstream Management Area (areas in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas) and a portion of the Xura River is classified as a Fish Support Area (includes sub-quaternary catchments

Tool	Motivation	Relevancy
		that are important for migration of threatened or near-threatened fish species). The Mntafufu, Msikaba and Mateku rivers are classified as FEPAs.
National Wetlands Inventory	Wetlands are very important aspects of the ecosystem as they are process areas. Not only do they form habitat for both flora and fauna, they also perform vital ecosystem functions. It is for this reason that wetlands are always rated with a high sensitivity and should be conserved. Wetlands in South Africa have been mapped on a broad-scale by various stakeholders and have been included in the National Freshwater Ecosystem Priority Assessment (NFEPA, 2011).	**Relevant.** There are a number of potentially impacted wetlands in the project area and three in the dam inundation area (Figure 6-7). None of these wetlands have been classified as FEPA wetlands.
National List of Ecosystems that are Threatened and in need of Protection. (NEMBA, Act 10 of 2004)	The National Environmental Management: Biodiversity Act provides a list of threatened terrestrial ecosystems. This has been established as little attention has historically been paid to the protection of ecosystems outside of protected areas. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems.	**Relevant**. There are a number of patches of vegetation classified as threatened that fall within the study area (Figure 8-2). However, as with the impact on NPAES areas, the pipelines are in areas that are already severely degraded. The inundated area is located within a threatened ecosystem and although the vegetation that occurs here is widespread and very few species of conservation concern were identified, this area will still be lost when the area inundated (Figure 6-8).
The Eastern Cape Biodiversity Conservation Plan (ECBCP)	The Eastern Cape Biodiversity Conservation Plan (ECBCP) is responsible for mapping areas that are priorities for conservation in the province, as well as assigning land use categories to the existing land depending on the state that it is in (Berliner et al. 2007). Critical Biodiversity Areas (CBAs) are defined as "terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning". Table 6-5 and 6-6 illustrates the CBA categories.	**Relevant.** The inundation area falls within a terrestrial CBA 2 area and the pipelines fall within terrestrial CBA 1 and CBA 2 areas. The study area falls within an estuary CBA 1 area (Figure 6.9 and 6.10). The site survey indicates that the study area is degraded and that areas classified as CBA 1 and 2, where project infrastructure will have an impact, are in poor condition and generally overgrazed.

Table 6-5. Terrestrial Critical biodiversity Areas and Biodiversity Land Management Classes as described by the Eastern Cape Biodiversity Conservation Plan.

CBA map category	Code	BLMC		Recommended land use objective
Protected areas	PA1	BLMC 1	Natural landscapes	Maintain biodiversity in as natural state as possible. Manage for no biodiversity loss.
	PA2			
Terrestrial CBA 1 (not degraded)	T1			
Terrestrial CBA 1 (degraded)	T1	BLMC 2	Near-natural landscapes	Maintain biodiversity in near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted.
Terrestrial CBA 2	T2			
	C1			
	C2			
Other natural areas	ONA T3	BLMC 3	Functional landscapes	Manage for sustainable development, keeping natural habitat intact in wetlands (including wetland buffers) and riparian zones. Environmental authorisations should support ecosystem integrity.
	ONA			
Transformed areas	TF	BLMC 4	Transformed landscapes	Manage for sustainable development.

Table 6-6. Aquatic Critical Biodiversity Areas as described by the Eastern Cape Biodiversity Conservation Plan.

ABLMC	CBA Code	Description of CBAs	ABLMC Transformation Threshold
ABLMC 1	CBA1	Critically important river sub-catchments; Priority primary catchments for E1 estuaries	Less than 10 % of total area of sub-quaternary catchment
ABLMC 2a	CBA2	Important sub-catchments, Primary catchment management areas for E2 estuaries.	Less than 15 % of total area of sub-quaternary catchment
ABLMC 2b	CBA3	Catchments of free flowing rivers important for fish migration	Less than 20 % of total area of sub-quaternary catchment

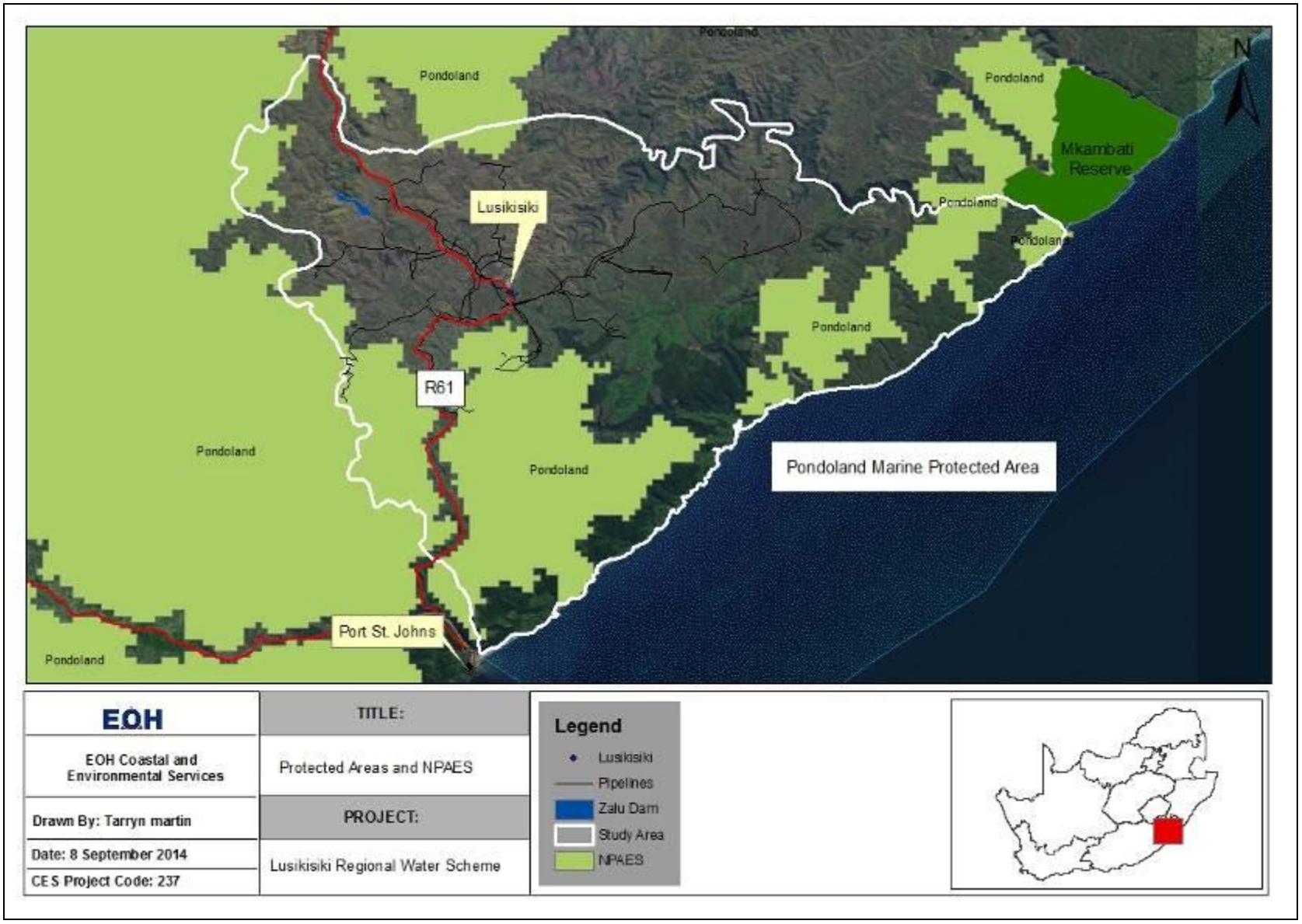


Figure 6-5. Terrestrial Protected Areas, Marine Protected Areas (MPA) and Expansion Strategy Areas that occur within and near the project study area.

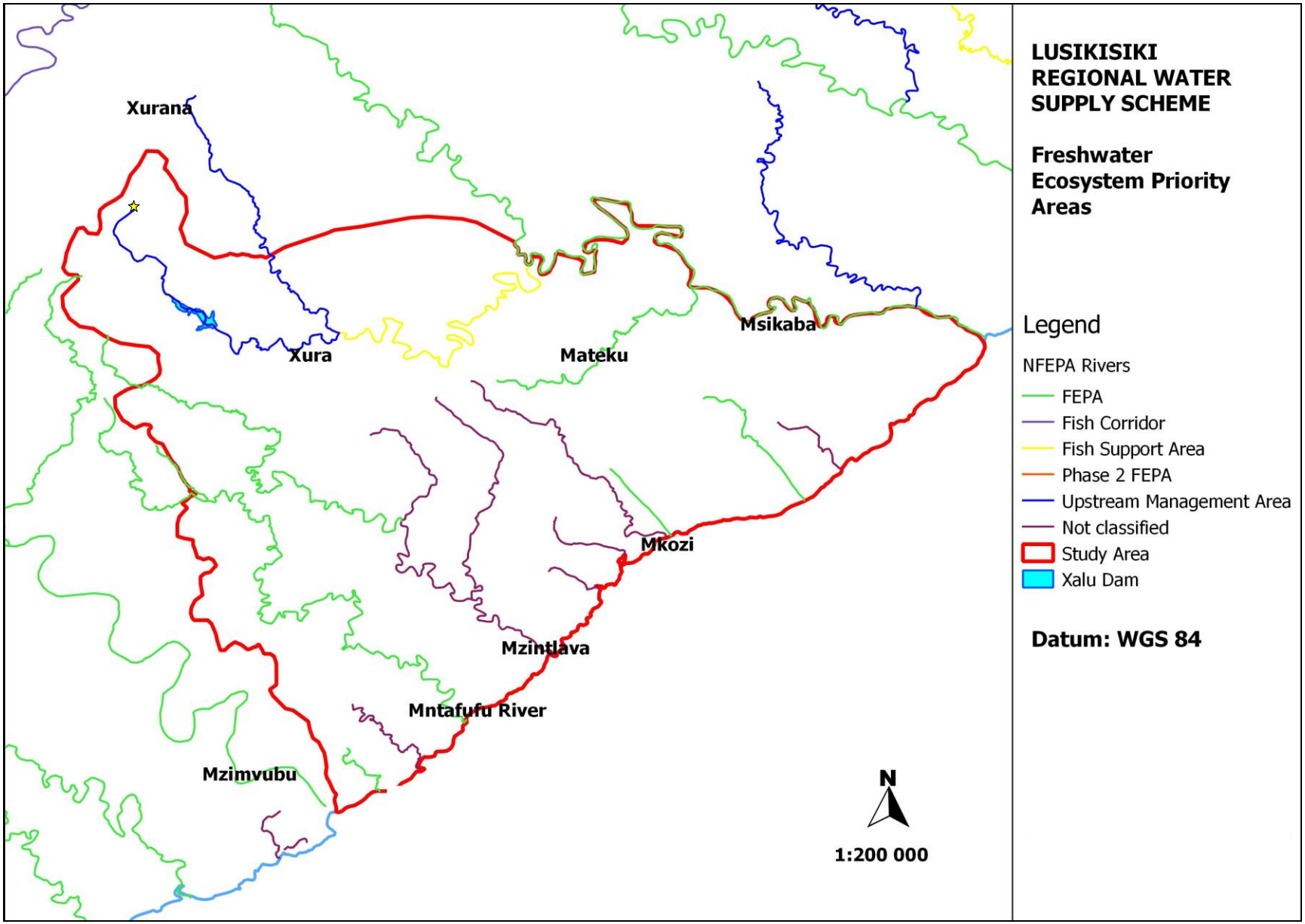


Figure 6-6. NFEPA rivers in the LRWSS project area.

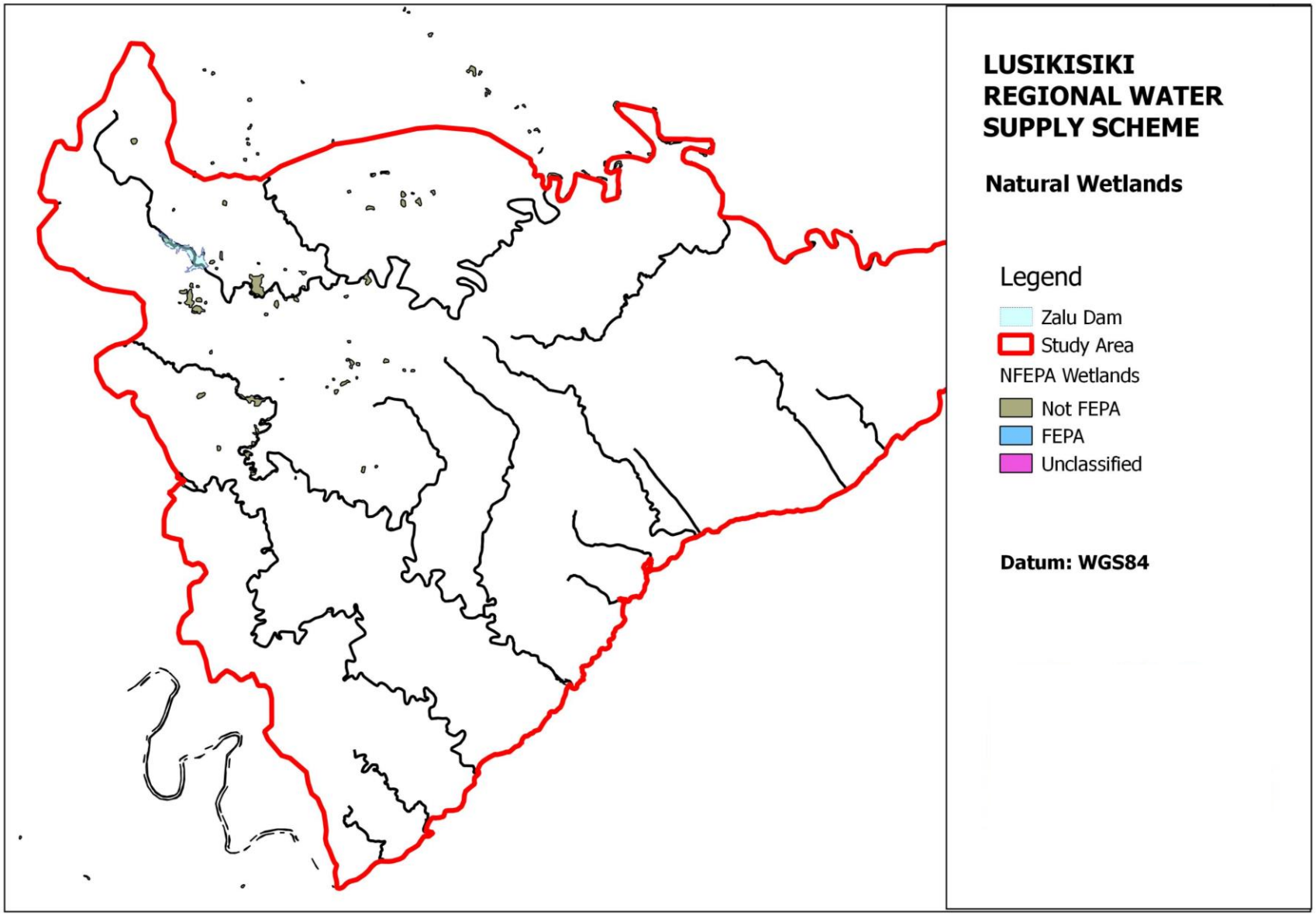


Figure 6-7. NFEPA wetlands in the project area.

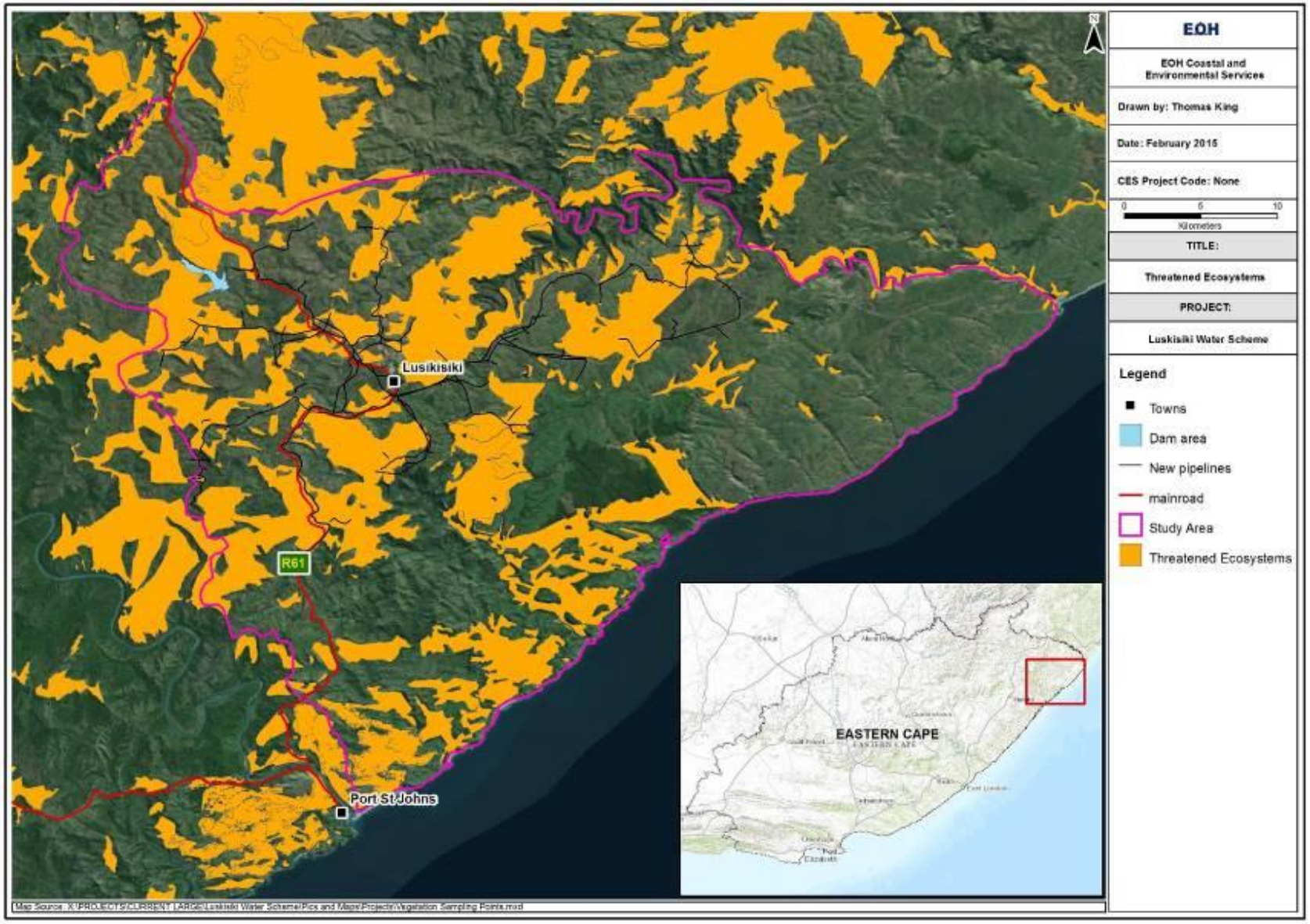


Figure 6-8. Threatened ecosystems found within the study area.

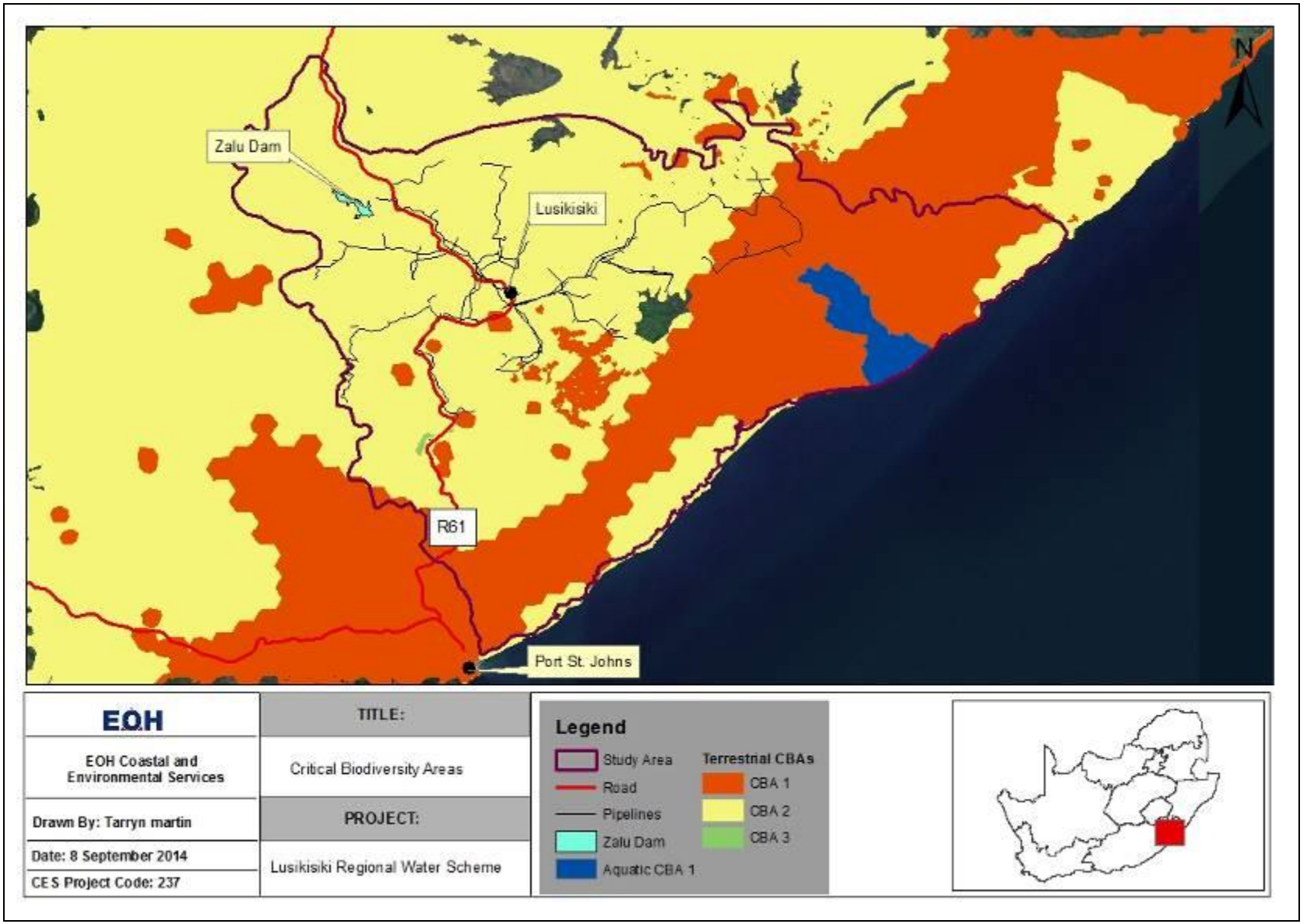


Figure 6-9. Terrestrial Critical Biodiversity Areas found within the study area.

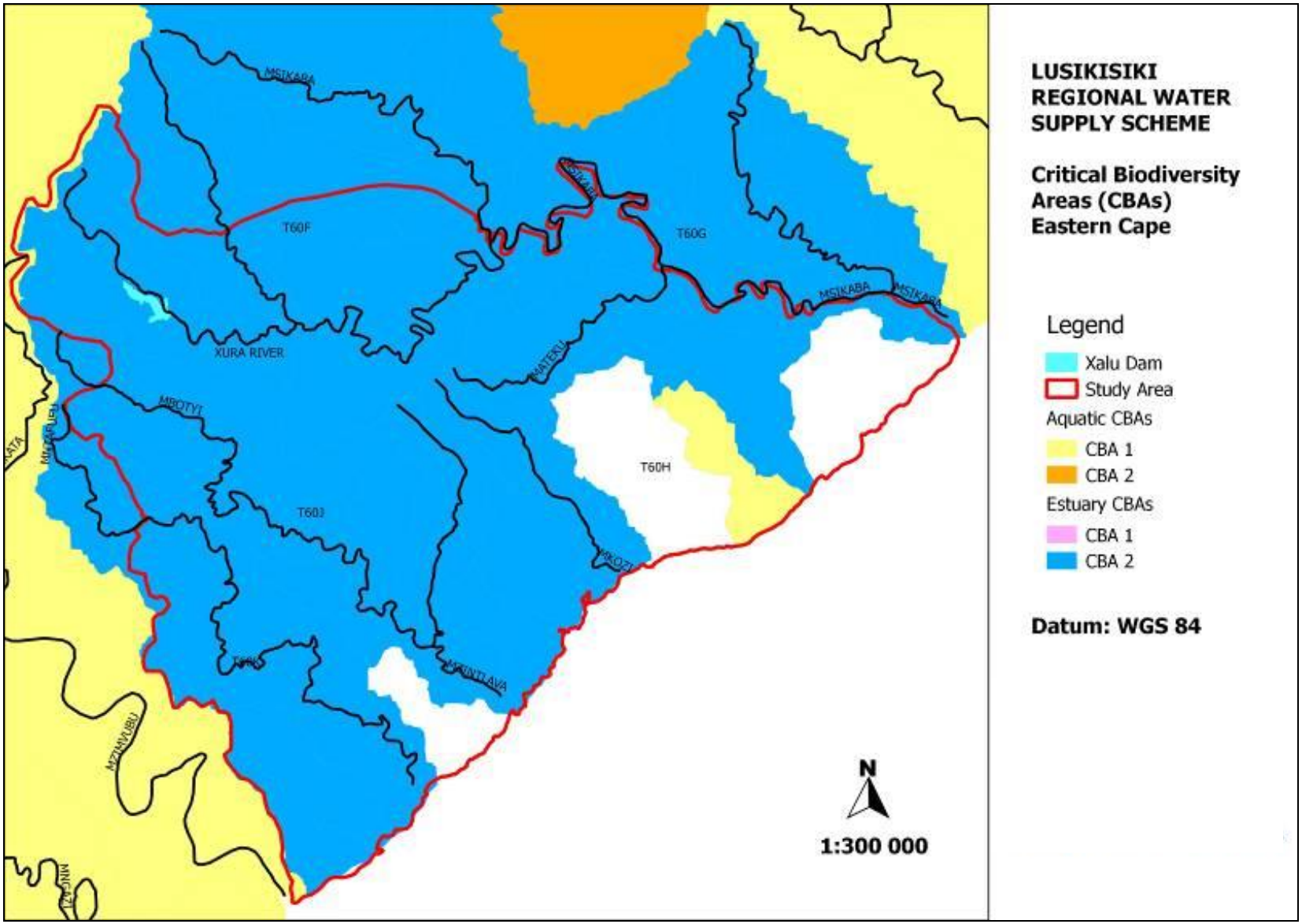


Figure 6-10. Aquatic Critical Biodiversity Areas found within the study area.

6.1.11 Socio- economic Environment

The proposed water supply scheme affects a number of wards in the IHLM and PSJLM, this section focuses largely on the socio-economic context of only the directly affected wards in both these municipalities as detailed socio-economic indicators for these specific wards would reflect a more accurate setting of the current conditions surrounding the proposed LRWSS. The "project area" referred to consists of wards 4,12,13,14,15,16,17,18,19,20,21,22,23 and 24 in the IHLM and wards 13,14,15,19 and 20 in the PSJLM.

Data at ward level was obtained from StatsSA (2011), and information supplemented by the IDP of the IHLM (2014-2015) and ORTDM (2012-2016). The section has also been informed by primary data obtained through discussions with the municipality, one-on-one interviews, as well as focus groups held with representatives from the Project Affected Communities (PACs).

Demographic Overview

The vast majority of the population in the project area is classified as Black African (99%) while all other races combined are less than 1% (Figure 6-11). This may be largely attributed to the fact that this area is a former homeland (Transkei) and therefore still remains largely populated by blacks. The majority of the population is female at 54%, while males constitute 46%.

According to StatsSA (2011) 44.5% of the population in the project area are 15 years or younger, while 50.3% are in the 15-64 year age bracket. Senior citizens above the age of 64 years constitute 5.2% of this population.

There seems to be an out-migration of economically active people in the age group of 20-34 years. This highlights the need for economic investment in order to retain an active workforce and a healthy male-to-female ratio in the area. According to the IHLM IDP, the "high number of young people… leaving the area… suggests that service provision and social upliftment should be targeted at the youth and should be an important consideration for development." (IHLM IDP Review, 2014-2015). The reasons for such migration can be attributed to a number of factors such as:

- The absence of tertiary educational institutions;
- Promises of better living and working conditions elsewhere;
- Poorly developed rural areas; and
- The poverty context and high unemployment levels.

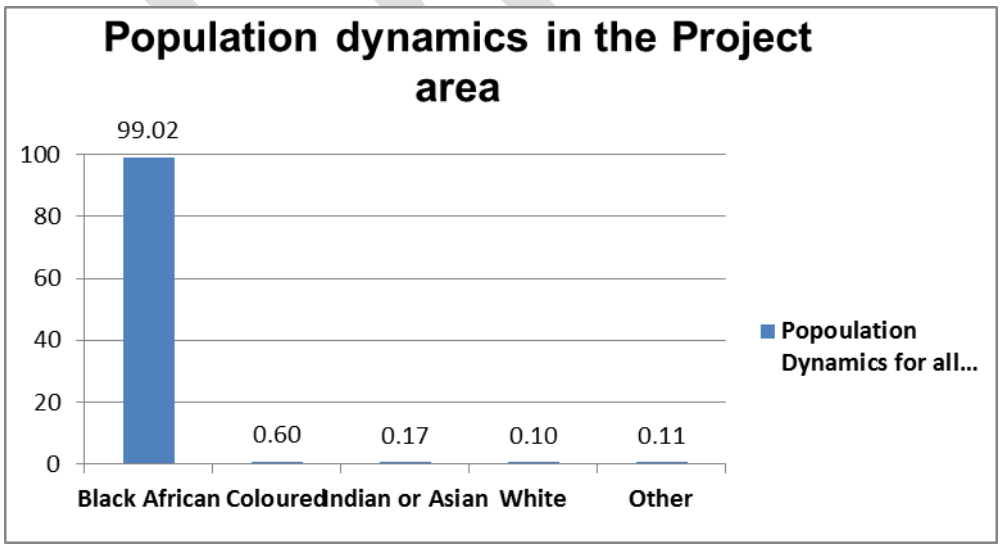


Figure 6-11. Population dynamics for the affected wards.

In addition to migration patterns, the largest issue with regards to population dynamics is the prevalence of HIV/AIDs. This disease, apart from creating large strain on health and community support services, can also cripple the local economy. A survey of antenatal HIV prevalence conducted in ORTDM indicates that as of 2012, approximately 30% of the survey participants were HIV positive. The incidence of the disease recorded in the economically active age groups (estimated in this study to range from 20-39 years old) was 73.1%, although an alarming 24.1% of the surveyed women younger than 19 are also HIV positive. This means that the majority of HIV victims, and 22% of the antenatal group surveyed, may not be economically active.

According to the IHLM Annual Report (2008), however, the HIV/AIDS prevalence in the local municipality was 20.2%. The source of this information is not provided, but these values indicate that HIV/AIDs prevalence is significantly lower than the surrounding municipalities in the ORTDM.

Employment

Only 7% of the people within the project area are economically active/employed, most of which are employed within the government sector (Figure 6-12). This status is indicative of a collapsed economy which will require large-scale investment intervention to stimulate economic sectors.

According to the IHLM IDP the IHLM is the second highest contributor to the ORTDM's GGP, after King Sabata Dalindyebo Local Municipality, and accounts for 9.4% GGP contribution to the District Municipality (IHLM, 2006). The government sector makes a significant contribution to the IHLM GGP of the municipality with a total contribution of 56%, followed by wholesale (8.7%), retail (7.8%) and agriculture & hunting at 7.4%. The remaining sectors have a contribution of less than 5% each which hampers the economic growth of the area.

Ironically it is the sectors that are making the smallest contribution that have the highest potential to improve the local economy. For example, the agricultural sector which should be the dominant sector in the municipality is declining. The decline in agricultural output has several implications for the economy. It indicates that the IHLM depends almost entirely on imports of basic food stuffs. This also results in loss of employment opportunities that could be created by this sector.

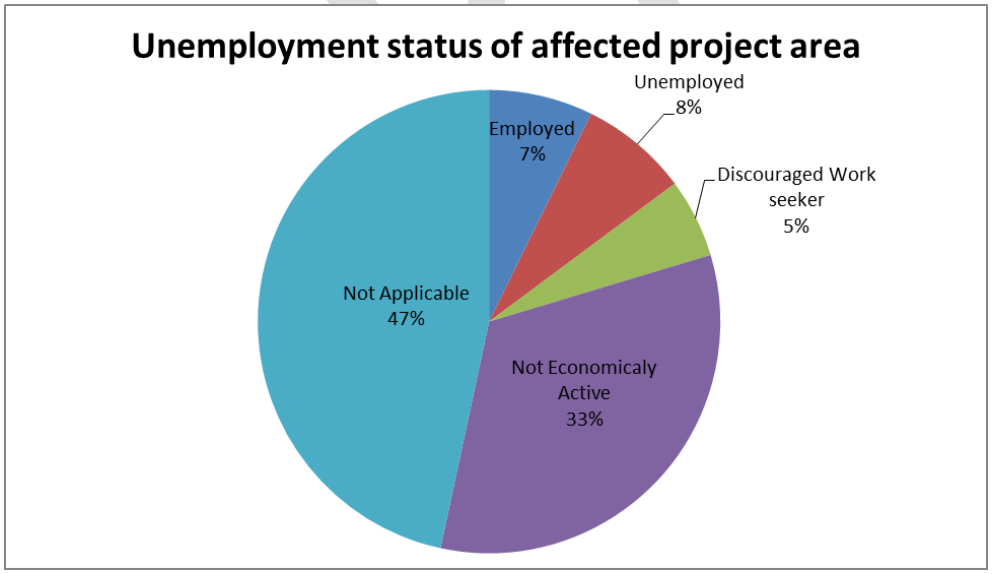


Figure 6-12: Unemployment status of the project area.

Figure 6-12 represents the unemployment status of the population in the project area. The majority of this population is 15 years or younger (47%) and thus may attribute to the large percentage of the population falling under the 'not applicable' category. Only 7% of the population is employed, implying that this area may have a low standard of living. Many (33%) are not economically active which suggests a high dependency on social grants.

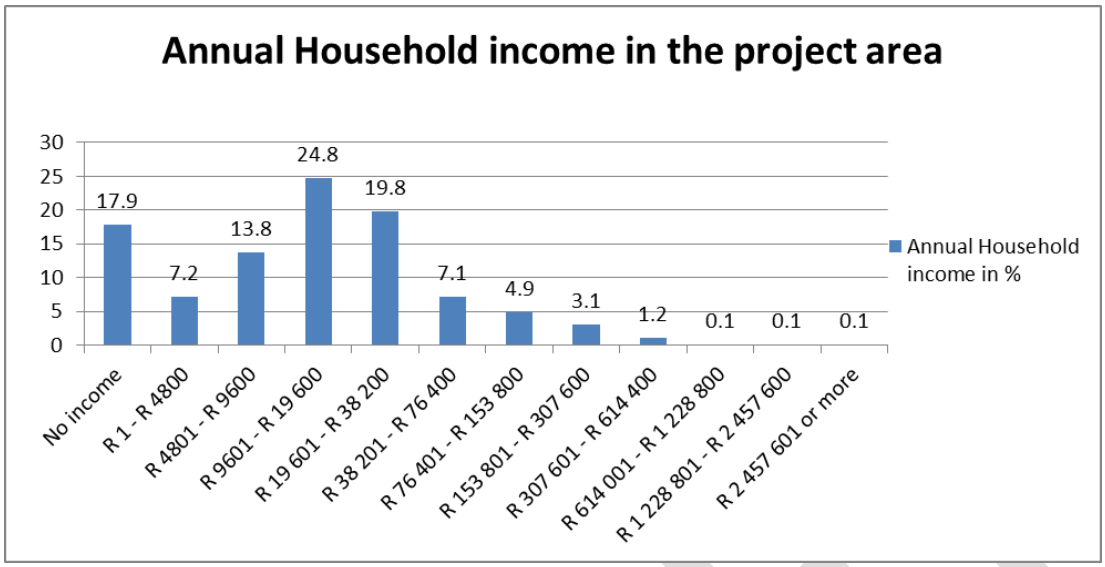


Figure 6-13: Annual household income in the project area (StatsSA, 2011)

The bulk of the households in the project area (58.4%) receive between R4,801- R38,200 per year (Figure 6-13). While almost 18% of the household receive no income at all. Very few households (only 1.45%) receive more than R307, 601 per year (or R25 633 per month). Baseline data generated from interviews indicates that items such as food, electricity, healthcare and school-related expenses (uniforms and books, for example) were the households' largest monthly expenses.

Land use and households

All the affected wards are based in the former Transkei. As a result the vast majority of the land is zoned as traditional land at 93.6%. Approximately 0.1% of the land is classified as farms and 3.8% is zoned as "urban". According to StatsSA (2011) 1.2% of the population in the project area occupy informal dwellings. Due to the rural nature of the municipality the majority of the population live in traditional dwellings (56%).

The majority of the population (62%) in the project area own fully paid houses and 9% are still paying for their homes. About 8% of the population live in rent houses and approximately 15% occupy houses rent free. The average household in the project area is occupied by 4.7 people and approximately 60% of households are female-headed. In light of the area's limited economic opportunities, many of these female-headed households are reliant on social grants to make ends-meet.

Education

The level of education in the project area is very low. The majority (35.7%) of the population have some primary school education. Only 6.8% of the population have completed secondary school and a mere 2.6% of the population have education higher than matric. This can be attributed to lack of higher educational institutions within the municipality. According to the IHLM IDP when comparing the levels of education across the municipalities, a strong correlation with household incomes, high unemployment and a low human development index can be demonstrated.

Water

According to StatsSA (2011), an alarming percentage of the population in the project area have no access to piped water (61.28%). While this figure has dropped in the past decade, this remains a serious challenge in the area. Figure 6-14 shows access to different sources of water within the project area.

There are number of rivers running through the project area, which extends from the Mzimvubu River in the south-west to the Msikaba River in the north-east. There are other rivers within the project area such as Xura where the Zalu dam will be located. Most of the communities within the project area receive water from natural sources especially rivers, springs and boreholes.

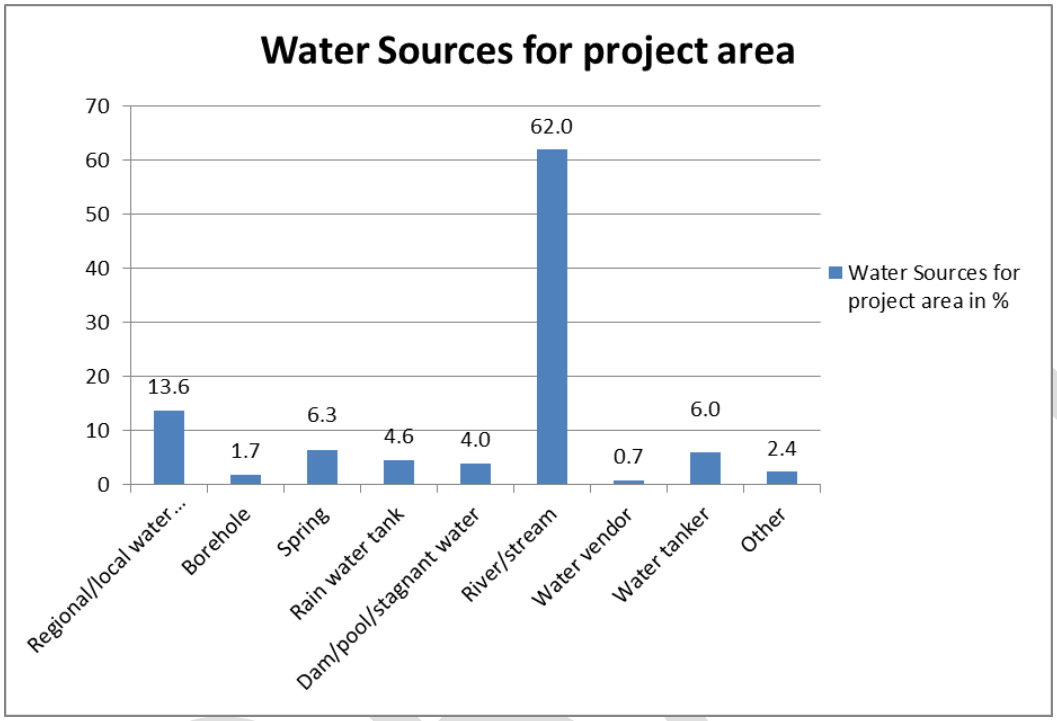


Figure 6-14: Sources of water for the project area.

Clearly, there is a need to provide not only potable water services to more households within the area, but also to assist the municipalities with sustainable and clean water provision. At present, the ORTDM has a number of water schemes under its area of jurisdiction. In order to deal with the need for water supply, boreholes are used in some areas.

Roads

IHLM is traversed by the R61 which links Port St Johns to Durban. This road runs through the commercial centres of the municipality which are Lusikisiki and Flagstaff, and is also a link with Mthatha, the main city in the ORTDM. In most cases this road is not fenced. The road is not adequately maintained resulting in a gradual decline in the quality and safety. The majority of the smaller, rural access roads in the project area are poorly-maintained gravel roads that have no road markings or signs. There is a serious problem of vehicle-livestock collisions on most of the roads in the project area, especially along the R61. The majority of the population are pedestrians. A small proportion of the population makes use of buses, minibus taxis and private cars for transport.

Electricity

Approximately 77% of the households of IHLM have access to RDP standards of electricity. In spite of this, 42% and 58% of the households in the project area still make use of wood for cooking and heating purposes, respectively. Paraffin is commonly used, but to a lesser degree, 8% and 12% for cooking and heating, respectively. It is interesting to note that currently more use of electricity is made from cooking purposes than wood. Electricity is used by 75% of the households in the project area for lighting, whilst candles are used by the remainder of the population (23%). Additional, but little used energy sources include gas, solar, coal and animal dung.

Sanitation and refuse removal

Sanitation (water borne) and refuse removal services in the project area is not undertaken and in both IHLM and PSJLM is limited to the major towns. According to StatsSa only 2% of the population in the project area have flush toilets and a further 12% use chemical toilets. As shown in Figure 6-15, 12% of the population have no access to sanitation services. The majority of the population use pit toilets without ventilation (38%) (Figure 6-15).

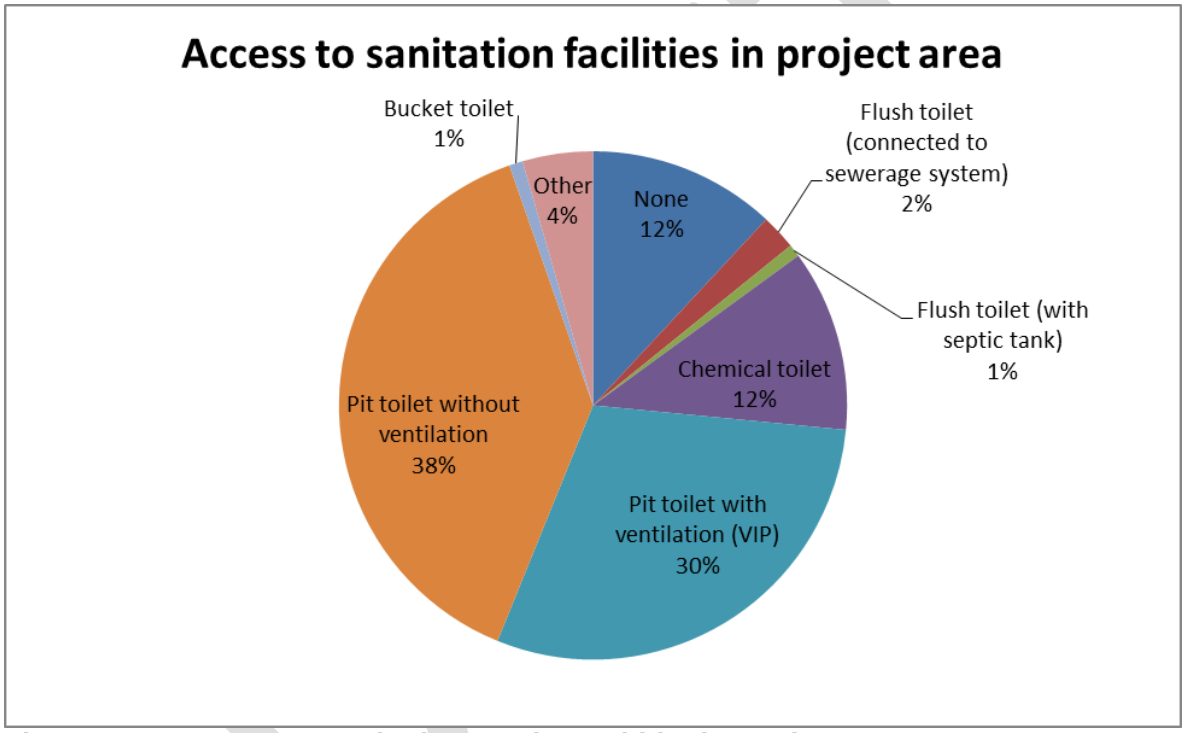


Figure 6-15: Access to sanitation services within the project area.

Refuse removal is limited to major towns and surrounding townships in the municipalities. According to StatsSA only 2.4% of the population in the project area have refuse collected weekly and a further 0.5% get refuse collected less often (Figure 6-16). The majority of the population (77.6%) dispose refuse in their own dumps. In all the villages interviewed, it was noted that they either burn their waste or dig a pit for use as a dump site.

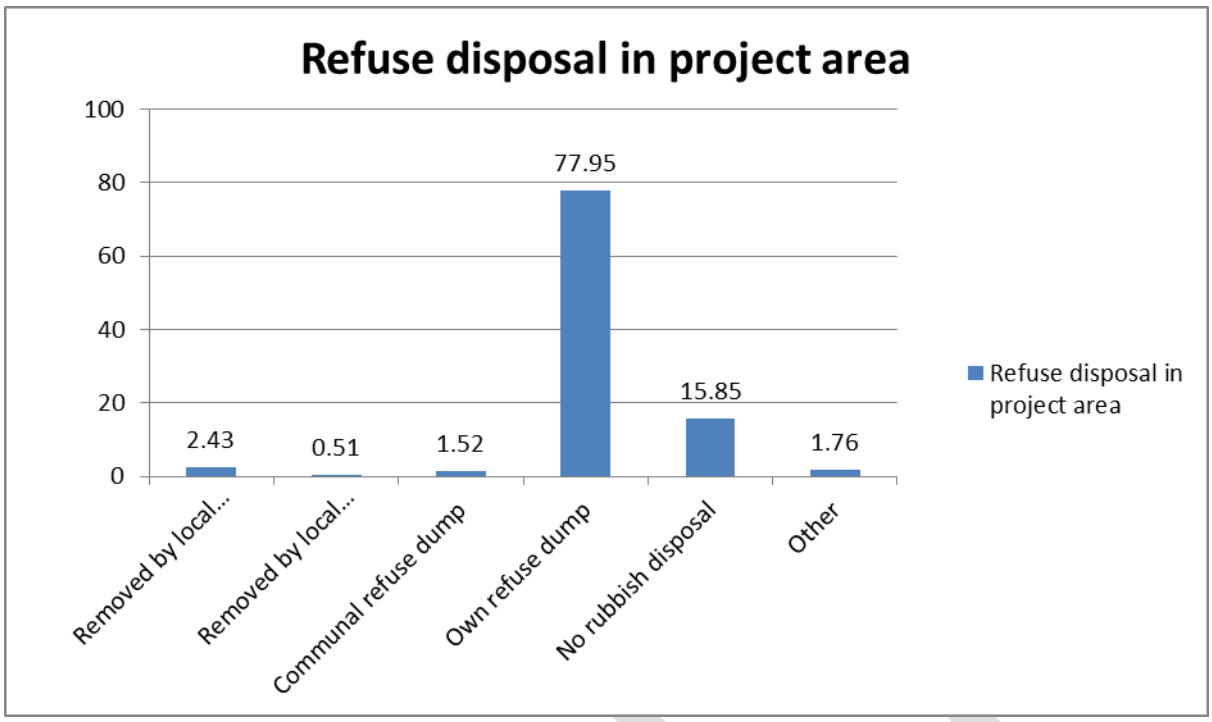


Figure 6-16: Refuse disposal in the project area.

7 APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(h) An indication of the methodology used in determining the significance of potential environmental impacts.

In line with the above-mentioned legislative requirement, this chapter of the LRWSS EIR details the approach to the EIA phase of the proposed water supply scheme with a particular focus on the methodology that was used when determining the significance of potential environmental impacts.

7.1 General Impact Assessment

A general impact assessment was conducted based on site visits and information relating to the construction and operation of the proposed water supply scheme.

7.2 Specialist Impact Assessments

A series of specialist studies were conducted during the EIA and the outcomes will be summarised in this EIR. The team of specialists that conducted the specialist studies were required to assess the foreseeable impacts of the proposed project from all possible angles and also to address the issues raised by I&APs in their reports by gathering baseline information and identifying the possible impacts related to the proposed project. Mitigation measures for impacts were also provided. Specialist studies undertaken for the EIA:

- Ecological Impact Assessment
- Aquatic Impact Assessment
- Paleontological Impact Assessment
- Heritage Impact Assessment
- Social Impact Assessment
- Visual Study

The detailed specialist studies have been compiled into a separate Specialist Volume (Appendix C of the EIR). The details and expertise of each of the specialists as well as signed declarations of their independence are also included in the Specialist Volume and are therefore not repeated here.

7.3 Methodology for Assessing Impacts and Alternatives

7.3.1 Introduction

Identified impacts will be assessed against the following criteria:

- Temporal scale
- Spatial scale
- Risk or likelihood
- Degree of confidence or certainty
- Severity or benefits
- Significance

The relationship of the issue to the temporal scale, spatial scale and the severity are combined to describe the overall importance rating, namely the significance of the assessed impact.

7.3.2 Description of criteria

Table 7-1: Significance Rating Table

Significance Rating Table	
Temporal Scale (The duration of the impact)	
Short term	Less than 5 years (Many construction phase impacts are of a short duration).
Medium term	Between 5 and 20 years.
Long term	Between 20 and 40 years (From a human perspective almost permanent).
Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.
Spatial Scale (The area in which any impact will have an affect)	
Localised	Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
Study area	The proposed site and its immediate environs
Municipal	Impacts affect either Ingquza Hill/Port St Johns, or any towns within them.
Regional	Impacts affect the wider district municipality or the province as a whole.
National	Impacts affect the entire country.
International/Global	Impacts affect other countries or have a global influence.
Likelihood (The confidence with which one has predicted the significance of an impact)	
Definite	More than 90% sure of a particular fact. Should have substantial supportive data.
Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.

Table 7-2 Impact Severity Rating

Impact severity **(The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party)**	
Very severe	Very beneficial
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.
Severe	Beneficial
Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy.
Moderately severe	Moderately beneficial
Medium to long term impacts on the affected system(s) or party (ies), which could be mitigated. For example constructing a sewage treatment facility where there was vegetation with a low conservation value.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality.
Slight	Slightly beneficial
Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.
No effect	Don't know/Can't know
The system(s) or party(ies) is not affected by the proposed development.	In certain cases it may not be possible to determine the severity of an impact.

Table 7-3 Overall Significance Rating

Overall Significance (The combination of all the above criteria as an overall significance)	
VERY HIGH NEGATIVE	VERY BENEFICIAL
These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects. Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance. Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.	
HIGH NEGATIVE	BENEFICIAL
These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light. Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated. Example: The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH.	

MODERATE NEGATIVE	SOME BENEFITS
These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial. Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.	
LOW NEGATIVE	FEW BENEFITS
These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect. Example: The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels. Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.	
NO SIGNIFICANCE	
There are no primary or secondary effects at all that are important to scientists or the public. Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.	
DON'T KNOW	
In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information. Example: The effect of a particular development on people's psychological perspective of the environment.	

8 KEY FINDINGS OF THE SPECIALIST STUDIES

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must contain all the information necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35, and must include–

(j) A summary of the findings and recommendations of any specialist report or report on a specialised process.

The following discussion summarises the key findings of the specialist studies. Full reports have been attached in Appendix C of the EIR.

8.1 Specialist Studies

The following Specialist Studies have been completed for the EIA Phase:

- **Ecological Impact Assessment (Flora and Fauna):** Ms Tarryn Martin from EOH CES
- **Social Impact Assessment:** Mr Lungisa Bosman, Dr Greer Hawley from EOH CES
- **Aquatic Impact Assessment:** Dr Cherie-Lynn Mack from EOH CES
- **Heritage Impact Assessment:** Mr Gavin Anderson from Umlando
- **Paleontological Impact Assessment:** Dr Gideon Groenewald
- **Visual Study:** Ms Rosalie Evans from EOH CES

8.1.1 Ecological Impact Assessment

Ecological Specialist

Ms Tarryn Martin, from EOH CES, was appointed to conduct an ecological specialist report in accordance with the potential ecological impacts identified during the scoping phase.

Approach

The study site and surrounding areas were described using a two-phased approach. Firstly, a desktop assessment of the site was conducted in terms of current vegetation classifications and biodiversity programmes and plans. This included the consideration of:

- The South African Vegetation Map (Mucina and Rutherford, 2006)
- NFEPA Wetlands and Rivers
- The ECBCP
- The list of National Threatened Ecosystems
- Protected Areas and National Protected Area Expansion Strategy (NPAES) Areas

Further to the above, one site visit was conducted (1-5 December 2014) in order to assess the actual ecological state, current land-use, identify potential sensitive ecosystems and identify plant species associated with the proposed project activities. The site visit also served to inform potential impacts of the proposed project and how significantly it would impact on the surrounding ecological environment.

Information on the general area and plant species was also generated using historical records for the Quarter Degree Square that the area falls within (SIBIS, 2015). This information has been used to supplement the findings of this report.

Results

- The site survey indicates that the study area is degraded and that areas classified as CBA 1 and 2, where project infrastructure will have an impact, are in poor condition and generally overgrazed. A significant loss of biodiversity in these areas has already occurred and these areas should therefore be classified as areas of low to moderate sensitivity rather than high sensitivity as the ECBCP spatial planning tool recommends.

- The majority of the Zalu Dam inundation area was degraded and impacted by human settlement. Consequently, these areas were defined as areas of **low sensitivity**.

- Although degraded and infested with alien vegetation, the riparian zone, forest patches, wetlands and drainage lines still play an important role for ecological processes. These areas were therefore classified as having a **high sensitivity**.

- Ngonigoni veld has been classified as **low sensitivity** due to its high level of degradation.

- Pipelines and access roads follow existing roads through areas that are already degraded and as a result many of the impacts will be avoided with effective management of the site as well as effective and monitored rehabilitation after construction.

Recommendations

- In the case of the pipeline route, it is essential that areas of high sensitivity (e.g. forests, water courses and wetlands) are avoided where feasible. Any disturbed land used during the construction phase of the development, which will not be used during the operation phase of the development, must be rehabilitated after construction is completed.

- Prior to construction and dam inundation it is recommended that a botanist/ecologist ground-truths the final pipeline route plans and inundation area to determine the presence of any of the species of special concern or protected species. Before the clearing of the site is authorised, the appropriate permit must be obtained from the relevant department should any protected species need to be removed or replanted.

- Impacts associated with the Operation Phase are associated with the infestation of alien plant species. Alien invasive species should be managed effectively to prevent further impacts on the study area.

- The operation phase will consist of the commissioning of the dam wall and actual inundation of the Zalu Dam. A search and rescue programme for slow moving and burrowing animals must be implemented during this time.

- A detailed Plant Removal and Rehabilitation Plan must be developed as a condition of authorisation. The plan must be incorporated into the final Environmental Management Programme (EMPr) and must consist of the location of protected plant species that may be affected, removal, relocation and storage methods, rehabilitation species, re-vegetation methodology and re-vegetation monitoring (in terms of frequency and success).

- The plants can also be removed and placed in a nursery for use for rehabilitation purposes. If a species is identified for relocation, individuals of the species will need to be located within the proposed site, before vegetation clearing commences, and carefully uprooted and removed by a skilled horticulturist. Prior to removal, however, suitable relocation areas need to be identified, either within the site or in other disturbed areas on the property. Individual plants that cannot be relocated at the time of removal should be moved to the nursery.

- It should be noted that many critical SSC are plants that will not be able to be successfully uprooted and replanted at all (Phillipson, 2002), or at best may have a low survival rate. In all cases the species will require very careful treatment to give them the best chances of survival, and specialist horticultural knowledge will be needed.

Conclusion & Specialist Opinion

Overall, the impacts of the development will be low negative after implementation of mitigation measures. Residual impacts will mainly be associated with a loss of vegetation. This loss of vegetation is also important for fauna as it constitutes habitat loss. Positive impacts include the active management of the alien vegetation on the site.

Ecological Impact Assessment Overall Significance (Post-Mitigation): **LOW NEGATIVE**

8.1.2 Social Impact Assessment

The Social Impact Assessment (SIA) was conducted by Dr Greer Hawley and Mr Lungisa Bosman of EOH CES.

Approach

The SIA has been drafted in accordance with the South African Environmental Impact Assessment (EIA) regulatory requirements, as guided by Chapter 5 of the National Environmental Management Act (NEMA) (107 of 1998, as amended in 2010). By assessing the Project-Affected Communities (PACs), the report sketches the area's socio-economic environment and analyses the potential socio-economic impacts of the project on these PACs. This report is based largely on primary data gathered by means of qualitative focus group discussions, meetings and key individual interviews held during March and August 2014. Data has also been supplemented with an analysis of the South African Household Census Data of 2011, as well as secondary literature sources.

Results

The socio-economic environment in and around the project area is characterised by poor levels of education, low income generation and potential, service delivery backlogs and economic depression. The main economic drivers include civil service and agriculture (crop, livestock and forestry) and are severely under-developed. At a local level, the Ingquza Hill Local Municipality (IHLM) Local Economic Development (LED) Plan identifies a number of high potential industries for economic development, such as tourism, including what is termed catalytic projects such as the Wild Coast N2 Toll Highway. Catalytic projects are expected to unlock the economic potential of the area. The current proposed LRWSS would also be considered a catalytic project.

The proposed Zalu Dam and associated infrastructure will result in a number of issues and impacts, both positive and negative.

The following mains issues and impacts relating to the proposed project have been identified and assessed:

1. Influx of Job-Seekers
   a. Increased community conflicts between local labour and outside workers
   b. Change in social behaviour – increased crime, increased prostitution, etc.
   c. Increased risk of spread of HIV/AIDS and other communicable diseases
   d. Economic stimulation of and investment into business and enterprise due to an increase in demand for local services

2. Impact on health and general quality of life
   a. Provision of water
   b. Upgrading of roads
   c. Increased demand on existing infrastructure facilities and social services
   d. Noise and dust generated by construction activity
   e. Reduced safety during the construction of the dam due to high vehicle activity and potential run-away fires
   f. Risk of drowning in the Zalu dam

3. Loss of land as result of the Zalu dam construction
   a. Land Acquisition for the Dam
   b. Loss of access to natural resources

4. Stimulation of Economic Growth
   a. Employing local labour: Job opportunities
   b. Supporting local businesses and Small Medium Micro Enterprises (SMMEs)
   c. Skills training opportunities
   d. Potential spin-off economic opportunities: aquaculture, irrigation, recreation and tourism.

5. Disturbance of graves sites
   a. Impact on grave sites along the route of the pipeline

Recommendations

The following recommendations have been supplied in the SIA:

Table 8-1. Recommended mitigation measures from the SIA.

Influx of Job Seekers	
Community conflicts between local labour and outside workers	• A project steering committee consisting of the DWS, contractor (community liaison person), recruitment agency, community leaders, elders, youth, ward councillors and the IHLM LED (Local Economic Development) must be established in order to: o Conduct an audit of the affected communities in terms of employment capacity o Identify potential workers from the affected communities o Identify possible conflicts in and between communities o Recommend support programmes that would assist with conflict minimisation and resolution
Change in social behaviour	• The following are mitigation measures for crime: o Support the Traditional Authorities role of exerting control over land allocation in order to prevent densification of people around the construction areas. o The DWS and contractor must encourage settlement in Lusikisiki by providing daily transport for “outside” workers who settle in the town of Lusikisiki, to and from the construction site to minimise the potential crime factor in the rural areas. o All construction workers must be clearly identifiable and wear easily recognisable uniforms. They need to carry identification cards issued by the contractor. o Ensure that the SAPS has access to construction sites o Encourage the local communities to report suspicious activity to the community liaison or nearest environmental site officer. o The contractor must prevent loitering around the construction camp by providing transport to and from the camp sites. o All construction and camp sites must be fenced and secure. • Mitigation measures for increased prostitution and sexual behaviour:

	o Support national and local awareness programmes that discourage promiscuity, especially at schools in the project area. o Ensure that condoms are easily accessible to all construction workers.
Risk of spread of HIV/AIDS and other communicable diseases	• HIV/AIDS (non-discrimination, awareness, prevention and health care support) policy must be implemented. • Condoms must be easily accessible to all construction workers. • Develop and implement an HIV/AIDs education and behaviour change programme for all contracted construction workers. This must extend to the communities located near the construction site. • Existing public health care centres and programmes such as TAC must be involved in the HIV/AIDS campaigns. The HIV/AIDS prevalence must be monitored through these agencies. • Voluntary counselling and testing must be encouraged for all workers.
Economic stimulation and investment into business and enterprise	• The proponent must link the Provincial Department of Economic Development and Local Municipal LED (Local Economic Development) programmes with small to medium enterprises (including communities) in the area so that a state of "readiness" to optimise economic benefits is achieved. This may involve training in the following sectors: business, tourism, catering, etc.
Loss of land due to Zalu Dam construction	
Land acquisition for the dam	• The process for land acquisition by DWS must be conducted through the traditional authorities operating in the areas as they have jurisdiction over land allocations. • Individual land users must be identified and engaged.
Loss of access to natural resources	• Current landowners and land users should be sufficiently compensated. Compensation must be equitable across gender and age. • Assist with the relocation of livestock, if necessary.
Disturbance to grave sites	
Inappropriate routing of pipelines	• Pipeline routes need to be planned around grave sites as specified in the Heritage Specialist report (20 m buffer around grave sites). • The community should be consulted before pipeline routes are established to ensure any grave sites that were not identified in the Heritage Specialist report are identified, mapped and taken into account in the pipeline layout.
Stimulation of economic growth	
Employing local labour	• Equal job opportunities for women and men must be promoted. • Employment must be managed by a recruitment agency/office that uses a selection system that ensures recruitment of semi and unskilled workers from all local, impacted communities in accordance with recent government policies related to local procurement. • Where appropriate, employees involved in the construction phase should be incorporated in the permanent maintenance staff for the operational phase; and • Particular attention must be paid to employment opportunities for women and disabled persons.
Supporting local businesses and SMMEs	• The proponent must ensure that the principal of utilising local business resources (suppliers and SMMEs) in accordance with recent government policies related to local procurement forms part of the procurement specifications. Examples of local business resources that must be considered: o Catering services o Transport services o Quarries/borrow pits (where necessary) o Small civils o Accommodation

	o Security o Hygiene services o Fencing
Skills training opportunities	• Implement a skills development programme which includes training in business, project management, monitoring and evaluation.
Potential spin-off economic opportunities	• DWS should, in their consideration of water use applications, consider the benefit to local communities. • DWS should readily facilitate water use activities that will benefit the community. • Construction camps and settlements can be converted into tourism or recreation facilities.
Impact on health and general quality of life	
Increased demand on existing infrastructure facilities and social services	• DWS should promote awareness of the project (with LMs, Department of Health, SAPS, etc.) and the potential pressure to provide services for new households.
Noise and dust generated by construction activity	• Noise and dust prevention measures must be implemented. • Dust along access roads must be monitored. • Ensure that communities have an easy grievance reporting mechanism, e.g. through a project steering or liaison committee
Reduced safety during construction of the dam	• Mitigation measures for traffic safety: o Develop and inform all affected communities of the formal construction routes. o All vehicle operators and drivers must undergo regular training, clearly outlining the high safety risk to local rural communities o Erect signage making communities aware of the high safety risk due to heavy construction vehicles on the road. o Traffic calming devices such as speed bumps must be considered on rural access roads. • Mitigation measures for fire safety: o No fires must be lit outside construction camps. o Fires that are lit must be in a contained area. The fire must be monitored for cinders and extinguished when no longer needed. o Fire fighting equipment must be stored onsite o The construction campsite must be surrounded by a firebreak. o Fire risks must form part of the construction worker training.
Risk of drowning	• Identify and develop safe and controlled recreational swimming sites. • A water safety awareness campaign should be implemented by DWS. • Ensure signage of drowning risks is visible in high activity areas such as the river/dam crossing. • The implementation of a swimming programme for local scholars should be considered.

Conclusions

The public engagement process shows that the project is highly desired due to the associated skills development and employment benefits. Key issues pertain to an influx of job-seekers and outsider workers, with particular emphasis on social pathologies in the communities. Several mitigation measures to manage the impacts have been proposed.

In conclusion, the consultant is of the opinion that the project will ultimately uplift communities, which are in dire need of basic water supply and employment opportunities.

Since socio-economic impacts are often subtle and unintended, and exist within a dynamic shifting paradigm, consistent monitoring of key socio-economic aspects during project implementation must be employed. Since mitigation of socio-economic impacts is at times not possible, management of impacts will be required. It is the opinion of the author that the impacts identified in this report can be sustainably mitigated and managed through on going stakeholder engagement and the involvement of affected communities.

Social Impact Assessment Overall Significance (Post-Mitigation): **LOW - MODERATE NEGATIVE / BENEFICIAL**

8.1.3 Aquatic Impact Assessment

Aquatic Specialist

The Aquatic Impact Assessment was conducted by Dr Cherie-Lynn Mack of EOH CES, who is familiar with the assessment of linear infrastructure impacts on aquatic environments. EOH CES is familiar with the requirements of the Department of Water and Sanitation in terms of authorisation of activities that may impact on a water resource, i.e. water use licenses.

Approach

Before going on site, a thorough desktop assessment of the aquatic environment was conducted. This included mapping all wetlands, dams, watercourses, etc. in relation to the proposed infrastructure plan. Documents and programmes such as the National Freshwater Ecosystem Priority Area (NFEPA) programme, the National Spatial Biodiversity Assessment and the Eastern Cape Biodiversity Conservation Plan were consulted in order to determine the “state of aquatic environment”. Areas where the aquatic environment intersected with proposed infrastructure were highlighted for further assessment in the field.

The aquatic environment was surveyed on two occasions; in August 2014 and in February 2014. Photographic analysis of each interaction was undertaken, and a high level aquatic habitat assessment was conducted.

Results

In total, over 70 interactions were confirmed. This includes the inundation of three listed wetlands by the proposed dam, the upgrading of a bridge, and a large number of occasions where pipelines will cross either major or minor water courses.

A sensitivity analysis was performed, with HIGH and MODERATE sensitivity areas indicated in relation to the proposed infrastructure.

Areas of high sensitivity include:

- Un-degraded process areas such as rivers, wetlands and streams that are important for ecosystem functioning, including surface and ground water as well as animal and plant dispersal;
- Areas that are not significantly impacted, transformed or degraded by current land use; and
- River reaches of major systems that are important for overall ecosystem functioning

Areas of moderate sensitivity include:

- Areas that still provide a valuable contribution to biodiversity and ecosystem functioning despite being degraded;
- Smaller tributaries of larger river systems

Recommendations

- All watercourse crossings must be authorised by the Department of Water and Sanitation, in terms of Section c and i of the National Water Act (Act 36 of 1998).
- The impoundment of the Zalu Dam must be authorised by the Department of Water and Sanitation, in terms of Section b, c and i of the National Water Act (Act 36 of 1998).
- Abstraction of water from the Xura River must be authorised by the Department of Water and Sanitation, in terms of Section a, c and i of the National Water Act (Act 36 of 1998).
- Wherever possible, directional drilling should be used to direct pipelines under major water courses, i.e. Xura, Xurana, Mzintlava, Mateku, Mtafufu.
- Small tributaries can be crossed using conventional trenching methods.
- Coffer dams should not remain in place for longer than 6 weeks.
- No concrete mixing should take place within 50 m of a watercourse.
- Where pipelines are routed near NFEPA-listed wetlands, ensure that the pipeline is laid on the opposite side of the road from the wetland
- Construction in watercourses MUST take place in the drier winter months of the year, i.e. May to September.
- Where the pipeline crosses the Mateku River below the waterfall, the pipeline route should be amended to either cross at the road crossing, or amend the entire pipeline route as indicated in Figure 8-1.
- By amending the pipeline route as shown (adding green line and removing line scratched out in red), all communities are still serviced, but the difficult terrain and sensitive riparian and aquatic habitat around the Mateku River is avoided.

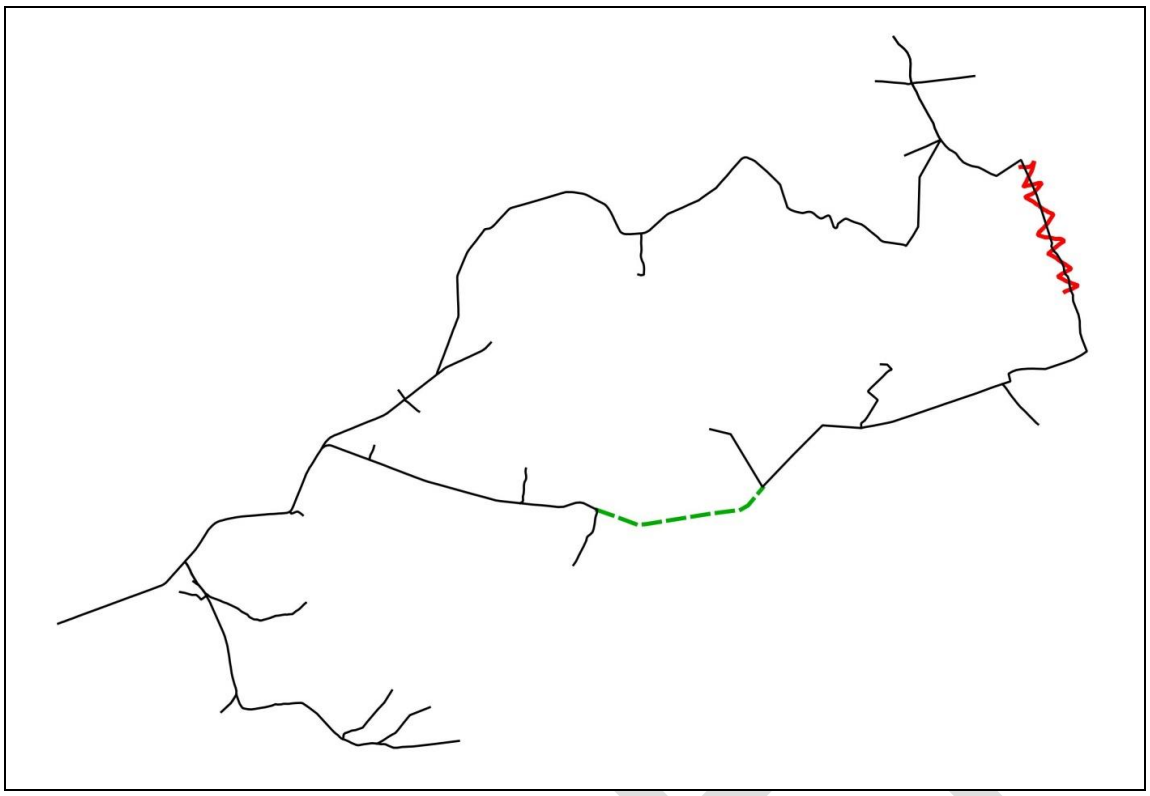


Figure 8-1. Pipeline crossing at Mateku River (in the eastern portion of the study area).

Conclusion & Specialist Opinion

The aquatic impact assessment recorded more than 70 water resource/infrastructure interactions. Each of these will need to be authorised by the Department of Water and Sanitation. Most of these are where pipelines cross streams, drainage lines, etc., but in a few cases the crossings are larger and will require more significant construction (e.g. the impoundment structure on the Xura River itself).

None of the impacts assessed remained HIGH after mitigation, and assuming that the mitigation measures are correctly implemented, the aquatic environment downstream of the dam should not suffer any permanent negative impact. In particular, the Dam Operating Rules must be designed to maintain the ecological reserve within the river across the seasons.

Aquatic Impact Assessment Overall Significance (Post-Mitigation): **LOW NEGATIVE**

8.1.4 Heritage Impact Assessment

Heritage Specialist

Mr Gavin Anderson, from Umlando, was appointed to conduct a heritage specialist report in accordance with the potential heritage impacts identified during the scoping phase.

Approach

The first step in the Heritage Impact Assessment (HIA) is a desktop assessment. This involves consultation of the Umlando database which contains archaeological site locations and basic information from several provinces. The database is in Google Earth format and is thus used as a quick reference when undertaking desktop studies. Local data recording centres, a historical architect, palaeontologist and a historian are also consulted where necessary. The survey results then define the significance of each recorded site as well as a management plan. All sites are grouped according to low, medium and high significance.

Results

Eighty-seven heritage sites were noted during the survey. Most of the sites consist of human graves in a fenced off and/or demarcated area, however, these tend to be close to the road and/or pipeline. Only graves within 50 m of the new pipelines were recorded.

Recommendations

- Each cemetery or grave is protected if it falls within 50 – 100 m of a development. All grave(s) and/or cemeteries should be clearly demarcated prior to the commencement of construction.
- There should be a 5 m buffer between the edge of the grave/cemetery and the fence. The fence should be clearly demarcated.
- A 20 m buffer is usually required between the edge of the grave and the edge of the footprint. The pipeline is, however, often restricted by space in the villages in which case the pipeline can be moved to the opposite side of the road.
- Graves that are already in demarcated and fenced off yards will not require further mitigation. In the case of human graves outside of the villages, the 20 m buffer rule should apply.
- If human graves are uncovered during the course of earthmoving activities then both the police and the Eastern Cape Provincial Heritage Resources Agency (ECPHRA) need to be contacted immediately. All construction activity in the area should stop.
- All graves that are not in a municipal graveyard are protected. Only a registered undertaker or an institution declared under the Human Tissues Act should handle human remains younger than 60 years.
- Anyone who wishes to develop an area where there are graves older than 60 years is required to follow the process described in the legislation.
- The archaeological artefacts affected by the development do not require permits. They are isolated instances of artefacts and do not constitute a site per se.

Conclusion & Specialist Opinion

The heritage survey undertaken for the LRWSS recorded 87 heritage sites that may be affected by the project. Most of the heritage sites are human graves dating to the last 50 years. Many of these graves occur within existing fenced yards and should not be affected by any servitudes. The archaeological sites that were noted are of low significance and do not require further mitigation.

Heritage Impact Assessment Overall Significance (Post-Mitigation): **LOW NEGATIVE**

8.1.5 Paleontological Impact Assessment

Paleontological Specialist

Gideon Groenewald was appointed to undertake a Phase 1 Paleontological Impact Assessment in accordance with the potential paleontological impacts identified during the scoping phase.

Approach

Prior to the field investigation a preliminary assessment (desktop study) of the topography and geology of the study area was completed using appropriate 1:250 000 geological maps (3128 Umtata) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations, etc.) were identified within the study area and the known fossil heritage within each rock unit was inventoried from the published scientific literature, previous paleontological impact studies in the same region and the author's field experience.

Priority paleontological areas were identified within the development footprint to focus the field investigator's time and resources.

The likely impact of the proposed development on local fossil heritage was determined on the basis of the paleontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged.

Results

The field investigation confirms that the area is underlain by the Silurian aged Natal Group, Carboniferous to Permian aged Dwyka Formation, Permian aged Ecca Group, Jurassic aged Dolerite and Quaternary aged Alluvium.

Due to the deep weathering of the Dwyka Formation and Ecca Group sediments, a **Low Paleontological Sensitivity** is allocated to the development. No severe impacts are envisaged and paleontological mitigation is limited to the ECO noting the possibility of trace fossils on the bedding planes of Ecca Group shales at the wall and spillway of the Zalu Dam.

Recommendation

It is recommended that the ECO of the project be informed of the possibility that trace fossils might be exposed on the bedding planes of the Ecca Group shales during deep excavations for the construction of the Zalu Dam wall and spillway. If fossils are recorded the palaeontologist, ECPHRA and SAHRA must be notified and the fossils recorded according to SAHRA specification.

Paleontological Impact Assessment Overall Significance (Post-Mitigation): **LOW NEGATIVE**

8.1.6 Visual Study

Visual Specialist

A visual study of the proposed Zalu Dam was conducted by Ms Rosalie Evans and Dr Alan Carter of EOH CES.

Approach

A desktop visual study was completed using the following significant viewpoints surrounding the proposed dam:

- Bayi Village
- Mrhoshozo Village
- Mthimde Village
- Ndimbaneni Village
- Ntsimbini Village
- Palmerton Mission
- R 61

These viewpoints are located within a range of between 125m and 1 791 m of the proposed dam.

Results

The proposed Zalu Dam has been positioned in such a way that the development is largely sheltered by both natural vegetation and the topography of the landscape. The overall visual sensitivity of the site is MODERATE. If visual mitigation measures are followed the overall visual impact of the Zalu Dam will be LOW.

Recommendation

- Any buildings or structures should be painted, tiled, etc. using neutral colours such as grey, beige or dark green (roof only).
- The planning and design phase should, where possible, plan for buildings and structures associated with the Zalu Dam to be constructed in low lying areas to reduce their visual intrusion on the surrounding landscape.
- The planning and design of the Zalu Dam wall should include a plan for grassing large barren areas of the dam wall and planting trees to screen the dam wall from nearby dwellings.
- Ensure that plans are made to replant indigenous vegetation (that is removed during the construction phase) nearby to reduce the effect of vegetation removal on the aesthetic quality of the inundation area.
- During the operational phase, the vegetation that has been planted (grassing and/or trees) must be maintained if necessary.

Conclusion and Specialist Opinion

The Zalu Dam will dominate the visual landscape for those in its immediate proximity. However, it is concluded that potential losses of scenic resources are not sufficiently significant to present a fatal flaw to the proposed project.

Visual Impact of Zalu Dam (Post-Mitigation): **LOW NEGATIVE**

8.2 Sensitivity Assessment

A sensitivity map was developed based on specialist reports, and was classified into areas of high, low and medium sensitivity (Figure 8-2).

Areas of **high sensitivity** include:

- Areas such as heritage sites (20-50 m buffer);
- Process areas such as rivers and streams (including a 30-50 m buffer) and wetlands (500 m buffer) that are important for ecosystem functioning including surface and groundwater as well as animal and plant dispersal;
- River reaches of major systems that are important for overall ecosystem functioning;
- Areas that have a high species richness;
- Areas that are not significantly impacted, transformed or degraded by current land use and;
- Areas that contain the majority of species of special concern found in the area.

Areas of **medium sensitivity** include:
- Areas that still provide a valuable contribution to biodiversity and ecosystem functioning despite being degraded;
- Degraded areas that still have a relatively high species richness;
- Degraded areas that still contain species of special concern and;
- Smaller tributaries of larger river systems.

Areas of **low sensitivity** include:
- Areas that are highly impacted by current land use and provide little value to the ecosystem and;
- Highly degraded areas that are unlikely to harbour any species of special concern.

To best describe the sensitivity of the LRWSS study area individual maps were created along the study area (Figure 8-3 to 8-6).

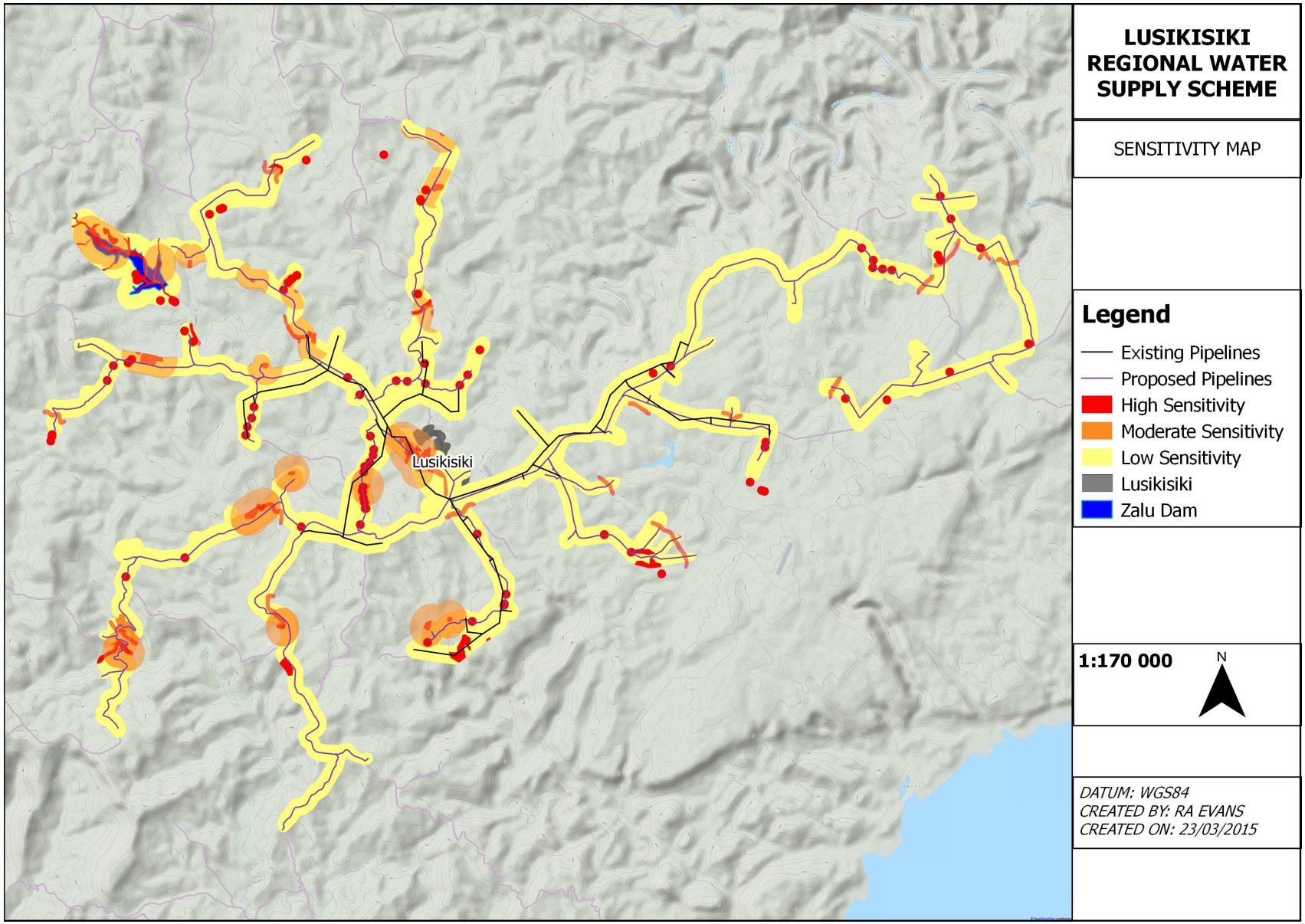


Figure 8-2. Sensitivity map of the LRWSS study area.

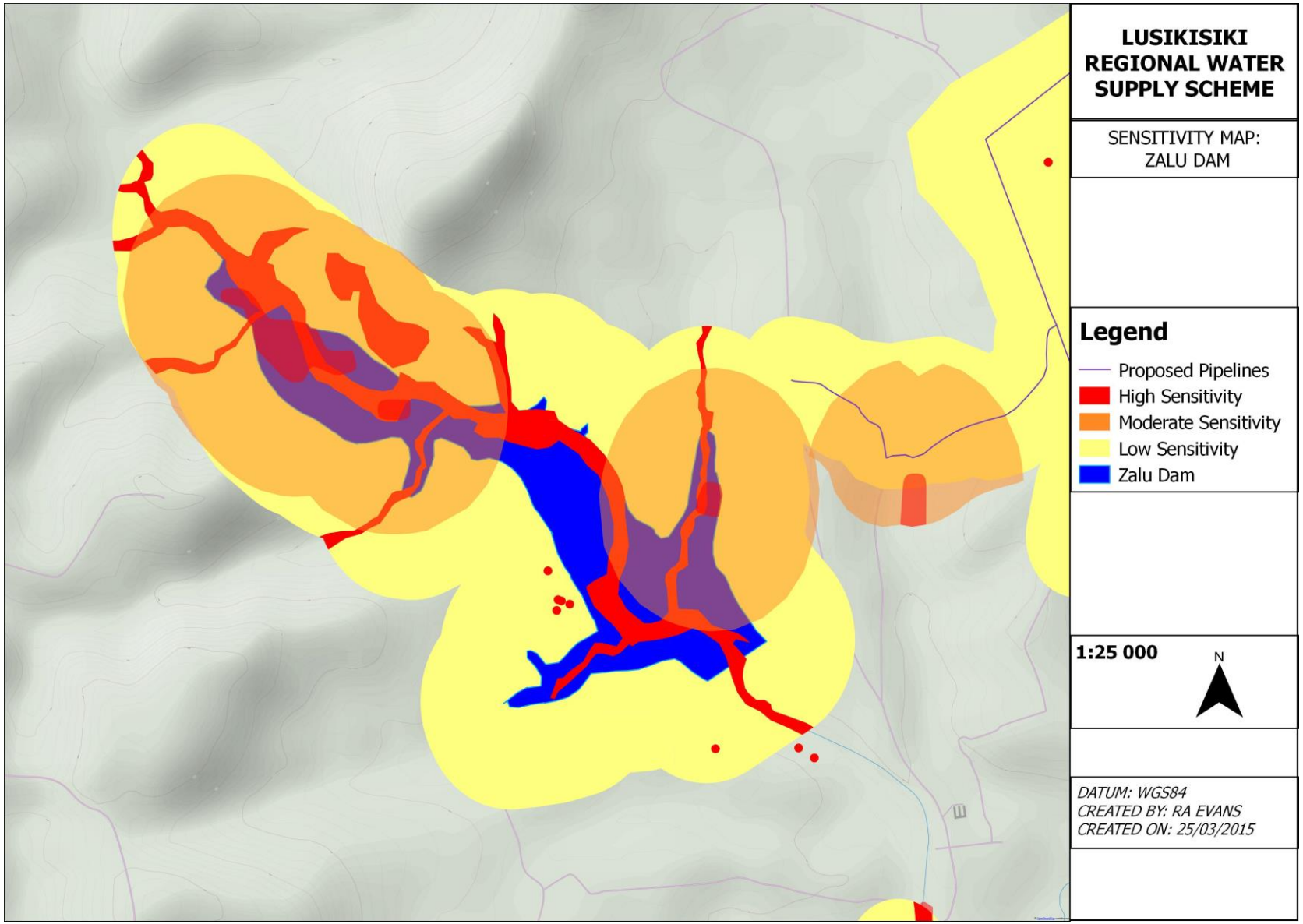
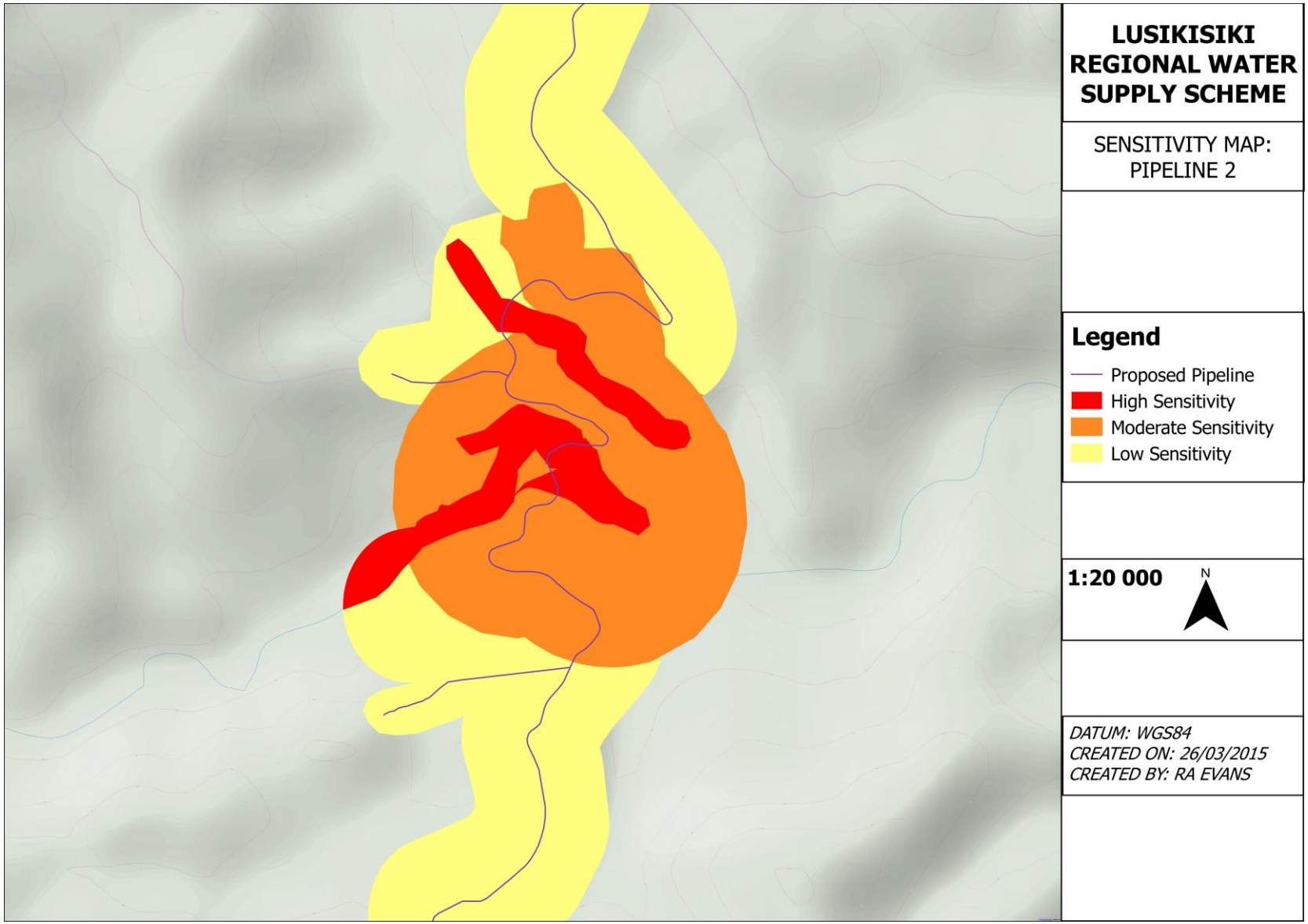


Figure 8-3. Sensitivity Map of the Zalu Dam inundation area.



Figue 8-4. Pipeline sensitivity map (in the south western portion of study area).

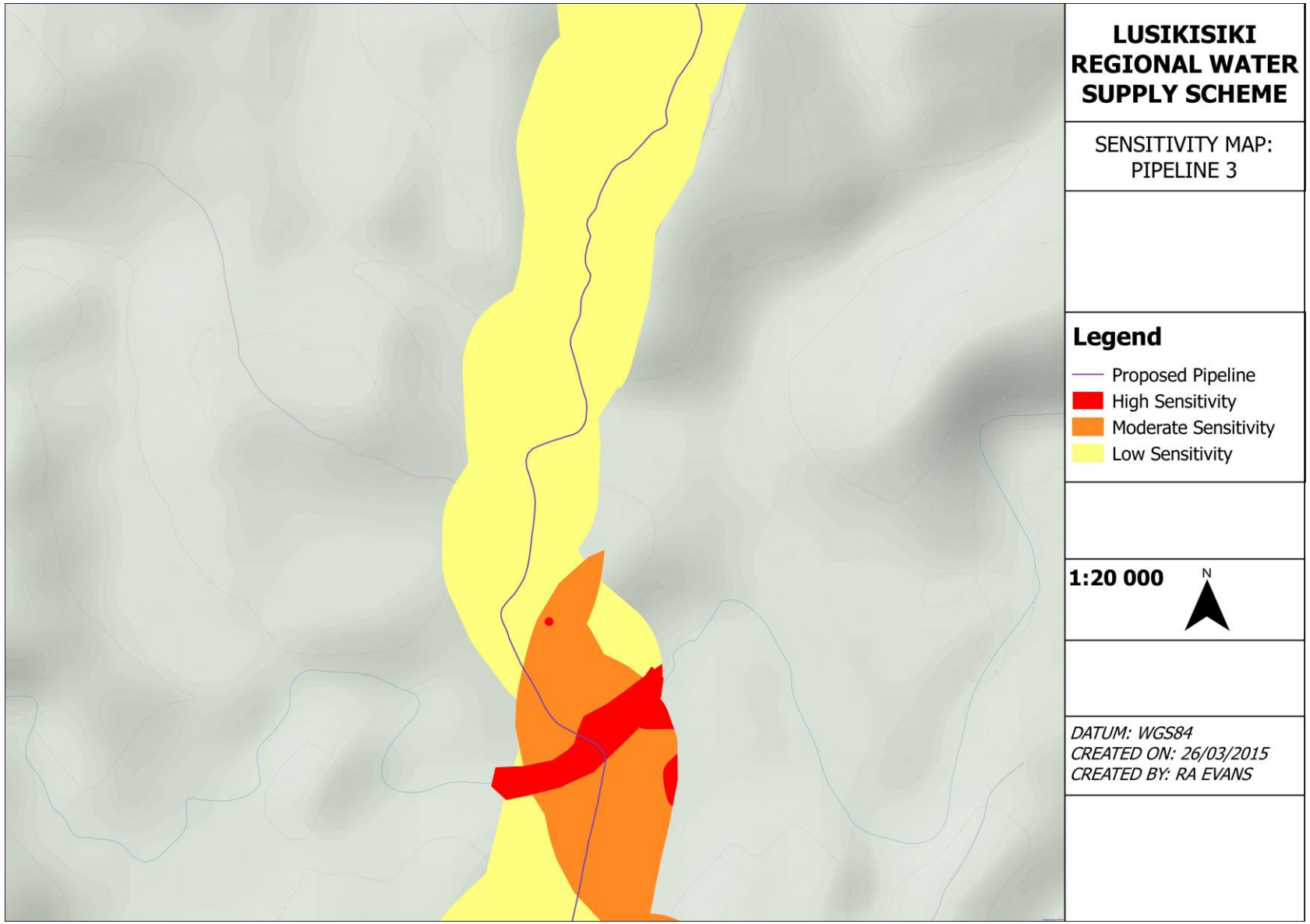


Figure 8-5. Pipeline sensitivity map (central portion of study area).

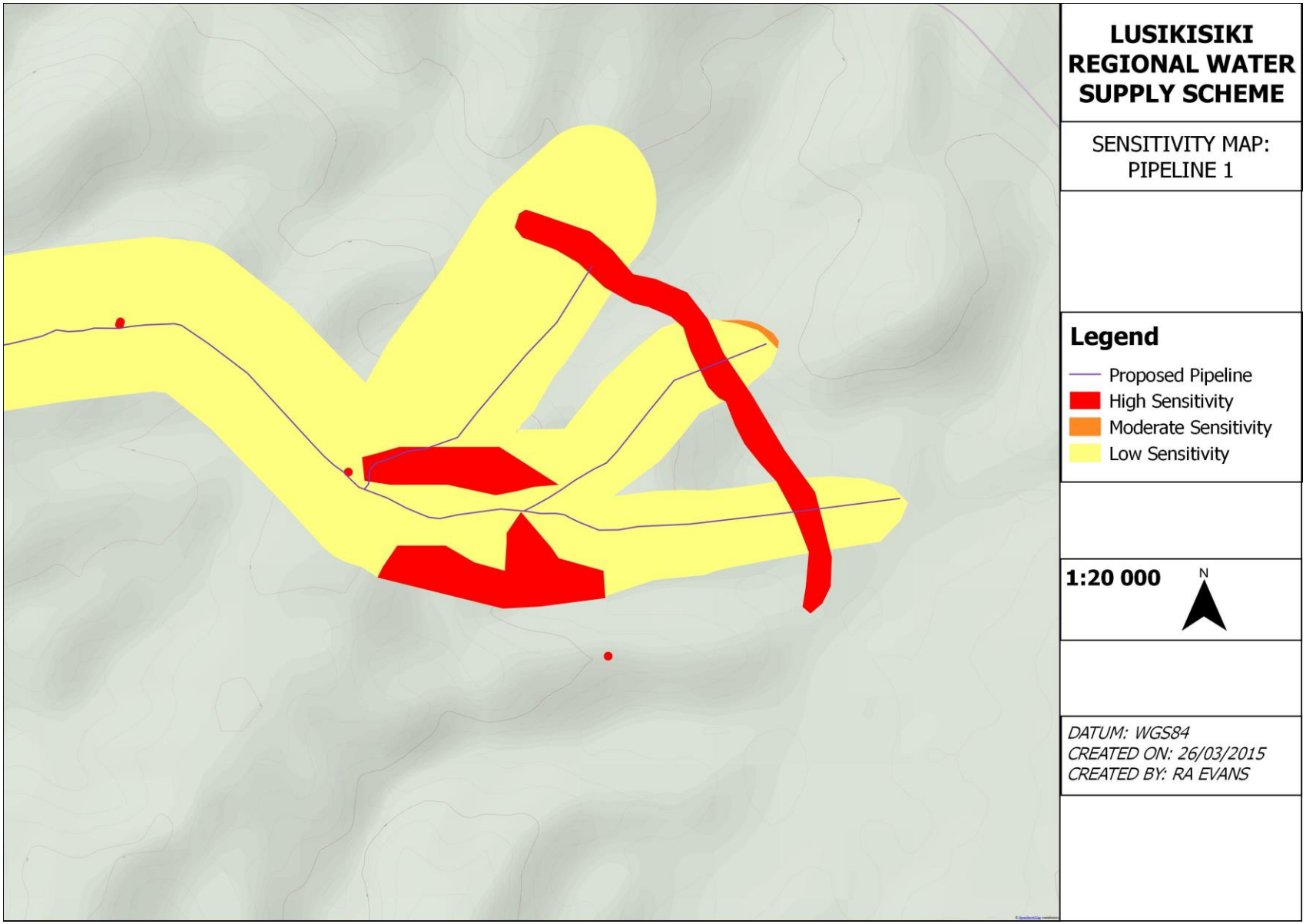


Figure 8-6. Pipeline sensitivity map (south eastern portion of study area).

9 PUBLIC PARTICIPATION

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(e) Details of the public participation process conducted in terms of subregulation 1, including-
- **(i) Steps undertaken in accordance with the plan of study;**
- **(ii) A list of persons, organisations and organs of state that were registered as interested and affected parties;**
- **(iii) A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and**
- **(iv) Copies of any representations and comments received from registered interested and affected parties.**

In line with the above mentioned legislative requirement this chapter of the LRWSS EIR provides details of the public participation process (PPP) conducted for the proposed project.

The current PPP involved four phases.

- Feasibility Phase
- Initial Phase
- Scoping Phase
- EIR Phase

During the feasibility phase, an initial stakeholder engagement process was conducted by AECOM. This was a limited public participation process in support of Environmental Screening in the Feasibility Study. The objective of the process was to facilitate the establishment of a stakeholder committee, engage stakeholders at a local, provincial and national level and inform stakeholders of the intention to develop the LRWSS and provide information about the project. Two main issues raised during this PPP was that there is a negative attitude towards groundwater and there is lack of sustainable and safe drinking water sources in the area.

A report on the PPP followed during the EIR phase and all proof of public notification is attached in Appendix A of this EIR.

9.1 Notification of interested and affected parties

A report on the PPP process followed during the EIR phase. The PPP report and proof of public notification is attached in Appendix A of this EIR.

9.1.1 Newspaper advert

The proposed activity was advertised in the Daily Dispatch on 10 July 2014 (Appendix A).

9.1.2 On site notice boards

Notice boards were placed in Lusikisiki, Port St Johns and at various locations in the study area (Appendix A).

9.1.3 Stakeholders and I&APs

Certain stakeholders were identified based on their potential interest in the project. These stakeholders were contacted either via e-mail or telephone for comment and were sent a Letter of Notification (LON) and a Background Information Document (BID). A full list of stakeholders and I&APs (who registered or attended public meetings) is available in Appendix A.

9.1.4 Surrounding and Affected Residents

Landowners, surrounding landowners and affected residents were identified and notified of public meetings through ward councillors. They were given BID documents.

9.1.5 Public review of Draft Scoping Report

The draft Scoping Report was made available for public review at the Library and Information Centre in Lusikisiki and the Port St Johns library. It was also made available on the EAP's website.

9.1.6 Issues and Response Trail

A number of public meetings were held during the Scoping and EIR phase where key issues were raised by participants. Table 9-1 summarises the main issues raised during these meetings and includes the EAP's responses to these issues.

The Issues and Response Trail is updated throughout the EIA process and will include all comments received until submission of the final EIR to the competent authority.

Table 9-1. Issues raised by I&APs and Response

Raised by	Event	Issue / Concern / Comment	Reply /Action
Councillor (Cllr) Tenyane	Public Meeting	This project was mentioned a long time ago. Feasibility study after feasibility has been conducted and a long process of consultation has been going on. Now its 2014 but still you are doing studies. When is the project actually going to start? It seems you don't understand the problem of water in the areas. It becomes worse when its winter as rain water tanks are dry and people have to use natural sources and walk long distances.	It was indicated that the start date of the dam project is uncertain but that the EIA process would be competed by the end of 2015.
Cllr Tenyane	Public Meeting	Is it possible for DWS, OR Tambo and other role players in this project to come to Ingquza Municipality? OR Tambo District Municipality is responsible for water supply and they are the ones who have built infrastructure in these areas. The Zalu Dam has been part of O R Tambo Municipality for a long time.	It was confirmed that DWS and OR Tambo would be invited to future meetings.
Cllr Daniso	Public Meeting	I thought we were going to be told the project is starting. In ward 20 & 21 people were trained on how to treat groundwater by a private company employed by O R Tambo DM. What happened to that project?	It was indicated that the project mentioned by the councillor was not known to the CES project team, but that people would get the opportunity to ask these questions to OR Tambo officials at future meetings. It is also possible for councillors to direct these questions to OR Tambo DM as each municipality is represented in the district municipality.
Cllr Daniso	Public Meeting	Are all villages going to benefit from employment?	It was indicated that that employment opportunities for local people would be provided, although there would be more jobs during the construction phase than during the operational phase of the project.
Mr Vungaye	Public Meeting	There is a dam between ward 16 & 20 close to Hombe. Can we not get temporary arrangements to get water from the dam? Maybe a generator can be installed and water pumped to the close villages. I also support Cllr Denyane that we need the project proponents here.	It was indicated that this issue is not part of the scope of the current project but the communities can engage the DM on this matter.
Mr Mditshane	Public Meeting	Water supply can help a lot. We are struggling in the villages without water.	This was noted and it was confirmed that current project would improve water supply in these areas.
Mr Mfoloisi	Public Meeting	Some infrastructure has been installed in our area but there is no water.	This was noted and it was confirmed that current project would result in the improvement of infrastructure and water supply.

Raised by	Event	Issue / Concern / Comment	Reply /Action
Mr Mali:	Public Meeting	A reservoir and trenches were built in ward 14 but only the clinic and the school got water.	It was indicated that this might be caused by shortage of water supply and this project is aimed at improving the current situation.
Mr Magwala	Public Meeting	We as community leaders are afraid to talk to people about water as this is a sensitive issue. People have been waiting for water for a long time. In our area there was a borehole drilled but its not working.	It was indicated that the current proposed project is aimed at improving water supply in the affected areas.
Cllr Sotshongaye	PSJ Municipal Meeting	You do not mention ward 17 while it is between ward 16 and 20. There are also villages close to Mrotshozweni and Mthimde such as Lutshaya, Kwanyali. Are these villages going to get water supply?	It was indicated that it was uncertain which villages will be receiving water supply at this stage and that villages currently being engaged are those that will be affected by construction and infrastructure.
Cllr Sotshongaye	PSJ Municipal Meeting	When is the project going to start?	It was indicated that the start date of the project depends on a number of isses such as funding, etc.
Cllr Sotshongaye	PSJ Municipal Meeting	In our municipality you are talking about boreholes while we have rivers. Why not get water from Mzimvubu?	It was indicated that the borehole proposal came from a feasibility study completed by the engineers which recommended boreholes in this area.
Cllr Moon	PSJ Municipal Meeting	This project is too far as you mention that the EIA will be completed in June 2015. When DWS representatives visited this area they mentioned that Lutshaya is under this scheme and it's not on the list of villages.	It was indicated that there might be changes that resulted from the feasibility study that was completed. We will check if this village is not affected.
Cllr Moon	PSJ Municipal Meeting	Mthimde and surrounding villages also need water. Are these villages going to get water supply?	It was again indicated that it was uncertain which villages will be receiving water supply at this stage and that villages currenlty being engaged are those that will be affected by construction and infrastructure.
Cllr Moon	PSJ Municipal Meeting	You mentioned the inundation area. Is this area going down or expanding wider?	It was indicated that the area will expand both wider and downstream.
Cllr Moon	PSJ Municipal Meeting	Why use boreholes while there are rivers in this municipality?	It was indicated that this was a result of feasibility study that was completed which recommended use of boreholes in this area.
Cllr Fono	PSJ Municipal Meeting	Are you doing only doing an assessment of the affected wards?	It was confirmed that we are doing an assessment of the affected areas only.

Raised by	Event	Issue / Concern / Comment	Reply /Action
Cllr Fono	PSJ Municipal Meeting	In ward 9 a dam was proposed at Telityema and this dam was going to supply the whole of PSJ municipality. What happened to this proposal?	It was indicated that the team were not aware of this project but if DWS was involved they would get a proper response when they review the documents.
Cllr Fono	PSJ Municipal Meeting	Ward 17 & 18 are close to ward 20 but they were not invited or included in the list, why?	It was indicated that the team were focussing on wards that would be affected by the construction activities.
Mayor	PSJ Municipal Meeting	After listening to the questions raised by the councillors the mayor suggested that the Municipality look at the list and make a consolidated list of villages that still need water supply, especially of those not appearing on the list.	This was noted and indicated that the mayors suggestion would be appreciated. This could be a single document prepared by the municipality with all issues relating to the project.
Cllr Zweni	PSJ Municipal Meeting	Mzimvubu and Mzintlava rivers are much bigger than Xura where the dam will be built. Why not use these rivers to build a dam that will supply water to PSJ rather than use boreholes that run dry? We are against the use of boreholes as we have seen in some areas that they run dry and people are left without water.	It was indicated that boreholes are most suitable for this area due to terrain.
Cllr Mbotsha	PSJ Municipal Meeting	I am not sure about the list of villages listed here. I think some of these areas are Administrative Areas (AA) rather than villages. For example Zalu Heights is an AA consisting of a number of villages but no village called Zalu Heights. For example Lutshaya village is along the Xura bridge which is going to be upgraded but is not listed here.	It was confirmed that we will confirm this with DWS as we were given this as a list of villages that are going to be affected either by infrastructure or water supply.
Cllr Tshoto	PSJ Municipal Meeting	You need to consider the use of local rivers as we do not want boreholes.	This was noted but it was indicated that this is not part of this project. It may be a separate project on it's own.
Cllr Tshoto	PSJ Municipal Meeting	In the next meeting can you invite DWS so that we can ask questions directly to them?	It was confirmed that DWS would be invited to the next meeting.
Cllr Ntshobo	PSJ Municipal Meeting	Every winter season there is a serious problem of water in all villages. We are happy with the project and we want CES to complete the EIA report soon so that we can get to the next step in the process. We want to know the exact site of the dam so that we know whose land is affected. We need to start with the process of negotiation as there might be problems which can delay the project.	It was indicated that at this stage the exact location or boundaries of the dam coud not be provided. But DWS officials will visit and show the community the boundaries of the dam once the EIA is complete.

Raised by	Event	Issue / Concern / Comment	Reply /Action
Mr Khwalo:	Public Meeting	There are graves to close to the site you mentioned and that is why we need to know the exact boundaries of the dam so that we can see if the graves will be affected or not.	It was confirmed that this will be done once the EIA is approved.
Mr. Mahambule	Public Meeting	Is the dam not going to affect the amount of water downstream?	It was confirmed that this can happen but the specialists' studies have been done including a more detailed assessment of the impacts of the dam on river flow downstream. The impacts are expected to be limited.
Mr Mafanya	Public Meeting	We want the dam and other things will be discussed later.	Noted
Mr Kwalo	Public Meeting	You need to have contact details of other people within the community so that meetings can be properly advertised.	It was confirmed that a register of all people who attended this meeting will be kept and any other people who may register independently. As the process moves forward we will inform all those registered about the next meetings and public review opportunities. We can also take names of other community leaders we need to contact for the next meetings.
Mr. Nongwani	Public Meeting	What will be the solution to speeding trucks and construction vehicles?	It was confirmed that an Environmental Management Plan (EMP) will be submitted with the EIA. The aim of the EMP is to provide guidelines which will be followed during the construction and operational phase of the project. These include safety guidelines that will be followed by construction vehicles such as minimum and maximum speed limits. These guidelines will also be made available to the communities as part of the Environmental Authorisation.
Cllr Mbotshwa	Public Meeting	What is the relation between DWS and OR Tambo District Municipality (ORTDM)?	It was confirmed that there have been communications between the DWS and OR Tambo District Municipality (ORTDM) and even in the stakeholder meeting of the 24th February 2015 they were invited while there was no representative at the meeting.

Raised by	Event	Issue / Concern / Comment	Reply /Action
Cllr Mbotshwa	Public Meeting	OR Tambo is proposing a dam at Mzintlava but the progress is very slow. Is there a possibility to link these projects to speed up the process?	It was indicated that the projects are not linked and that there is nothing we can do to help with the other project but ORTDM can engage DWS to see what can be done to help speed up the process. Currently we are dealing with the EIA for the LRWSS and cannot make any promises regarding that project.
Cllr Mbotshwa	Public Meeting	We are concerned about the involvement of ORTDM in this process as we have been experiencing problems with ORTDM especially with regards to maintenance of infrastructure. ORTDM will argue that they were not implementing agent and cannot maintain the infrastructure and that the contractor must be called to deal with maintenance issues. We would not like to see a similar situation with this project.	As mentioned previously ORTDM has been involved and DWS will keep on engaging with the district municipality as it is the implementing agent for water in the municipality.
Mr Mangana	Public Meeting	Can DWS help with the current projects being implemented by ORTDM as the progress is very slow in these projects and the one you are presenting today is a long way from implementation?	It was indicated that the team could not answer this on behalf of DWS. As previously mentioned, ORTDM will have to engage with DWS separately to discuss the possibility of involving the department of it's current projects.
Cllr Mbotshwa	Public Meeting	You need to consider these villages when looking at water supply in these areas: • Mthimde • Dumezweni • Sunrise • Jabavu • Sthayelo	It was confirmed that these will be considered once we have received environmental authorisation for the EIA.
Mr Mthemba	Public Meeting	How would the community know if those are real graves as it is clear from your presentation that you are not sure about some of them? You said some graves look to be more than fifty years old?	It was confirmed that DWS will initiate a separate public consultation process once the EIA has been approved to engage with all those affected either with regard to graves or loss of land.
Mr. Ngwane	Public Meeting	What are the benefits we will get as the communities surrounding the dam except for the water from the dam?	It was indicated that at this stage there is nothing tangible that will benefit the adjacent communities except water supply but a number of initiatives such as fly fishing can be looked at once the EIA has been approved.

Raised by	Event	Issue / Concern / Comment	Reply /Action
Mr. Mafana	Public Meeting	Will the dam not be safety hazard to livestock and people? For example will it not bring water animals that will suck and drown animals and people into the dam?	It was indicated that dam safety would be considered and if necessary, the dam will be fenced off. At this stage there is no proposal to close or fence the dam.
Mr. Mthemba	Public Meeting	If there are any protected trees or animals who will remove these?	It was indicated that a qualified botanist will be contracted to relocate protected plant species.
Mr. Mthemba	Public Meeting	What do you do if the tree or plants do not grow after relocation?	It was indicated that nothing can be done if the trees die but as mentioned previously a qualified person is appointed to oversee the relocation.
Mr. Ngcoza	Public Meeting	What will happen to people who still plant close to the dam?	It was indicated that the only land that will be affected will be the land in the inundation area of the dam. The area adjacent to the dam can be used as normal.
Mr. Witbooi	Public Meeting	What if you cannot find the owners of the graves? Is the project going to stop?	It was indicated that there is a legal process that will be followed prior to the relocation of the graves if the owners cannot be found. This process will be completed in collaboration with community leaders of the affected area. All in all the project will not stop but it might be delayed if the relatives are not found.
Mr Ngcoza	Public Meeting	When will the project start (i.e. construction)?	It was indicated that at this stage we cannot say when the project will start as there are still a lot of processes to be followed and completed before beginning of construction. For example, once the EIA has been approved the budget for construction of the dam will need to be approved by the minister. These processes normally take time.
Ms Goniwe	Public Meeting	How many villages are going to benefit from the project?	It was indicated that at this stage it is not clear how many villages will benefit as there are still some designs to be finalised.
Mr. Mtwasa	Public Meeting	How is the employment going to happen? Are people from all these villages going to be employed in the project?	It was confirmed that people from local communities will be employed in the project. The department (DWS) has a policy with regards to how contractors must deal with employment issues.
Ms Goniwe	Public Meeting	How are we going to be protected from natural disasters that will come as result of the dam? For example we know that these dams have a tendency of bringing big water animals that eat livestock and people. Sometimes they even cause tornadoes and other natural disasters.	It was indicated that at this stage we cannot promise what will be or not be done as we are still speculating. If these disasters occur even if it's as a result of the dam the government normally has a disaster management plan to deal with such issues.

10 IMPACT ASSESSMENT

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(k) A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issues could be addressed by the adoption of mitigation measures;

(l) An assessment of each identified potentially significant impact, including-

- **(i) Cumulative impacts;**
- **(ii) The nature of the impact;**
- **(iii) The extent and duration of the impact;**
- **(iv) The probability of the impact occurring;**
- **(v) The degree to which the impact can be reversed;**
- **(vi) The degree to which the impact may cause irreplaceable loss of resources; and**
- **(vii) The degree to which the impact can be mitigated.**

The impact assessment for the proposed LRWSS was conducted in two parts:

- General Impact Assessment
- Specialist Impact Assessment

The general impact assessment and specialist impact assessments were combined into one table per phase and a detailed assessment of all impacts and mitigation measures is available in Appendix B.

10.1 General Impact Assessment

The general impact assessment identified and assessed impacts across three phases of development:

- Planning & Design Phase
- Construction Phase
- Operational Phase

Issues identified were not covered in the specialist studies such as:

- Waste management
- Traffic and Transport
- Socio-economic impacts
- General construction impacts
- Stormwater management
- Visual impacts (Visual desktop study)

10.2 Specialist Impact Assessment

The specialist impact assessment covered issues identified by the following specialist studies:

- Ecological Impact Assessment
- Aquatic Impact Assessment
- Paleontological Impact Assessment
- Heritage Impact Assessment
- Social Impact Assessment

10.3 Summary of findings

The various impacts that were identified are summarised in Table 10-1 and Table 10-2 below.

Table 10-1. General Impacts Identified

PLANNING AND DESIGN PHASE
Compliance with relevant environmental legislation and policy - Failure to adhere to existing policies and legal obligations could lead to the project conflicting with local, provincial and national policies/legislation.
Traffic and transport - During the planning and design phase, inadequate planning for the transportation of construction equipment to site could result in traffic congestion. - The integrity of the existing roads may be compromised by the heavy vehicle traffic delivering materials and components to site. - Road modifications which may be necessary to allow for the delivery of materials and components to site via heavy vehicles could have long lasting traffic benefits.
Visual intrusion - During the planning and design phase, inadequate planning for the construction of infrastructure associated with the Zalu Dam, such as a car park or buildings, could result in the loss of scenic quality. - During the planning and design phase inappropriate consideration of the design of the Zalu Dam wall could result in a visually intrusive dam wall structure. - The removal of indigenous vegetation from the inundation area will result in the degradation of the aesthetic quality of the area surrounding the dam.
Loss of land due to Zalu Dam construction - Loss of an existing foot path through the inundation area.
Proposed reticulation layout - During the planning and design phase, a lack of environmental consideration in the infrastructure layouts could result in the unnecessary degradation of areas of high environmental/social sensitivity.
CONSTRUCTION PHASE
Visual intrusion - During the construction phase, construction activity on site and the presence and use of large machinery on site and along access roads will result in a visual disturbance of the landscape.
Socio-economic - The construction phase will create temporary jobs for local communities. - During construction, impeding the existing flow of the Xura River will limit the volume of water available to downstream users.
Nuisance dust - During the construction phase, generation of dust from heavy vehicles and machinery could impact on nearby communities.
Construction camp - During the construction phase, unnecessary disturbance of vegetation due to sprawl of campsites can cause loss of biodiversity.
Alien and invasive plants - During construction, unnecessary disturbance of the areas within the site could increase the risk of spreading noxious weeds, invasive and alien plants.
Fire - During the construction phase, runaway fires from cooking or other activities in the construction camp might lead to the burning of surrounding vegetation and threaten the local community.
Noise - During construction adverse noise effects will occur, e.g. from the movement of heavy vehicles through community areas to site.
Stormwater management - During construction, sediment created as a result of construction activities could be washed

into nearby drainage lines.
Soil erosion - During construction, disturbance of highly erosive soils and vegetation removal on steep slopes could exacerbate soil erosion.
Management of general waste - During construction littering on site may attract vermin, detract from the visual appeal of the area, and pollute the surrounding areas.
Hazardous substances - During construction onsite maintenance of vehicles/machinery and equipment could result in oil, diesel and other hazardous chemicals contaminating surface and ground water. - Spillage of diesel, lubricants, cement, etc. could result in surface and groundwater pollution.
Management of construction waste - During the construction phase, waste from construction activities e.g. excess concrete and cement mixture, empty paint containers, oil containers, etc., could cause pollution of ground and surface water when they come into contact with run-off water.
OPERATION PHASE
Visual intrusion - During the operational phase, if grassing and tree planting screens are deemed necessary but not implemented correctly and/or maintained, the dam wall could negatively impact the aesthetic quality of the landscape surrounding the dam wall. - During the operational phase the Zalu Dam could become an attractive destination for tourists. - During the operational phase, if the associated infrastructure is not maintained it may become degraded and visually obtrusive. - During the operational phase if the indigenous vegetation, planted within the offset area, is not maintained correctly it could result in sections of the site becoming visually obtrusive.
Maintenance - During the operational phase, insufficient maintenance of pipelines could result in damage to the pipeline and leaks.
Socio-economic - During the operational phase there will be a reliable water supply throughout the study area. - During the operational phase there will be employment opportunities for maintenance of the dam wall, pipelines and other infrastructure. - During the operational phase, there may be a reduced volume of water available to downstream users.
Hazardous chemical storage - During the operational phase inappropriate storage of chemicals, herbicides, diesel and other hazardous substances on site could result in soil and water contamination.
Increased stormwater run-off - During the operational phase, failure to follow the stormwater control measures could result in damage to the landscape, flooding and increased sheet erosion.
Waste management - During the operational phase maintenance workers and security personnel could litter on site.

Table 10-2. Specialist Impacts Identified

PLANNING & DESIGN PHASE
Loss of indigenous vegetation, sensitive areas - The construction of the Zalu Dam and associated infrastructure will result in the loss of 100 Ha of degraded Ngonigoni Veld. - During the planning and design phase the inappropriate routing of pipelines, access roads and other structures through sensitive areas could result in degradation of these areas. - Sensitive areas (scarp forest, riparian areas and wetlands) in the planned inundation area will be completely lost. - During the planning and design phase the inadequate assessment of the planned route of pipelines, positioning of the dam, and the compilation of the dam operating rules could lead to widespread degradation and loss of potentially sensitive aquatic habitats.
Scheduling of construction - Planning/scheduling of construction that does not take into account the seasonal requirements of the aquatic environment could lead to short-term impacts such as excessive sediment mobilization.
Changes to fluvial geomorphology - Incorrect placement and/or design of bridge pilings or culverts may result in scouring of the river bed in areas immediately surrounding the pilings or culverts. - Insufficient planning for erosion prevention along the banks of the river alongside the Palmerton bridge structure will result in erosion that may eventually impair the safety of the structure.
Flood attenuation - During the planning and design phase failure to account for the 1:100 year flood event may compromise the integrity of the Palmerton bridge structure.
Heritage features - Inappropriate planning of the pipeline route and other reticulation infrastructure through sensitive areas could result in the destruction of heritage features.
Loss of land due to Zalu Dam construction - Acquisition of the dam inundation area, currently used for grazing, could lead to dissatisfaction from the current land users especially if they are not compensated. - Inundation of the dam will result in a loss of access to natural resources – livestock grazing, fuel wood, etc.
Disturbance of grave sites - During the planning and design phase inappropriate routing of the pipeline could result in disturbance of grave sites.
Stimulation of economic growth - Planning and design should take into account potential spin-off economic opportunities (aquaculture, irrigation, recreation and tourism)
CONSTRUCTION PHASE
Loss of sensitive vegetation during construction - During construction there might be a loss of plant species of conservation concern due to vegetation clearing. - During construction, indiscriminate removal of riparian vegetation may lead to disturbance of the aquatic ecosystem.
Disturbance to surrounding vegetation and fauna - During construction vehicular movement, noise and habitat destruction will disturb animals in the area. - During construction an influx of contractor staff could result in poaching of wild animals. - During construction, inappropriate disturbance beyond the development/construction footprint could result in excessive damage and loss of vegetation/fauna.
Soil erosion and environmental degradation due to poor rehabilitation - During construction clearing and excavation will result in exposed soil. If not rehabilitated, this may result in severe topsoil erosion, bank destabilisation, downstream sedimentation and colonization by invasive alien plant species.
Water quality

- During construction, wet concrete (highly alkaline) could result in flash kills of macroinvertebrates and fish species in the vicinity.
- During construction of the pipelines, accidental chemical spills in the vicinity of watercourses will result in water pollution.
- During construction of the pipelines, mobilisation of soil into the streams via erosion will cause sedimentation of ecological habitats downstream of construction. This could decrease the diversity of macroinvertebrate communities.

Hydrology

- During construction of the Palmerton bridge, coffer dams have the potential to permanently change the flow dynamics in a river, exacerbating scour and enhancing sedimentation. Both of these changes can impact negatively on the aquatic ecosystem.

Channel banks and soils

- During construction of the dam wall, construction activities could result in localised erosion and jeopardise bank stability. Associated vegetation removal could also destabilise banks.

Sedimentation

- During construction excavations within the inundation area for material for dam construction, if undertaken without proper precautions, could mobilise large volumes of sediment into the Xura River, reducing aquatic habitat and decreasing water quality.

Water quantity

- During construction impeding the existing flow of the river will result in the degradation of the aquatic environment downstream of the dam, essentially halting all of the ecosystem functions of the river.

Destruction of underlying fossils

- During construction of the Zalu Dam wall and spillway deep excavations may expose/destruct underlying fossils.

Damage to heritage features

- During construction there could be accidental damage to already identified heritage features.
- During construction there is a risk of damage to potential heritage features.

Influx of job seekers

- During the construction phase there may be increased community conflicts between local labour and outside workers.
- During construction there may be a change in social behaviour - elevated crime, increased prostitution, increased substance abuse and risky sexual behaviour.
- During construction there may be an increased risk of the spread of HIV/AIDS and other communicable diseases.
- During the construction phase there will be an increase in economic stimulation and investment into business and enterprise due to an increase in demand for local services.

Stimulation of economic growth

- During the construction phase, if proper labour recruitment practices are not used and the use of local resources is not prioritised the project may garner negative sentiment with local communities.
- During the construction phase, if local businesses and SMMEs (Small Medium and Micro Enterprises) are not supported and their development is not stimulated, the economic benefit of the LRWSS would be considered a missed opportunity.
- During the construction phase, if a skills development programme is not developed this would be a missed opportunity to improve the livelihoods of the local community.

Impact on health and general quality of life

- During the construction phase a number of the existing roads will be upgraded. This will be beneficial to the region and will have long term benefits for affected communities.
- During the construction phase there could be an increased demand on the existing infrastructure facilities and social services due to the influx of people wanting to take advantage of the economic opportunities associated with the LRWSS.
- During the construction there could be an increase in noise and dust generated from construction activities.
- During the construction phase, the safety of local community members could be reduced as a result of high vehicle activity and potential run-away fires (resulting in injuries).

OPERATION PHASE

Alien vegetation - During the operational phase, failure to monitor rehabilitation initiatives post construction, can lead to infestation by alien plant species.
Water quality - Dams typically act as nutrient "sinks". This may improve the quality of the water downstream of the dam.
Geomorphology - During the operational phase the condition of the river geomorphology in the scour zone will degrade since sediment will be trapped in the dam, causing clear water (sediment free) releases to the downstream reach. - During the operational phase, at the abstraction weir, the baseflows released from the dam will be abstracted from the river. This will result in the reach immediately downstream of the weir experiencing very low baseflows. - During the operational phase reduced floods are likely to cause a degradation of the riparian and in-channel habitat conditions through reduced scour abilities of the river.
Riparian vegetation - During the operational phase sediment-free water releases and the resultant scour will decrease the availability of any riparian habitat (Instream and Marginal). - The potential reduction in baseflows, due to abstraction at the weir, would impact on the potential availability of water to supply the adjacent riparian zones and could reduce the overall extent of these habitats.
Fish - During the operational phase there could be reduced breeding success of the Transkei barb, a new species. The number of spawning events could also be reduced by the capture of the high flow events by the dam. - During the operational phase the dam wall and reduction in flow may disrupt the normal migratory behaviour of eels.
Macroinvertebrates - During the operational phase reduction in the sediment content of water downstream of the dam could reduce both the availability of food and habitat for macroinvertebrates.
Hydrology and sediment dynamics - Once the pipelines are in position, the new infrastructure will possibly cause a permanent change to the flow dynamics of the watercourses. This could result in loss of habitat and an associated loss in aquatic biodiversity.
Impact on health and general quality of life - During the operational phase the unusual presence of a large water body may pose a drowning risk. - During the operational phase there could be an increased demand on the existing infrastructure facilities and social services due to the influx of people wanting to take advantage of the economic opportunities associated with the LRWSS. - Alleviation of water shortages.
Stimulation of economic growth - The construction of the Zalu Dam could result in potential spin-off economic opportunities associated with aquaculture, irrigation schemes, recreation and tourism.

10.4 Comparative assessment of impacts

Below is an assessment of the impacts in terms of the number of impacts identified for each phase. The breakdown of the impact assessments in Table 10-3 – 10-9 below provide insight into the key issues of all phases of the proposed LRWSS development.

10.4.1 GENERAL IMPACT ASSESSMENT

An analysis of the distribution of General impacts identified indicates that the bulk of the mitigation effort should be placed on the Construction Phase. The Construction Phase was assessed as the highest impacting phase with one HIGH and one VERY HIGH pre-mitigation impact.

In the Construction Phase the VERY HIGH pre-mitigation impact related to potential runaway fires from construction camps.

Both HIGH and MODERATE identified impacts can be significantly reduced through the recommended mitigation measures resulting in predominantly LOW post-mitigation impacts.

Five impacts were identified as being positive impacts. These impacts related to the socio-economic benefit of the proposed water supply scheme for communities in the study area.

Table 10-3 Impact Assessment for General Impacts occurring in all phases of the proposed development (+ = beneficial impact)

	PRE-MITIGATION				POST-MITIGATION			
	LOW	MODERATE	HIGH	VERY HIGH	LOW	MODERATE	HIGH	VERY HIGH
Planning & Design	3 (+1)	4	1	0	8(+1)	0	0	0
Construction	2	8 (+1)	1	1	9	3 (+1)	0	0
Operation	1	6 (+1)	1 (+2)	0	8	(+1)	(+2)	0
TOTAL	**6(+1)**	**18(+2)**	**3(+2)**	**1**	**25(+1)**	**3(+2)**	**(+2)**	**0**

10.4.2 ECOLOGICAL IMPACT ASSESSMENT

The Ecological Impact Assessment identified impacts in all phases of the development. HIGH impacts mostly related to disturbance of sensitive/indigenous vegetation and fauna as well as an increased growth of alien vegetation. The VERY HIGH ecological impact identified in the Planning and Design Phase relates to loss of sensitive areas (scarp forest, riparian areas and wetlands) in the inundation area. This impact is still HIGH after mitigation.

An analysis of the distribution of impacts illustrated that the bulk of the mitigation effort should be placed on the Construction Phase as this is the highest impacting phase.

HIGH and MODERATE pre-mitigation impacts can be reduced through the recommended mitigation measures to predominantly LOW post-mitigation impacts.

Table 10-4 Impact Assessment for impacts identified by the Ecological Impact Assessment

	PRE-MITIGATION				POST-MITIGATION			
	LOW	MODERATE	HIGH	VERY HIGH	LOW	MODERATE	HIGH	VERY HIGH
Planning & Design	0	2	0	1	2	0	1	0
Construction	0	2	4	0	4	2	0	0
Operation	0	0	1	0	1	0	0	0
TOTAL	**0**	**4**	**5**	**1**	**7**	**2**	**1**	**0**

10.4.3 AQUATIC IMPACT ASSESSMENT

The bulk of the aquatic impacts identified were in the Construction Phase. However, two VERY HIGH impacts were identified in the Planning and Design phase. These VERY HIGH impacts related to loss of sensitive aquatic habitat and flood attenuation.

Other HIGH impacts identified related to destabilisation of channel banks, changes in fluvial geomorphology, hydrology, changes in water quantity and the impact on fish species. A positive impact identified during the Operational Phase related to a possible improvement in water quality downstream of the proposed Zalu Dam.

All HIGH and VERY HIGH pre-mitigation impacts can be reduced through the recommended mitigation measures to LOW or MODERATE post-mitigation impacts.

Table 10-5. Impact Assessment for impacts identified by the Aquatic Impact Assessment.

	PRE-MITIGATION				POST-MITIGATION			
	LOW	MODERATE	HIGH	VERY HIGH	LOW	MODERATE	HIGH	VERY HIGH
Planning & Design	0	3	1	2	3	3	0	0
Construction	5	7	4	0	13	3	0	0
Operation	2	5(+1)	2	0	6	3(+1)	0	0
TOTAL	**7**	**15(+1)**	**7**	**2**	**22**	**9(+1)**	**0**	**0**

10.4.4 HERITAGE IMPACT ASSESSMENT

The Heritage Impact Assessment only identified impacts in the Planning and Design and Construction Phases of development.

Pre-mitigation impacts identified were rated as MODERATE, with one HIGH impact in the construction phase. The HIGH impact relates to damage of potential heritage features. All impacts can be reduced using the recommended mitigation measures to MODERATE/LOW post-mitigation impacts.

Table 10-6. Impact Assessment for impacts identified by the Heritage Impact Assessment.

	PRE-MITIGATION				POST-MITIGATION			
	LOW	MODERATE	HIGH	VERY HIGH	LOW	MODERATE	HIGH	VERY HIGH
Planning & Design	0	1	0	0	1	0	0	0
Construction	0	1	1	0	1	1	0	0
Operation	0	0	0	0	0	0	0	0
TOTAL	**0**	**2**	**1**	**0**	**2**	**1**	**0**	**0**

10.4.5 PALEONTOLOGICAL IMPACT ASSESSMENT

Only one paleontological impact was identified in the Construction Phase. This impact was rated as MODERATE and can be reduced using the recommended mitigation measure to a LOW post-mitigation impact.

Table 10-7. Impact Assessment for impacts identified by the Paleontological Impact Assessment.

	PRE-MITIGATION				POST-MITIGATION			
	LOW	MODERATE	HIGH	VERY HIGH	LOW	MODERATE	HIGH	VERY HIGH
Planning & Design	0	0	0	0	0	0	0	0
Construction	0	1	0	0	1	0	0	0
Operation	0	0	0	0	0	0	0	0
TOTAL	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**

10.4.6 SOCIAL IMPACT ASSESSMENT

An analysis of the distribution of impacts in the Social Impact Assessment illustrated that the bulk of the mitigation effort should be placed on the Construction Phase as this is the highest impacting phase.

The VERY HIGH negative pre-mitigation impact identified relates to disturbance of grave sites along the pipeline route. This impact is HIGH even after mitigation.

HIGH negative pre-mitigation impacts relate to the increase and spread of HIV/AIDS, increased demand on existing infrastructure, reduced safety of residents in the study area and the risk of drowning in the Zalu Dam.

VERY HIGH and HIGH positive impacts relate to the stimulation of economic growth through possible spin off economic opportunities, employment of local labour, supporting local businesses and skills training opportunities.

Table 10-8. Impact Assessment for impacts identified by the Social Impact Assessment.

	PRE-MITIGATION				POST-MITIGATION			
	LOW	MODERATE	HIGH	VERY HIGH	LOW	MODERATE	HIGH	VERY HIGH
Planning & Design	0	2	(+1)	1	1	1	1(+1)	0
Construction	0	5(+2)	4	0	3	3(+1)	(+3)	(+1)
Operation	1	(+1)	1	(+1)	1	1	(+1)	(+1)
TOTAL	**1**	**7(+3)**	**5(+1)**	**1(+1)**	**5**	**5(+1)**	**1(+5)**	**(+2)**

10.4.7 NO-GO IMPACT ASSESSMENT

The negative impacts identified when assessing the NO-GO alternative related to communities in the project area (possibly 32 800 households) not having sufficient access to potable water. Socio-economic development in the study area would also be inhibited.

Positive impacts identified from the NO-GO alternative relate to the preservation of the existing vegetation and wildlife and agricultural/grazing land if the LRWSS does not go ahead.

Table 10-9. Impacts associated with the NO-GO alternative

	PRE-MITIGATION				POST-MITIGATION			
	LOW	MODERATE	HIGH	VERY HIGH	LOW	MODERATE	HIGH	VERY HIGH
TOTAL	**(+1)**	**1**	**1 (+2)**	**0**	**(+1)**	**1**	**1 (+2)**	**0**

10.5 Overall site sensitivity

The entire site has been assessed by various specialists, and this information has been analysed spatially and then used to inform the most environmentally acceptable layout for the water supply scheme. This layout will be based on an overall sight rate of **LOW** sensitivity with small localised areas of **MODERATE** and **HIGH** sensitivity (refer to sensitivity maps in Chapter 8). The final layout will be based on the sensitivity maps and impacts and mitigation measures identified throughout the process.

11 CONCLUSIONS AND RECOMMENDATIONS

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(m) A description of any assumptions, uncertainties and gaps in knowledge;
(n) A reasoned opinion as to whether the 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;
(o) An environmental impact statement which contains–
(i) A summary of the key findings of the environmental impact assessment; and
(ii) A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives.

In line with the above-mentioned legislative requirement, this Chapter of the LRWSS EIR provides the EAP's opinion as to whether or not the activity should be authorised and the reason(s) for this opinion. This chapter also includes an Environmental Impact Statement which summarises the environmental impact assessment findings. The various alternatives investigated in this report are also summarised below.

11.1 Description of Proposed Activity

The LRWSS has been under consideration since the 1970's when it was recommended that a regional water supply scheme based on a dam on the Xura River and a main bulk supply reservoir close to Lusikisiki would provide potable water for the entire region between Lusikisiki and the coast, extending from the Mzimvubu River in the south west to the Msikaba River in the north east. Some areas up to 15 km inland of Lusikisiki would also be supplied.

The proposed water supply scheme consists of the following components:

- Construction of the Zalu Dam on the Xura River
- Upgrade of the Lusikisiki water treatment works
- Possible upgrade of the abstraction weir on the Xura River
- Upgrade of pump station
- Upgrade and expansion of bulk distribution infrastructure
- Groundwater abstraction and reticulation

11.2 Assumptions, Uncertainties and Gaps

The following assumptions have been made during the EIA process:

- The information provided by DWS and their respective consultants (AECOM) is assumed to be correct.
- The layout provided by DWS is preliminary, and will undergo changes in response to the recommendations contained in this report.

11.3 Environmental Impact Statement

The HIGH and VERY HIGH negative impacts that were identified are summarised in Table 11.1 below. The majority of these impacts can be reduced through the recommended mitigation measures to LOW or MODERATE post-mitigation impacts.

Table 11-1: High and Very High pre-mitigation impacts identified.

Issue	Impact
Compliance with relevant environmental legislation and policy	• Failure to adhere to existing policies and legal obligations could lead to the project conflicting with local, provincial and national policies, legislation etc. This could result in a lack of institutional support for the project, overall project failure or delays in construction and undue disturbance to the natural environment.
Stormwater Management and Erosion	• Inadequate planning for stormwater management at any construction site could result in damage, pollution and potential flooding of the site.
Management of general waste	• Inappropriate planning for management and disposal of waste e.g. storage and disposal, could result in surface and ground water contamination.
Alien and invasive plants	• During construction, unnecessary disturbance of areas within the site could increase the risk of spreading noxious weeds, invasive and alien plants. • During the operational phase, failure to monitor rehabilitation initiatives post construction, can lead to infestation by alien plant species.
Loss of sensitive areas	• Sensitive areas (scarp forest, riparian areas and wetlands) in the planned inundation area will be completely lost.
Loss of sensitive aquatic habitat	• During the planning and design phase the inadequate assessment of the planned route of pipelines, positioning of the dam, and the compilation of the dam operating rules could lead to widespread degradation and loss of potentially sensitive aquatic habitats in both the inundation area, downstream of the dam and along pipeline routes.
Flood attenuation	• During the planning and design phase failure to account for the 1:100 year flood event may compromise the integrity of the bridge structure.
Changes to fluvial geomorphology	• Insufficient planning for erosion prevention along the banks of the river alongside the Palmerton bridge structure will result in erosion that may eventually impair the safety of the structure.
Disturbance of grave sites	• During the planning and design phase inappropriate routing of the pipeline could result in disturbance of grave sites.
Heritage features	• During construction there is a risk of damage to potential heritage features.
Visual intrusion (Zalu Dam construction)	• Visual disturbance of the landscape during construction caused by the construction activity on site, and the presence and use of large machinery on site and along access routes.
Fire	• During the construction phase, runaway fires from cooking or other activities in the construction camp might lead to the burning of surrounding vegetation and threaten the local community.
Disturbance to surrounding vegetation and fauna	• During construction an influx of contractor staff could result in poaching of wild animals.
	• During construction inappropriate disturbance beyond the development/construction footprint could result in excessive damage and loss of vegetation/fauna.
Disturbance of sensitive aquatic areas	• During construction unnecessary disturbance caused by construction of the dam wall, reticulation pipelines and access roads could result in erosion and degradation of water courses and associated riparian habitats.
Soil erosion and environmental degradation due to poor rehabilitation	• During construction clearing and excavation will result in exposed soil. If not rehabilitated, this may result in severe topsoil erosion, bank destabilisation, downstream sedimentation and colonisation by invasive alien plant species.
Channel banks and soils	• During construction of the dam wall construction activities could result in localised erosion and jeopardise bank stability. Associated vegetation removal could destabilise banks.
Water quantity	• During construction of the dam impeding the existing flow of the river will result in the degradation of the aquatic environment downstream of the dam, essentially halting all of the ecosystem functions that the river plays.
Hydrology	• During construction of the bridge and pipelines, coffer dams have the

	potential to permanently change the flow dynamics in a river, exacerbating scour and enhancing sedimentation. Both of these changes can impact negatively on the aquatic ecosystem.
Influx of job seekers	• During construction there may be increased risk of the spread of HIV/AIDS and other communicable diseases.
Stimulation of economic growth	• During the construction phase, if proper labour recruitment practices are not used and the use of local resources is not prioritised the project may garner negative sentiment with local communities.
Impact on health and general quality of life	• During the construction phase there could be an increased demand on existing infrastructure facilities and social services.
	• During the construction phase, the safety of local community members could be reduced as a result of high vehicle activity and potential run-away fires (resulting in injuries).
Maintenance	• During the operational phase, insufficient maintenance of pipelines could result in damage to the pipeline and leaks.
Impact on fish species	• During the operational phase there could be reduced breeding success of the Transkei barb, a new species. The number of spawning events could also be reduced by the capture of the high flow events by the dam.
	• During the operational phase the dam wall and reduction in flow may disrupt the normal migratory behaviour of eels.
Impact on health and general quality of life	• During the operational phase the unusual presence of a large water body may pose a drowning risk.

11.4 Consideration of Alternatives

11.4.1 Zalu Dam alternative

Location

A number of investigations have been undertaken since the 1970's to determine the best position of the proposed dam. The preferred dam site is located where the water resources of the Xura River could be developed as a reliable source for meeting estimated water requirements of the study area. Construction materials are readily available close to the preferred site. In light of the considerable amount of work already undertaken to determine the position of the proposed dam, no location alternatives were considered in this EIR.

Size

The preferred dam size is a 1.5 MAR dam with a FSL of 622.6 masl. This dam size will accommodate a larger population than a 0.6 MAR dam. The environmental impacts associated with a 1.5 or 0.6 MAR dam are the same. Only a 1.5 MAR dam was assessed in the EIR.

Dam Type

The preferred dam type, based on availability of construction materials and cost implications is an Earth Core Rockfill (ECR) Dam. This is the only dam type that was assessed in the EIR.

The Zalu Dam alternatives are deemed environmentally acceptable based on the findings in this report provided that the mitigation measures recommended in the general and specialist impact assessments are considered and implemented.

11.4.2 Pipeline alternatives

Layout

The preferred pipeline layout alternative (based on the feasibility study) is to decommission the existing pipelines and build a new extended system in its place which will follow the same routes of the original system as well as spread out further.

Technology

Three technology alternatives for the proposed pipelines were assessed in this EIR, i.e. buried pipelines (trenching), above ground pipelines and trenchless buried pipelines (horizontal directional drilling).

The pipeline alternatives are deemed environmentally acceptable provided that the mitigation measures recommended in the general and specialist impact assessments (particularly the Aquatic Report) are considered and implemented.

11.4.3 Reservoir alternatives

The preferred reservoir layout alternative (based on the feasibility study) is refurbishment of the existing reservoirs with additional new storage reservoirs. Only this reservoir layout alternative was assessed in this EIR.

The reservoir alternative is deemed environmentally acceptable provided that the mitigation measures recommended in the general and specialist impact assessments are considered and implemented.

11.4.4 Water Treatment plant alternative

The preferred water treatment plant (WTP) layout alternative (based on the feasibility study) is the refurbishment of the existing WTP and construction of a new WTP adjacent to the existing facility. Only this WTP layout alternative was assessed in this EIR.

The WTP alternative is deemed environmentally acceptable provided that the mitigation measures recommended in the general and specialist impact assessments are considered and implemented.

11.4.5 The NO-GO or no development option

The No-Go option would mean abandoning the proposed development with the following implications:

- Lack of socio-economic development in the study area.
- Communities in the study area (approximately 32 800 households) will not have access to potable water.

11.5 Opinion of the EAP

Although a number of significant impacts are associated with the proposed LRWSS and associated infrastructure, it is the professional opinion of EOH CES and the specialists that:

- The vast majority of environmental impacts identified can be adequately mitigated to reduce the impacts to an acceptable level, provided mitigation measures recommended in this report are implemented and maintained throughout the life of the project.
- The implementation of mitigation measures and recommendations must be consistently monitored by an independent Environmental Control Officer (ECO) during construction.

- The recommendations made by all specialists and the EAP in the EMPr (Appendix D) must be implemented.
- The information in the report is sufficient to allow DEA to make an informed decision.

It is the opinion of EOH Coastal & Environmental Services (EOH CES) that NO FATAL FLAWS are associated with the proposed LRWSS.

11.6 Recommendations of the EAP

It is the opinion of EOH CES that the proposed development should be approved provided that appropriate mitigation measures are implemented and that the Environmental Management Programme (EMPr) is implemented, maintained and adapted to incorporate relevant legislation, standard requirements and audit reporting, throughout the life of the LRWSS project.

The mitigation measures for all impacts identified in the EIA are provided in the detailed impact assessment in Appendix B and have been incorporated into the EMPr (Appendix D).

The EMPr must be implemented by the relevant parties during all phases of development of the project i.e. Planning & Design, Construction and Operational phase.

Inclusions, additions and adaptations of the EMPr, as well as all final plan drawings and maps must be submitted to DEA (Pretoria) for final approval.

11.7 Recommended mitigation measures

11.7.1 Planning and design phase

Table 11-2: Planning and design phase mitigation measures.

GENERAL MITIGATION MEASURES	
Activity/Issue	***Specification***
Compliance with relevant environmental legislation and policy	• Ensure that all relevant legislation and policy is consulted and further ensure that the project is compliant with such legislation and policy. • These should include (but are not restricted to): Local and District Spatial Development Frameworks, Eastern Cape Biodiversity Conservation Plan (ECBCP), Local Municipal bylaws. • In addition, planning for the construction and operation of the proposed water supply scheme should consider available best practice guidelines. • All legal matters pertaining to permitting must be completed prior to construction.
Traffic and transport	• Project planning should include a plan for traffic control that will be implemented, especially during the construction phase of the dam and associated infrastructure. • Careful planning of the routes taken by heavy vehicles must highlight areas of road that may need to be upgraded in order to accommodate these vehicles. Once identified, these areas must be upgraded if necessary. • One of the areas that will likely require upgrading is the bridge near Palmerton Mission. This will also require a WULA.
Visual intrusion	• During the planning and design phase, any buildings or structures should be painted, tiled, etc. using neutral colours such as grey, beige or dark green (roof only). • The planning and design phase should, where possible, plan for buildings and structures to be constructed in low lying areas to reduce their visual intrusion on the surrounding landscape. • The planning and design of the Zalu Dam wall should include a plan for grassing large barren areas of the dam wall and planting trees to screen the dam wall from nearby dwellings. • Ensure that plans are made to replant indigenous vegetation (that is removed during the construction phase) nearby to reduce the effect of vegetation removal on the aesthetic quality of the inundation area.

Loss of land due to Zalu Dam construction	• An alternative site for the existing foot path must be planned around the inundation area. The local community must be consulted to assist in deciding on a new position for the footpath.
Impact of proposed layout on sensitive environments	• Sensitive environments described in the EIA must be taken into account when planning the route of infrastructure. • For example, a 20 m buffer should be kept between the edge of a grave and the edge of the pipeline.
SPECIALIST MITIGATION MEASURES	
Activity/Issue	***Specification***
Loss of indigenous and sensitive vegetation	• All species of special concern, protected or vulnerable must be avoided or transplanted. • The existing roads must be utilised for access. • New access roads must only be constructed if there is no alternative, and the width of existing roads and tracks must be kept to a minimum. • Where feasible the pipeline must be located in areas that are already impacted on and degraded. • A relocation and search and rescue plan for sensitive plant species must be developed. • Existing roads must be used where feasible; • Align roads and pipelines within a single corridor and keep this as narrow as feasible; • Where practical and feasible, avoid locating linear infrastructure (such as roads and pipelines) through areas of high and moderate sensitivity. • Where feasible, avoid locating the pipeline and access road alongside streams and wetlands.
Loss of sensitive areas	• A relocation and search and rescue plan for sensitive plant and animal species must be developed. • Consideration should be given to establishing a possible conservation area near the inundation area for relocated plant species (for e.g. Scarp forest).
Loss of sensitive aquatic habitat	• Planning of the location and routing of infrastructure must be undertaken with suitable regard for the environment. • Suitably qualified specialists MUST be consulted during the planning and design phase.
Scheduling of construction	• Wherever possible, construction activities must be undertaken during the driest part of the year to minimize downstream sedimentation due to excavation, etc. • When not possible, suitable stream diversion structures must be used to ensure that rivers/streams are not negatively impacted by the activity
Changes to fluvial geomorphology	• Ensure that scour countermeasures are incorporated into the design of the bridge • Adequate bank stabilisation measures must be incorporated into the design of the bridge.
Flood attenuation	• The bridge must be designed to accommodate the risks associated with the 1:100 flood wherever possible • Flood attenuation plans must be drawn up by a qualified engineer and approved by DEA and DWS.
Destruction of heritage features due to incorrect placement of pipelines and associated infrastructure	• The recommendations of the Heritage specialist must be considered in the routing of the pipeline and associated infrastructure. • For example, a 20 m buffer should be kept between the edge of a grave and the edge of the development footprint.
Loss of land due to Zalu dam construction	• The process for land acquisition by DWS must be conducted through the traditional authorities operating in the areas as they have jurisdiction over land allocations. • Individual land users must be identified and engaged. • Current landowners and land users should be sufficiently compensated. Compensation must be equitable across gender and age.
Disturbance of grave sites	• Pipeline routes need to be planned around grave sites as specified in the Heritage Specialist report (20m buffer around grave sites)

	• The community should be consulted before pipeline routes are established to ensure any grave sites that were not identified in the Heritage Specialist report are identified, mapped and taken into account in the pipeline layout.
Stimulation of economic growth	• DWS should, in their consideration of water use applications, consider the benefit to local communities. • DWS should readily facilitate water use activities that will benefit the community. • Construction camps and settlements can be converted into tourism or recreation facilities • DWS, ORTDM and the LED (Local Economic Development) sector should give consideration to promoting potential economic activities such as aquaculture, tourism, etc.

11.7.2 Construction Phase

Table 11-3: Construction phase mitigation measures.

GENERAL MITIGATION MEASURES	
Activity/Issue	***Specification***
Socio-economic	• During construction all care should be taken to ensure that the ecological reserve volume of water is always released into the river downstream of the dam.
Nuisance dust	• Nuisance dust should be reduced by implementing the following: · o Damping down of exposed areas; o Retention of vegetation where possible; o Excavations and other clearing activities must be restricted to agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas; o Implementing a speed limit of 30km/h on dirt roads; o Attending to complaints emanating from the lack of dust control.
Construction camp	• The ECO must assist in the siting of structures and supervise any bush clearing (although this is not anticipated) for the construction camp. • Construction camp should be fenced to avoid sprawl.
Alien and invasive plants	• Alien plants should be removed from the site through appropriate methods e.g. hand pulling, chemical, cutting, etc. under supervision of the ECO. • Disturbed areas must be rehabilitated.
Fire	• Fire extinguishers should be available on site • There should be no burning of construction waste or debris onsite.
Noise	• Machinery that causes noise must only be operated at appropriate times (during the day and at normal working hours).
Stormwater management	• Stormwater control measures must be implemented to avoid soil erosion and siltation of drainage lines.
Soil erosion	• Vegetation must be retained where possible to avoid soil erosion. • If slopes are cleared during construction, these must be rehabilitated as soon as possible to minimize soil erosion losses using local indigenous vegetation.
Management of general waste	• Littering must be avoided and litter bins must be made available at various strategic points on site. Refuse from the construction site must be collected on a regular basis and deposited at an appropriate landfill site. • The ECO should monitor the neatness of the work sites as well as the Contractor campsite.
Hazardous substances	• The storage of fuels and hazardous materials must be located away from sensitive water resources. • All hazardous substances (e.g. diesel, oil drums, etc.) must be stored in a bunded area or other secured areas. • Stormwater control measures must be implemented during construction.
Management of construction waste	• All construction materials must be stored in a central and secure location with controlled access and an appropriate impermeable surface. • All excess waste must be disposed of at an appropriately licensed landfill site. • Stormwater control measures must be implemented to mitigate the risk of

	runoff water causing pollution.
SPECIALIST MITIGATION MEASURES	
Activity/Issue	***Specification***
Loss of sensitive vegetation during construction	• All species of special concern, protected or vulnerable must be avoided or transplanted. • The existing roads must be utilised for access. • New access roads must only be constructed if there is no alternative, and the width of existing roads and tracks must be kept to a minimum width. • In the unlikely event that a protected tree species needs to be removed, a permit to do so must be obtained from DAFF. • Laydown areas and turning areas must be located in areas that have already been impacted or show evidence of degradation. The ECO must identify such areas. • The servitude of the pipeline must be kept to a minimum. • Where feasible the pipeline must be located in areas that are already impacted on and degraded. • Rehabilitation of the disturbed areas and the remaining stockpiles (if any) must take place immediately after construction. • Topsoil must be stockpiled separately to sub soil. • The dam site must be surveyed and the pipeline route should be surveyed prior to construction during spring and mid-summer in order to locate protected geophytic plant species and transplant them in the neighbouring environment. • During excavations for the dam foundation, a search and transplant of species of special concern found in the topsoil layer must be undertaken
Disturbance to surrounding vegetation and fauna	• Restrict construction activities to post-dawn and pre-dusk. • Construction must be undertaken in the shortest time practical • All staff employed during construction must sign a daily register. • Construction workers should be cautioned against poaching. • No construction residence may be set up on site. • An independent ECO must inspect the immediate vegetation for evidence of snares. • Construction activities must be demarcated and vegetation clearing and top soil removal limited to these areas. • Dense vegetation that resembles Thicket or Forest must not be removed. In cases where this is unavoidable the ECO must be consulted and an assessment of the vegetation must be undertaken. • No construction must be undertaken in an area demarcated in this report as a sensitive area, or its associated buffer, unless authorised by an independent ECO. • Construction activities must be limited to delineated development areas.
Disturbance of sensitive aquatic areas	• Construction through watercourses must only take place where necessary and must occur within the smallest possible construction footprint. • Construction through watercourses must preferably take place during the dry season, and must immediately be followed by erosion stabilisation and re-vegetation.
Soil erosion and environmental degradation due to poor rehabilitation	• Implement a rehabilitation programme. • Monitor success of re-vegetation. Success is considered achieved when there is 80% or more vegetation cover.
Channel banks and soils	• No concrete mixing will take place within 32m of the river bank • A serviced CO_2 fire extinguisher should be available on site in the event that wet concrete is accidentally spilled into the river • During construction, all care should be taken to ensure that the ecological reserve volume of water is always released into the river downstream of the dam site.
Channel banks and soils	• Construction activities should take place during the driest season

Sedimentation	• The river must be diverted away from areas where excavation within the inundation area is to take place. • Excavation should take place in the drier months of the year in order to limit the influence of stormwater on the mobilization of sediment. • If necessary, stabilize berms must be used to prevent stormwater from carrying sediment into the existing river channel.
Water quantity	• During construction, all care must be taken to ensure that the ecological reserve volume of water is always released into the river downstream of the dam site.
Water quality	• No concrete mixing will take place within 32m of the river bank. • A serviced CO2 fire extinguisher (for releasing carbon dioxide gas into the affected area to neutralize pH levels) should be available on site in the event that wet concrete is accidentally spilled into the river. • No machinery should be parked overnight within 50 m of a watercourse. • All stationary equipment must be equipped with a drip tray to retain any oil leaks. • Monitors should be stationed 50 m upstream and downstream of the crossing site on a flowing stream. They should be trained to observe and identify bentonite releases, and have the equipment capacity to rapidly relay information to the drilling team. • Appropriate containment measures must be implemented to minimise the further release of slurry into the watercourse • The pressure levels of the lubricating slurry must be closely monitored while drilling is in progress, as a rapid or sudden loss of pressure could indicate a potential release of slurry into a fracture. • Excavation/trenching should take place during the driest season. • Where possible, silt fences must be installed to collect sediments mobilized during construction. • Banks must be monitored for signs of erosion, and measures must be taken to minimize the erosion as soon as possible. • Pipe bridge pilings should not be placed on stream banks wherever possible. Where this is not possible, ensure that appropriate sediment collection measures are put in place.
Riparian vegetation	• Removal of riparian vegetation should take place under the supervision of the ECO. • Removal of the alien invasive vegetation should be prioritised. • Banks should be artificially stabilised as soon as possible if significant riparian vegetation is removed.
Hydrology	• Coffer dams during bridge construction must not be left in place for longer than 30 days. • All work within the river should be completed during the dry season, when flows are at their lowest. • Water in the river must be allowed to pass downstream of the construction. If necessary this should be achieved via a temporary diversion – this should not be in place for more than 30 days. • Coffer dams must not be left in place for longer than 30 days.
Destruction of underlying fossils	• The ECO must be informed of the possibility that trace fossils might be exposed on the bedding planes of the Ecca Group shales during deep excavations for the construction of the Zalu Dam wall and spillway. • If fossils are recorded the palaeontologist, ECPHRA and SAHRA must be notified and the fossils recorded according to SAHRA specification.
Damage to heritage features	• If any graves/heritage features are damaged during construction then construction must stop immediately. • It must be reported to the ECO, Heritage Specialist and SAHRA. • If human graves are uncovered during construction then all activity must stop immediately. • The police and ECPHRA must to be notified immediately. • If any other archaeological artefacts are uncovered during construction then construction must stop and these should be reported to the ECO, Heritage Specialist and SAHRA/ECPHRA immediately.

Influx of job seekers	• A project steering committee consisting of the DWS, contractor (community liaison person), recruitment agency, community leaders, elders, youth, ward councillors and the IHLM LED (Local Economic Development) must be established in order to: o Conduct an audit of the affected communities in terms of employment capacity o Identify potential workers from the affected communities o Identify possible conflicts in and between communities o Recommend support programmes that would assist with conflict minimisation and resolution • The following are mitigation measures for crime: o Support the Traditional Authorities role of exerting control over land allocation in order to prevent densification of people around the construction areas. o The DWS and contractor must encourage settlement in Lusikisiki by providing daily transport for "outside" workers who settle in the town of Lusikisiki, to and from the construction to minimise the potential crime factor in the rural areas. o All construction workers must be clearly identifiable and wear easily recognisable uniforms. They need to carry identification cards issued by the contractor. o Ensure that the SAPS has access to construction sites o Encourage the local communities to report suspicious activity to the community liaison or nearest environmental site officer. o The contractor must prevent loitering around the construction camp by providing transport to and from the camp sites. o All construction and camp sites must be fenced and secure. • Mitigation measures for increased prostitution and sexual behaviour: o Support national and local awareness programmes that discourage promiscuity, especially at schools in the project area. o Ensure that condoms are easily accessible to all construction workers. • HIV/AIDS (non-discrimination, awareness, prevention and health care support) policy must be implemented. • Condoms must be easily accessible to all construction workers. • Develop and implement a HIV/AIDs education and behaviour change programme for all contracted construction workers. This must extend to the communities located near the construction site. • Existing public health care centres and programmes such as TAC must be involved in the HIV/AIDS campaigns. The HIV/AIDS prevalence must be monitored through these agencies. • Voluntary counselling and testing must be encouraged for all workers. • DWS is limited in its capacity to enhance the benefits of this impact. The proponent must link the Provincial Department of Economic Development and Local Municipal LED (Local Economic Development) programmes with small to medium enterprises (including communities) in the area so that a state of "readiness" to optimise economic benefits is achieved. This may involve training in the following sectors: business, tourism, catering etc.
Stimulation of economic growth	• Equal job opportunities for women and men must be promoted. • Employment must be managed by a recruitment agency/office that uses a selection system that ensures recruitment of semi and unskilled workers from all local, impacted communities in accordance with recent government policies related to local procurement. • Where appropriate, employees involved in the construction phase should be incorporated in the permanent maintenance staff for the operational phase; and • Particular attention must be paid to employment opportunities for women and disabled persons. • Negotiate employment charter with LM before start of construction. • The proponent must ensure that the principal of utilising local business resources (suppliers and SMMEs) in accordance with recent government

	policies related to local procurement forms part of the procurement specifications. Examples of local business resources that must be considered: ○ Catering services ○ Transport services ○ Quarries/borrow pits (where necessary) ○ Small civils ○ Accommodation ○ Security ○ Hygiene services ○ Fencing • Implement a skills development programme which includes training in business, project management, monitoring and evaluation.
Impact on health and general quality of life	• DWS should promote awareness of the project (with LMs, Department of Health, SAPS, etc.) and the potential pressure to provide services for new households. • Regularly monitor the schools and clinics in order to determine whether there are sufficient resources. When resources are deemed insufficient, DWS must communicate with the relevant departments for assistance. • Mitigation measures for noise and dust: ○ Noise and dust prevention measures must be implemented. ○ Dust along access roads must be monitored. ○ Ensure that communities have an easy grievance reporting mechanism, e.g. through a project steering or liaison committee • Mitigation measures for traffic safety: ○ Develop and inform all affected communities of the formal construction routes. ○ All vehicle operators and drivers must undergo regular training, clearly outlining the high safety risk to local rural communities ○ Erect signage making communities aware of the high safety risk due to heavy construction vehicles on the road. ○ Traffic calming devices such as speed bumps must be considered on rural access roads. • Mitigation measures for fire safety: ○ No fires must be lit outside construction camps. ○ Fires that are lit must be in a contained area. The fire must be monitored for cinders and extinguished when no longer needed. ○ Firefighting equipment must be stored onsite ○ The construction campsite must be surrounded by a firebreak. ○ Fire risks must form part of the construction worker training.

11.7.3 Operational Phase

Table 11-4: Operation phase mitigation measures.

GENERAL MITIGATION MEASURES	
Activity/Issue	***Specification***
Visual intrusion	• During the operational phase, the vegetation that has been planted (grassing and/or trees) must be maintained and rehabilitated if necessary. • During the operational phase, the associated infrastructure must be maintained and must adhere to the planning and design phase associated infrastructure aesthetic control recommendations. • During the operational phase, the replanted indigenous vegetation in the offset area should be maintained.
Socio-economic	• The dam operating rules must stipulate that the ecological reserve volume is released at all times.
Maintenance	• Pipelines MUST be regularly monitored for leaks. If these are identified immediate actions must be taken to repair leaks. • Regular maintenance and inspections of pipelines should take place.
Hazardous chemical storage	• All hazardous substances must be stored in appropriately secure locations.

Increased stormwater run-off	• Stormwater control measures must be followed.
Waste management	• Ensure there are sufficient containers at all operational facilities available for collecting waste. • No waste must be buried on site. • Waste must be collected on a regular basis and disposed of at a licensed landfill site.
SPECIALIST MITIGATION MEASURES	
Activity/Issue	***Specification***
Alien Vegetation	• Design and Implement an Alien Vegetation Management and Monitoring Plan; • Eradicate alien plants as they appear; and monitor the study area for any new invasive plants. • Alien vegetation must be monitored for at least 6 months after construction has been completed.
Geomorphology	• The dam operating rules must stipulate that there be infrequent but regular releases of water from the lower section of the dam, allowing sediment to move through the system.
Riparian Vegetation	• The dam operating rules must stipulate that there be regular releases of sediment from the dam. • The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.
Fish	• The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.
Macroinvertebrate	• The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.
Hydrology and sediment dynamics	• Pipe bridge pilings on the banks or bed of the watercourse must be designed to limit the effects of scour on the sediment flows in the stream.
Impact on health and general quality of life	• Safe and controlled swimming sites should be developed. • A safety awareness campaign amongst the local community should be undertaken. • Ensure signage of drowning risks is visible in high activity areas such as the river/dam crossing. • The implementation of a swimming programme for local scholars should be considered. • DWS should promote awareness of the project (with LMs, Department of Health, SAPS, etc.) and the potential pressure to provide services for new households.
Stimulation of economic growth	• The proponent is limited in terms of their input regarding the spin-off business opportunities as these depend on investor interest and market demand. However they play a key role in permitting water use activities. DWS should therefore, in their consideration of water use applications, consider the benefit to local communities and ensure that equitable benefits are realised and readily facilitate water use activities that will benefit the community.

12 INFORMATION REQUIRED BY COMPETENT AUTHORITY

In terms of Section 31(2) of the EIA Regulations (2010), an Environmental Impact Assessment Report must include–

(r) Any specific information required by the competent authority;

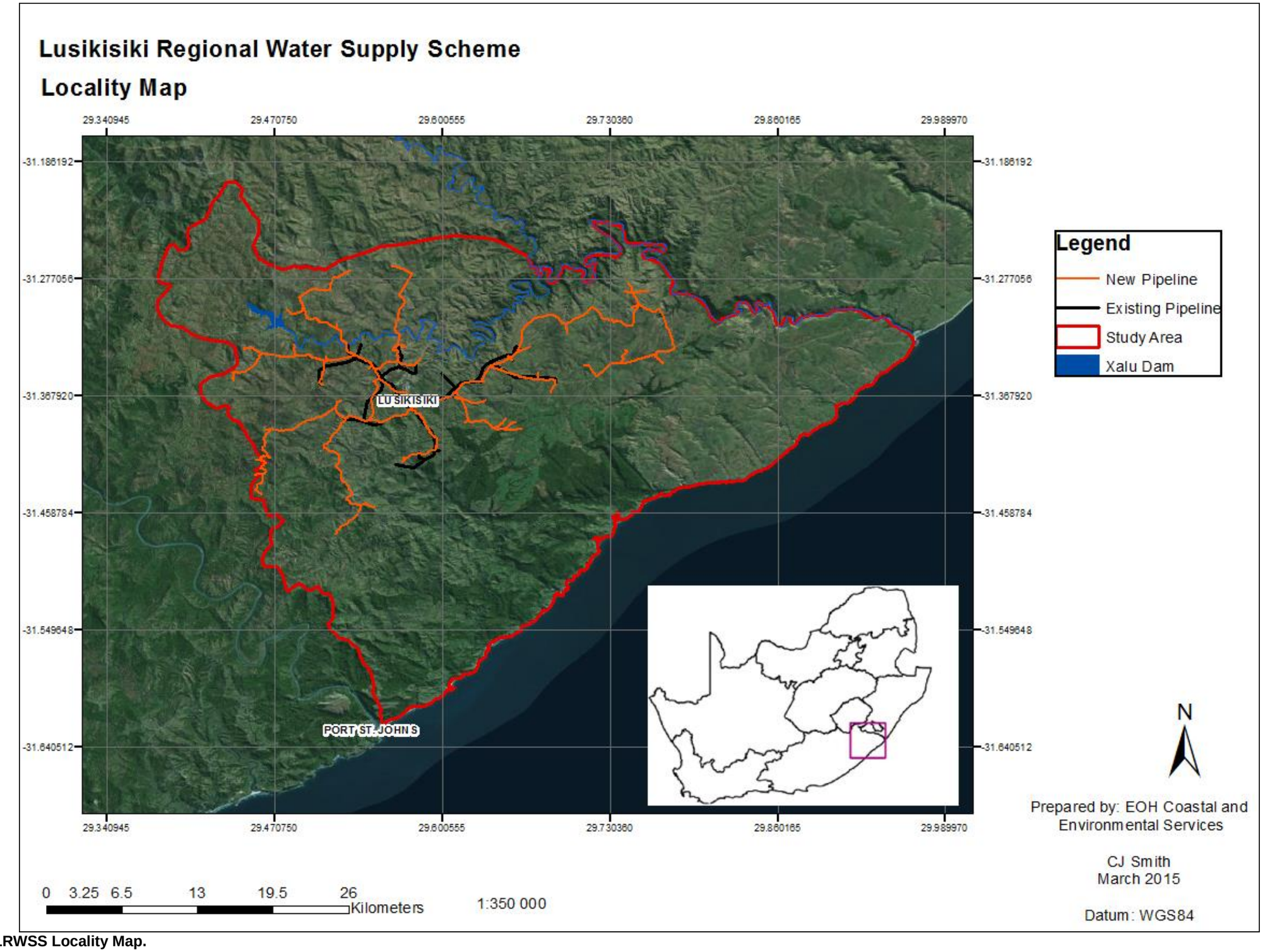


Figure 12-1: LRWSS Locality Map.

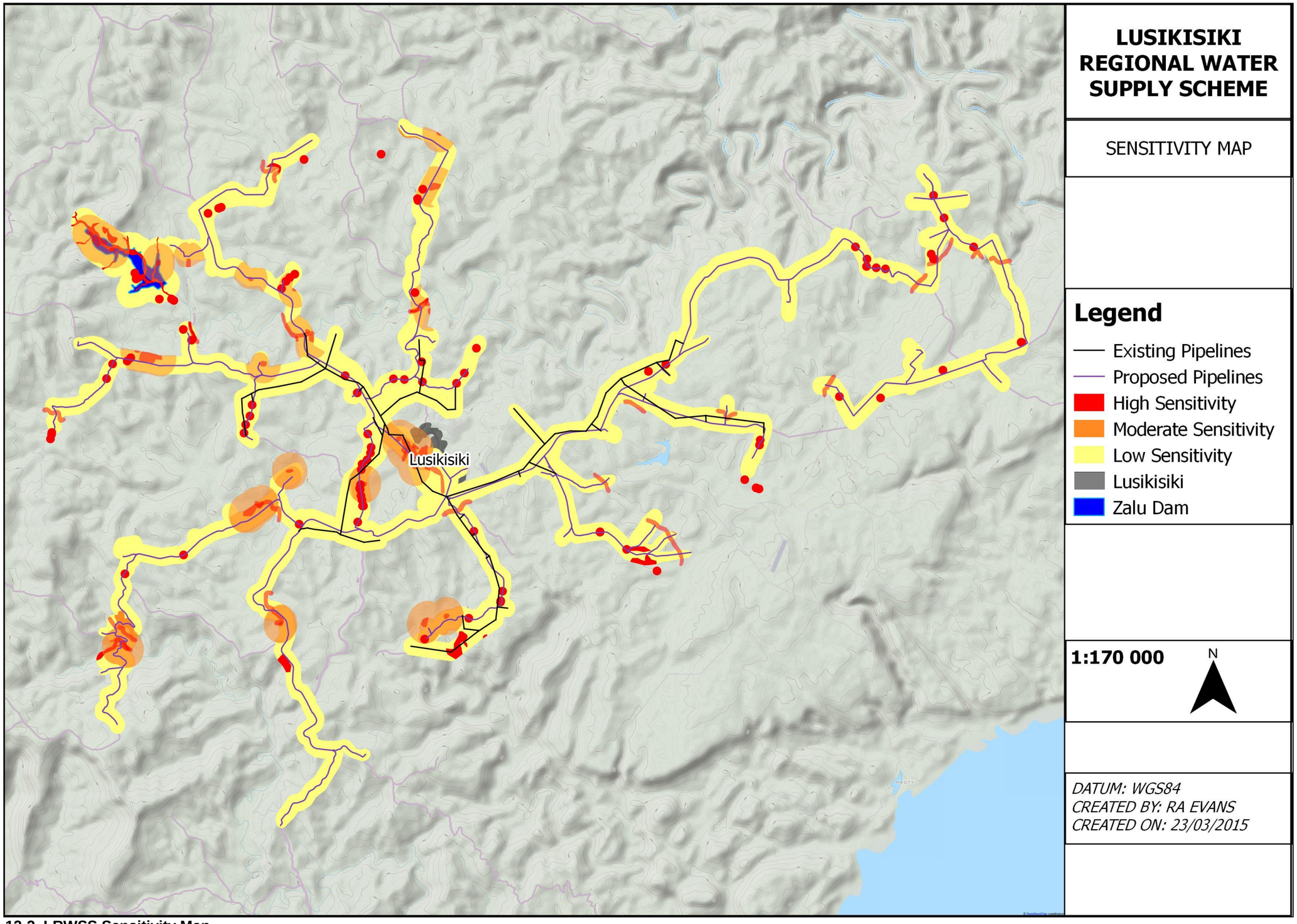


Figure 12-2. LRWSS Sensitivity Map.

13 REFERENCES

Alexander, G. and Marais, J. 2010. A Guide to Reptiles of Southern Africa. Struik Nature, Cape Town.

Barnes, K.N. (ed.). 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.

Branch, W.R. 1998. Field Guide to Snakes and Other Reptiles of Southern Africa. Fully revised and updated to include 83 new species. Struik, Cape Town.

Conservation and Agricultural Resources Act (No. 43 of 1983).

Constitution Act (No. 108 of 1996).

Hazardous Substances Act (No. 15 of 1973).

Integrated Development Plan (2014/2015). Ingquza Hill local Municipality.

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

Mucina, L. & Rutherford, M.C. (eds). 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

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

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

National Environmental Management: Biodiversity Act (No. 10 of 2004).

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

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

National Forests Act (No. 84 of 1998).

National Heritage Resource Act (No. 25 of 1999).

National Road Traffic Act (No. 93 of 1996).

National Water Act (No. 36 of 1998).

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

The Department of Water and Sanitation, 2014. Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme: Main Study Report, P WMA 12/T60/00/4911.

The Department of Water and Sanitation, 2012. Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme: Environmental Screening Report, P WMA 12/T60/00/4711.

The Department of Water and Sanitation, 2014. Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme: Zalu Dam Feasibility Design Report, P WMA 12/T60/00/4511.

The Department of Water and Sanitation, 2013. Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme: Materials and Geotechnical Investigation Report, P WMA 12/T60/00/4411.

The Department of Water and Sanitation, 2014. Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme: Water Distribution Infrastructure Report, P WMA 12/T60/00/4311.

The Department of Water and Sanitation, 2013. Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme: Domestic Water Requirements Report, P WMA 12/T60/00/4111.

The Department of Water and Sanitation, 2013. Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme: Assessment of Augmentation from Groundwater Report, P WMA 12/T60/00/3811.

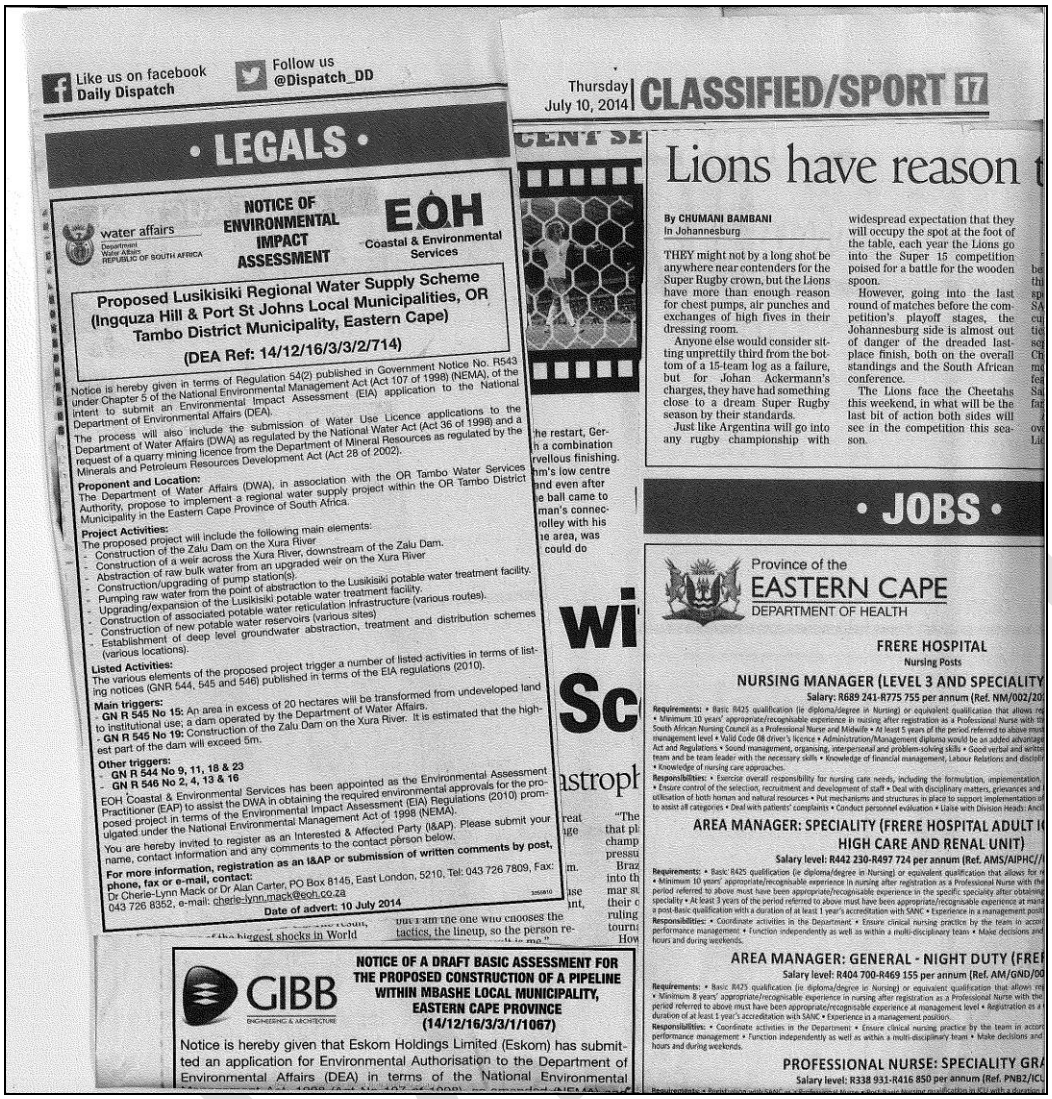
The Department of Water and Sanitation, 2014. Feasibility Study for the Augmentation of the Lusikisiki Regional Water Supply Scheme: Intermediate Preliminary Reserve Determination Report, P WMA 12/T60/00/3911.

StatsSA (http://www.statssa.gov.za/).

14 APPENDICES

14.1 Appendix A: Public Participation Documents

14.1.1 Newspaper advert:



Like us on facebook Daily Dispatch
Follow us @Dispatch_DD

Thursday July 10, 2014 | CLASSIFIED/SPORT 17

• LEGALS •

water affairs
Department Water Affairs REPUBLIC OF SOUTH AFRICA

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT

EOH Coastal & Environmental Services

Proposed Lusikisiki Regional Water Supply Scheme (Ingquza Hill & Port St Johns Local Municipalities, OR Tambo District Municipality, Eastern Cape)

(DEA Ref: 14/12/16/3/3/2/714)

Notice is hereby given in terms of Regulation 54(2) published in Government Notice No. R543 under Chapter 5 of the National Environmental Management Act (Act 107 of 1998) (NEMA), of the intent to submit an Environmental Impact Assessment (EIA) application to the National Department of Environmental Affairs (DEA).

The process will also include the submission of Water Use Licence applications to the Department of Water Affairs (DWA) as regulated by the National Water Act (Act 36 of 1998) and a request of a quarry mining licence from the Department of Mineral Resources as regulated by the Minerals and Petroleum Resources Development Act (Act 28 of 2002).

Proponent and Location:
The Department of Water Affairs (DWA), in association with the OR Tambo Water Services Authority, propose to implement a regional water supply project within the OR Tambo District Municipality in the Eastern Cape Province of South Africa.

Project Activities:
The proposed project will include the following main elements:
- Construction of the Zalu Dam on the Xura River
- Construction of a weir across the Xura River, downstream of the Zalu Dam.
- Abstraction of raw bulk water from an upgraded weir on the Xura River
- Construction/upgrading of pump station(s).
- Pumping raw water from the point of abstraction to the Lusikisiki potable water treatment facility.
- Upgrading/expansion of the Lusikisiki potable water treatment facility.
- Construction of associated potable water reticulation infrastructure (various routes).
- Construction of new potable water reservoirs (various sites)
- Establishment of deep level groundwater abstraction, treatment and distribution schemes (various locations).

Listed Activities:
The various elements of the proposed project trigger a number of listed activities in terms of listing notices (GNR 544, 545 and 546) published in terms of the EIA regulations (2010).

Main triggers:
- **GN R 545 No 15:** An area in excess of 20 hectares will be transformed from undeveloped land to institutional use; a dam operated by the Department of Water Affairs.
- **GN R 545 No 19:** Construction of the Zalu Dam on the Xura River. It is estimated that the highest part of the dam will exceed 5m.

Other triggers:
- **GN R 544 No 9, 11, 18 & 23**
- **GN R 546 No 2, 4, 13 & 16**

EOH Coastal & Environmental Services has been appointed as the Environmental Assessment Practitioner (EAP) to assist the DWA in obtaining the required environmental approvals for the proposed project in terms of the Environmental Impact Assessment (EIA) Regulations (2010) promulgated under the National Environmental Management Act of 1998 (NEMA).

You are hereby invited to register as an Interested & Affected Party (I&AP). Please submit your name, contact information and any comments to the contact person below.

For more information, registration as an I&AP or submission of written comments by post, phone, fax or e-mail, contact:
Dr Cherie-Lynn Mack or Dr Alan Carter, PO Box 8145, East London, 5210, Tel: 043 726 7809, Fax: 043 726 8352, e-mail: cherie-lynn.mack@eoh.co.za

Date of advert: 10 July 2014

Lions have reason t

By CHUMANI BAMBANI
In Johannesburg

THEY might not by a long shot be anywhere near contenders for the Super Rugby crown, but the Lions have more than enough reason for chest pumps, air punches and exchanges of high fives in their dressing room.

Anyone else would consider sitting unprettily third from the bottom of a 15-team log as a failure, but for Johan Ackermann's charges, they have had something close to a dream Super Rugby season by their standards.

Just like Argentina will go into any rugby championship with widespread expectation that they will occupy the spot at the foot of the table, each year the Lions go into the Super 15 competition poised for a battle for the wooden spoon.

However, going into the last round of matches before the competition's playoff stages, the Johannesburg side is almost out of danger of the dreaded last-place finish, both on the overall standings and the South African conference.

The Lions face the Cheetahs this weekend, in what will be the last bit of action both sides will see in the competition this season.

• JOBS •

Province of the EASTERN CAPE
DEPARTMENT OF HEALTH

FRERE HOSPITAL
Nursing Posts

NURSING MANAGER (LEVEL 3 AND SPECIALITY
Salary: R689 241-R775 755 per annum (Ref. NM/002/20

Requirements: • Basic R425 qualification (ie diploma/degree in Nursing) or equivalent qualification that allows re • Minimum 10 years' appropriate/recognisable experience in nursing after registration as a Professional Nurse with th South African Nursing Council as a Professional Nurse and Midwife • At least 5 years of the period referred to above must management level • Valid Code 08 driver's licence • Administration/Management diploma would be an added advantage Act and Regulations • Sound management, organising, interpersonal and problem-solving skills • Good verbal and writte team and be team leader with the necessary skills • Knowledge of financial management, Labour Relations and disciplir • Knowledge of nursing care approaches.
Responsibilities: • Exercise overall responsibility for nursing care needs, including the formulation, implementation, • Ensure control of the selection, recruitment and development of staff • Deal with disciplinary matters, grievances and utilisation of both human and natural resources • Put mechanisms and structures in place to support implementation of to assist all categories • Deal with patients' complaints • Conduct personnel evaluation • Liaise with Division Heads: Ancill

AREA MANAGER: SPECIALITY (FRERE HOSPITAL ADULT I
HIGH CARE AND RENAL UNIT)
Salary level: R442 230-R497 724 per annum (Ref. AMS/AIPHC/

Requirements: • Basic R425 qualification (ie diploma/degree in Nursing) or equivalent qualification that allows for r • Minimum 10 years' appropriate/recognisable experience in nursing after registration as a Professional Nurse with the period referred to above must have been appropriate/recognisable experience in the specific speciality after obtaining speciality • At least 3 years of the period referred to above must have been appropriate/recognisable experience at mana a post-basic qualification with a duration of at least 1 year's accreditation with SANC • Experience in a management posit
Responsibilities: • Coordinate activities in the Department • Ensure clinical nursing practice by the team in accor performance management • Function independently as well as within a multi-disciplinary team • Make decisions and hours and during weekends.

AREA MANAGER: GENERAL - NIGHT DUTY (FRE
Salary level: R404 700-R469 155 per annum (Ref. AM/GND/00

Requirements: • Basic R425 qualification (ie diploma/degree in Nursing) or equivalent qualification that allows re • Minimum 8 years' appropriate/recognisable experience in nursing after registration as a Professional Nurse with the period referred to above must have been appropriate/recognisable experience at management level • Registration as a duration of at least 1 year's accreditation with SANC • Experience in a management position.
Responsibilities: • Coordinate activities in the Department • Ensure clinical nursing practice by the team in accor performance management • Function independently as well as within a multi-disciplinary team • Make decisions and hours and during weekends.

PROFESSIONAL NURSE: SPECIALITY GR
Salary level: R338 931-R416 850 per annum (Ref. PNB2/ICU

GIBB ENGINEERING & ARCHITECTURE

NOTICE OF A DRAFT BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A PIPELINE WITHIN MBASHE LOCAL MUNICIPALITY, EASTERN CAPE PROVINCE (14/12/16/3/3/1/1067)

Notice is hereby given that Eskom Holdings Limited (Eskom) has submitted an application for Environmental Authorisation to the Department of Environmental Affairs (DEA) in terms of the National Environmental

Advert in the newspaper (Published on the 10th July 2014 in the Daily Dispatch).

14.1.2 Notice boards

Notice boards in Lusikisiki town:

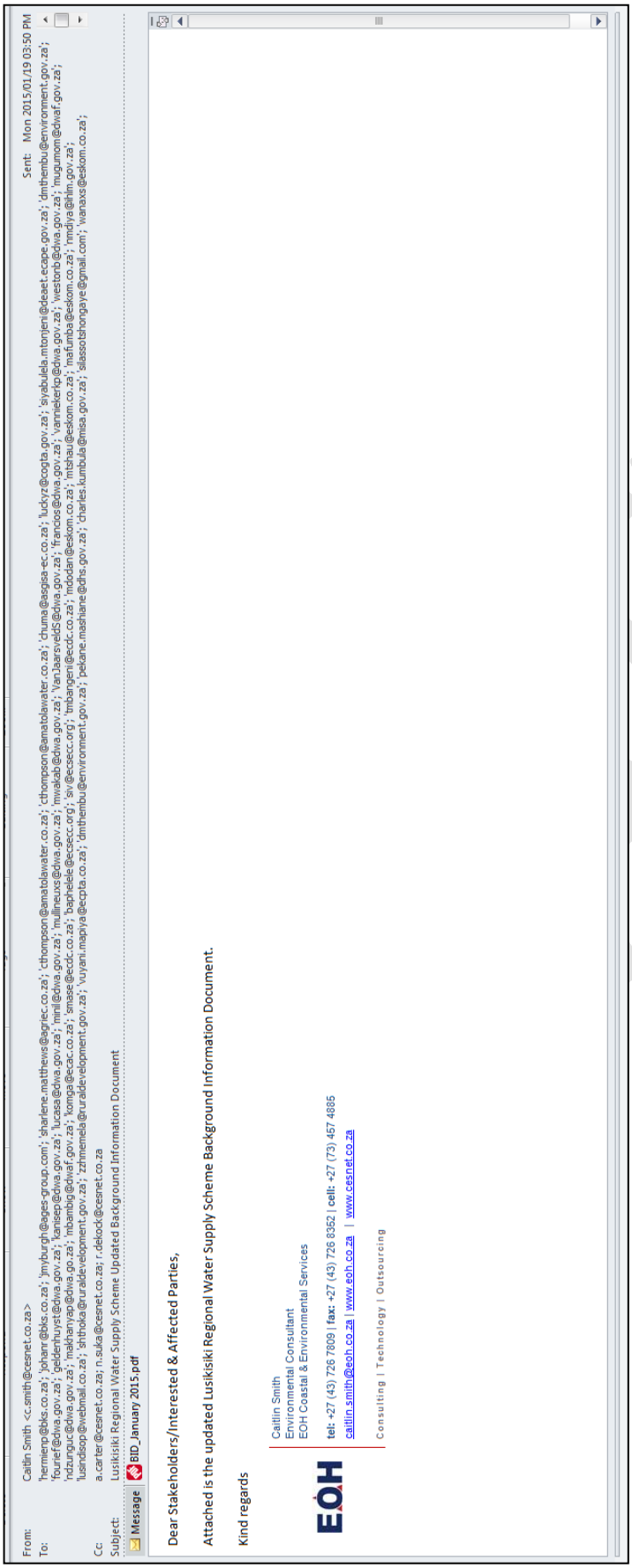
Notice board at Palmerton High School:

Notice board near Palmerton Mission:

Notice board at Lusikisiki Municipal Offices:

Notice board next to the R61 (approximately 600 metres from the existing Water Treatment Works):
31° 20.233'S, 29° 32.040'E

14.1.3 Proof of updated BID sent to stakeholders during EIR phase



From: Caitlin Smith <c.smith@cesnet.co.za>
Sent: Mon 2015/01/19 03:50 PM
To: 'hermienp@bks.co.za'; 'johan@bks.co.za'; 'jmyburgh@ages-group.com'; 'sharlene.matthews@agriec.co.za'; 'cthompson@amatolawater.co.za'; 'chuma@asgisa-ec.co.za'; 'ludyz@cogta.gov.za'; 'siyabulela.mtonjeni@deaet.ecape.gov.za'; 'dmthembu@environment.gov.za'; 'fourie@dwa.gov.za'; 'geldenhuyst@dwa.gov.za'; 'kantsep@dwa.gov.za'; 'lucasa@dwa.gov.za'; 'mnl@dwa.gov.za'; 'mullineux@dwa.gov.za'; 'mwakab@dwa.gov.za'; 'vanbaarsveld@dwa.gov.za'; 'francos@dwa.gov.za'; 'vanniekerkp@dwa.gov.za'; 'westonb@dwa.gov.za'; 'mugunom@dwaf.gov.za'; 'ndzunguc@dwa.gov.za'; 'makhanyap@dwa.go.za'; 'mbambig@dwaf.gov.za'; 'komga@ecdc.co.za'; 'smase@ecdc.co.za'; 'baphelele@ecsecc.org'; 'sir@ecsecc.org'; 'tmbangeni@ecdc.co.za'; 'mdodan@eskom.co.za'; 'mtshau@eskom.co.za'; 'mafunba@eskom.co.za'; 'mndyra@lm.gov.za'; 'lusindsop@webmail.co.za'; 'shthoka@ruraldevelopment.gov.za'; 'zhmemela@ruraldevelopment.gov.za'; 'vuyani.mapya@ecpta.co.za'; 'dmthembu@environment.gov.za'; 'pekane.mashiane@dhs.gov.za'; 'charles.kumbula@misa.gov.za'; 'silassotshongaye@gmail.com'; 'wanaxs@eskom.co.za';
Cc: a.carter@cesnet.co.za; n.suka@cesnet.co.za; r.deblock@cesnet.co.za
Subject: Lusikisiki Regional Water Supply Scheme Updated Background Information Document
Message | BID_January 2015.pdf

Dear Stakeholders/Interested & Affected Parties,

Attached is the updated Lusikisiki Regional Water Supply Scheme Background Information Document.

Kind regards

Caitlin Smith
Environmental Consultant
EOH Coastal & Environmental Services
tel: +27 (43) 726 7809 | fax: +27 (43) 726 8362 | cell: +27 (73) 457 4885
caitlin.smith@eoh.co.za | www.eoh.co.za | www.cesnet.co.za
Consulting | Technology | Outsourcing

14.1.4 Interested and affected parties database

Name	Organisation	Phone	Email
Stakeholders			
H Pieterse	AECOM	012 421 3628	hermien.pieterse@aecom.com
B Pullen	AECOM		
J Rossouw	AECOM	012 421 3594	johan.rossouw@aecom.com
M Trupelmann	AECOM		
JA Myburgh	AGES-EC	043 726 2070	jmyburgh@ages-group.com
S Matthews	Agri Eastern Cape		sharlene.matthews@agriec.co.za
J Moller	AgriSA	012 643 3400	moller@lantic.net
M Nyawose	Amatola Water	043 707 3700	cthompson@amatolawater.co.za
N Muller	Amatola Water		nmuller@amatolawater.co.za
C Thompson	Amatola Water	043 707 3700	cthompson@amatolawater.co.za
C Sangqu	ASGISAEC	043 735 1673	chuma@asgisa-ec.co.za
L Zuma	Cogta		luckyz@cogta.gov.za
Q Paliso	DEDEAT (OR Tambo)	047 531 1191	qondile.paliso@deaet.ecape.gov.za
S Mtonjeni	DEDEA (ORT)	047 531 1191	siyabulela.mtonjeni@deaet.ecape.gov.za
T Manyisana	Department of Agriculture and Rural Development – EC		thozi.manyisana@agr.ecprov.gov.za/
T Vetsheza	Department of Agriculture, Forestry and Fisheries	082 880 5452	thobaniV@daff.gov.za
Dan Mxolisi	Department of Agriculture, Forestry and Fisheries		mxolisiMa@daff.gov.za
M Mogorosi	Department of Environmental Affairs		MMogorosi@environment.gov.za
E Mthembu	Department of Environmental Affairs	012 310 3230	dmthembu@environment.gov.za
D Thompson	Department of Mineral Resources (PE)		Deidre.Watkins@dmr.gov.za
F Fourie	Department of Water Affairs	012 336 7303	fourief@dwa.gov.za
T Geldenhuys	Department of Water Affairs	048 881 3005	geldenhuyst@dwa.gov.za
P Kanise	Department of Water Affairs	043 604 5400	kanisep@dwa.gov.za
A Lucas	Department of Water Affairs	043 604 5403	lucasa@dwa.gov.za
L Mini	Department of Water Affairs	043 701 0208	minil@dwa.gov.za
S Mullineux	Department of Water Affairs	048 881 3005	mullineuxs@dwa.gov.za
B Mwaka	Department of Water Affairs	012 336 8188	mwakab@dwa.gov.za

Name	Organisation	Phone	Email
B Mwaka	Department of Water Affairs		
C Ntuli	Department of Water Affairs		
Sanet van Jaarsveld	Department of Water Affairs		VanJaarsveldS@dwa.gov.za
A Thobejane	Department of Water Affairs	012 336 7869	
Isa Thompson	Department of Water Affairs		ThompsonI@dws.gov.za
F Van der Merwe	Department of Water Affairs		
P Van Niekerk	Department of Water Affairs	012 336 8762	vanniekerkp@dwa.gov.za
B Weston	Department of Water Affairs	012 336 8221	westonb@dwa.gov.za
M Mugumo	Department of Water Affairs	012 336 6838	mugumom@dwa.gov.za
C Zungu	Department of Water Affairs (Eastern Cape)	047 532 6386	ndzunguc@dwa.gov.za
P Makhanya	Department of Water Affairs (Eastern Cape)		makhanyap@dwa.go.za
G Mbambisa	Department of Water Affairs(EC)	043 604 5407	mbambig@dwaf.gov.za
R Vorster	East-Cape- Ugie Agricultural Cooperative	043 831 1011	komga@ecac.co.za
S Mase	Eastern Cape development Corporation	043 704 5611	smase@ecdc.co.za
M Baphelele	Eastern Cape Socio-Economic Consultative Council	043 701 3400	baphelele@ecsecc.org
S Hesjebal	Eastern Cape Socio-Economic Consultative Council	043 701 3400	siv@ecsecc.org
N Maxongo	ECPHRA		nmaxongo@ecphra.org.za
Sello Mokhanya	ECPHRA		smokhanya@ecphra.org.za
T Mbangeni	ECDC	039 254 0854	tmbangeni@ecdc.co.za
S Kabane	Eskom		
N Mdoda	Eskom	047 531 0475	mdodan@eskom.co.za
T Mtshaulana	Eskom	047 531 2242	mtshau@eskom.co.za
N Mafumbatha	Eskom (Eastern Cape)	043 703 2210	mafumba@eskom.co.za
M Fihlani	Ingquza Hill Local Municipality	0834502470	nmdiya@ihlm.gov.za
M Nomandindi	Ingquza Hill Local Municipality	039 253 1602	
L Poyo	Ingquza Hill Local Municipality		lusindisop@webmail.co.za
S Thoka	Land Claims Commission	043 743 3824	shthoka@ruraldevelopment.gov.za
Z Memela	Land Claims Commissioner (Provincial)	043 743 3824	zzhmemela@ruraldevelopment.gov.za
V Mapiya	Mkhambathi Nature Reserve	039 306 9000	vuyani.mapiya@ecpta.co.za
E Mampane	National Department of Agriculture, Forestry and	012 319 7463	esthermam@daff.gov.za

Name	Organisation	Phone	Email
	Fisheries		
E Mthembu	National Department of environmental Affairs	012 310 3230	dmthembu@environment.gov.za
P Mashiane	National Department of Human Settlements	012 421 1311	pekane.mashiane@dhs.gov.za
Owen Hlazo	OR Tambo DM (Director Water Services)		owenhlazo@yahoo.com
C Kumbula	OR Tambo	0475016502	charles.kumbula@misa.gov.za
S Khoza	OR Tambo District municipality	047 501 6400	sifisok@ortambodm.gov.za
M Matiso	OR Tambo District municipality	047 501 6420	mandisam@ortambodm.gov.za
E Mzayiya	OR Tambo District municipality	047 501 6443	mzayiyae@ortambodm.gov.za
Z Hewu	Port St John's Local Municipality	047 564 1374	zhewu@psjmunicipality.co.za
O Sopela	Port St John's Local Municipality	047 564 1208	osopela@psjmunicipality.co.za
ZZ Macingwane	Prov. Dept of Health	040 608 1135	zukiswa.macingwane@mpilo.ecprov.gov.za
N Hackula	Prov. Dept of Social Development	043 605 5012	Bongiwe.mbomboshe@socdev.ecprov.gov.za
B Nelana	Provincial department of Economic dev. And Env. Affairs	043 605 7004	sisanda.fiyani@deat.ecape.gov.za
A Machimane	Provincial Department of Human Settlements	043 604 5536	machimanea@dwa.gov.za
L Ruleni	Provincial Dept of Local Government and Traditional Affairs		lizor@cogta.gov.za
N Vimba	Provincial Dept of Local Government and Traditional Affairs		ntandazov@cogta.gov.za
M Sogoni	Provincial Premier's Office	040 609 6382	babalwa.shushu@otp.ecprov.gov.za
P Scherman	Scherman, Colloty and Associates		patsy@itsnet.co.za
M Mthembu	Silaka Nature Reserve	047 564 1177	makhosi.mthembu@ecpta.co.za
N Matwasa	Traditional Leader		
N Matwasa	Tribal Authority (Zalu Dam area)		
Sinothi Ndlovu	Umgeni Water	033 341 1005	sinothi.ndlovu@umgeni.co.za
N Baai	Umngeni Water	033 846 1830	ntsiki.baai@umgeni.co.za
D Stephen	Umngeni Water	033 341 1237	david.stephen@umgeni.co.za
M Hobo	PSJ LM	0609612430	
DM Mangqo (Mayor)	PSJ LM		dmangqo@psjmuni.co.za
S Sotshongaye (Ward 17)	PSJ LM		silassotshongaye@gmail.com
N Diki (Ward 11)	PSJ LM		ngdiki@gmail.com
M Vena (Ward 10)	PSJ LM	073 477 7569	mthuthuzelivena@gmail.com

Name	Organisation	Phone	Email
Novangeli Town Hall	PSJ LM	073 415 4731	
Fono M (Ward 9)	PSJ LM	082 634 6725	fonokm@gmail.com
Daniso B (Ward 11)	PSJ LM	072 564 1712	
Mtiki Z (Ward 12)	PSJ LM	0827990135	zemtiki@gmail.com
Zweni M (Ward 13)	PSJ LM	082 564 0212	rmzweni@gmail.com
Cuba Z (Ward 14)	PSJ LM	082 564 2979	
Tshoto G (Ward 15)	PSJ LM	072 256 2463/ 079 896 1111	tshoto@webmail.co.za
Mzaza S (Ward 19)	PSJ LM	082 564 5298	siyamthanda.mzaza@yahoo.com
Ms Mbotshwa N (Ward 20) (Mthimde)	PSJ LM	073 035 3219 or 079 691 1451	ntsebz@gmail.com
Cllr X Moni (Ward 18)	PSJ LM		xolilemoni@gmail.com
Nolwazi N	PSJ LM	082 774 4288	nolwazin2000@yohaoo.com
IHLM Reception	Ingquza Hill LM	039 253 1563/ 039 253 1096	
Ms Nkayitshana (Ward 12)	Ingquza Hill LM	071 865 3068	
Mr Ntshobo (Ward 13)	Ingquza Hill LM	073 858 2831	
Mr Malulwana (Ward 14)	Ingquza Hill LM	082 843 3887	
Mr Thambodala (Ward 15)	Ingquza Hill LM	083 562 3717	
Ms Jotile (Ward 16)	Ingquza Hill LM	083 462 3892	
Mr Mpofana (Ward 17)	Ingquza Hill LM	071 865 3038	
Mr Zati (Ward 18)	Ingquza Hill LM	073 782 1459	
Mr Mtsosto (Ward 19)	Ingquza Hill LM	074 865 3591	mndenyane@ihlm.gov.za
Mr Ngxamile (Ward 20)	Ingquza Hill LM	071 865 3089	pngxamile@ihlm.gov.za
Ms Daniso (Ward 21)	Ingquza Hill LM	083 668 5540	
Mr Tshwatshuka (Ward 22)	Ingquza Hill LM	083 668 4480	
Ms Daliwe (Ward 23)	Ingquza Hill LM	083 623 6921	
Mr Nkungu (Ward 24)	Ingquza Hill LM	083 623 9025	minkungu@yahoo.com
Mr Mgwili (Ward 4) (Mfinizweni)	Ingquza Hill LM	083 455 3286	
Neliswa	IHLM Reception		n92vato@gmail.com
B Ngotana	Ingquza Hill LM	083 340 9583	

Name	Organisation	Phone	Email
MD Mvinjwa	Ingquza Hill LM	083 445 2496	
H Mabetla	Ingquza Hill LM	083 441 6564	
A Vungaye	Ingquza Hill LM	073 230 5592	
T Songunzu	Ingquza Hill LM	073 665 5772	
M Mfolozi	Ingquza Hill LM	083 444 1194	
F Mdutshane	Ingquza Hill LM	083 440 3459	
L Dumani	Ingquza Hill LM	082 209 3471	
N Ndondo	Ingquza Hill LM	083 446 0225	
S Mnge	Ingquza Hill LM	073 555 7913	
Z Bashe	Ingquza Hill LM	083 419 8256	
M Tana	Ingquza Hill LM	083 448 2567	
NF Diko	Ingquza Hill LM	083 591 4708	
N Nyenyiso	Ingquza Hill LM	083 447 1990	
B Mfitizo	Ingquza Hill LM	083 444 0933	
NF Dwabayo	Ingquza Hill LM	076 587 6282	
N Msikwa	Ingquza Hill LM	083 445 0593	
W Mhanywa	Ingquza Hill LM	083 444 4289	
N Bhala	Ingquza Hill LM	083 419 8550	
N kwakhwa	Ingquza Hill LM	060 380 5946	
M Sithilanga	Ingquza Hill LM	082 448 0351	
N Zikizela	Ingquza Hill LM	083 446 9036	
Z Tshemese	Ingquza Hill LM	083 448 3823	
M Matwasa	Ingquza Hill LM	078 670 1128	
NC Mkombe	Ingquza Hill LM	083 444 5600	
N Mtenjwa	Ingquza Hill LM	083 445 2229	
N Linganiso	Ingquza Hill LM	083 441 5869	
XW Sopilase	Ingquza Hill LM	083 448 3303	
M Mkwenkwe	Ingquza Hill LM	078 514 4996	
M Mali	Ingquza Hill LM	083 442 2457	
NC Cawe	Ingquza Hill LM	083 419 9499	

Name	Organisation	Phone	Email
L Mgwaza	Ingquza Hill LM	083 444 3153	
P Mbaleni	Ingquza Hill LM	073 188 4465	
N Mkumbuzi	Ingquza Hill LM	073 347 6531	
Y Kholisile	Ingquza Hill LM	083 441 4355	
Veliswa Peter	Ingquza Hill LM	083 447 5064	
Nothemba Jijimba	Ingquza Hill LM	073 559 0100	
Mampinge M Diko	Ingquza Hill LM	083 41 6762	
Michael Gqweta	Ingquza Hill LM	083 440 8277	
Mfundiso Jazi	Ingquza Hill LM	083 485 0115	
Alicia Mbalo	Ingquza Hill LM	083 443 2703	
P Tshicila	Ingquza Hill LM	083 443 3214	
TA Muge	Ingquza Hill LM	083 444 7774	
Nomalizo Manciya (Chieftainess)	Ingquza Hill LM	083 532 8191	
Hamilton Mgwici	Ingquza Hill LM	083 455 3286	
T Gwane	Ingquza Hill LM	078 654 4972	thembisile2@gmail.com
B Bantwana	Ingquza Hill LM	078 026 2170	bongeka2@gmail.com
A Mbena	Ingquza Hill LM	073 806 5470	
N Mpambaniso	Ingquza Hill LM	078 529 1242	
N Tenyane	Ingquza Hill LM	078 136 7929	
S Dlomo	Ingquza Hill LM	079 628 9203	
N Siko	Ingquza Hill LM	073 390 6243	n.siko@gmail.com
N Mngoma	Ingquza Hill LM	071 943 8596	
M Mngwane	Ingquza Hill LM	078 754 8704	
DL Mbola	Ingquza Hill LM	073 660 5004	
M Dlomo	Ingquza Hill LM	073 321 1638	
S Matwasa	Ingquza Hill LM	078 741 4790	
M Mafanya	Ingquza Hill LM	083 424 8945	
S Dlomo	Ingquza Hill LM	083 622 4396	
S Mbendana	Ingquza Hill LM	073 900 5574	

Name	Organisation	Phone	Email
M Siko	Ingquza Hill LM	083 770 6499	
M Mthemba	Ingquza Hill LM	078 501 5948	
L H Ngotana	Ingquza Hill LM	078 773 8858	
S Mbena	Ingquza Hill LM	071 816 0502	
K A Duntsula	Ingquza Hill LM	073 348 5430	
M Mbena	Ingquza Hill LM	072 662 3883	
B Mbena	Ingquza Hill LM		
M Mtsenge	Ingquza Hill LM	078 078 6997	
Mgwili Dedani	Ingquza Hill LM	073 702 0716	
T Godlwana	Ingquza Hill LM	0834502465	
S Rubuluza	Ingquza Hill LM	0718694613	
Mike Denison	Wildlife and Environment Society of South Africa		Mike.denison@wessa.co.za
WESSA (East London branch)	Wildlife and Environment Society of South Africa		eladmin@wessa.co.za
I&APS			
M V Ngomone		078 902 2442	Supercon@vodamail.co.za
A Mzobotshi	Mzintlava Quarry	071 059 7177	mzintlavaquarry@gmail.com
S Ngwane	Ndimbaneni	0715325461	
B Ngwane	Ndimbaneni	0733344312	
N Ngceni	Ndimbaneni	0730029477	
M Ntsenge	Mrhotshozweni	0780786997	
T Ngaka	Mrhotshozweni	0834462003	
M Mfolozi		0605632039	
M Ngwane	Ndimbaneni	0605660775	
F Mgwaza		0734343813	
N Nabo		0735367890	
X Sonwabo	Bwala A/A	0764674031	
N M		0737765798	
G Mtirara		0735013081	
M Mngomo		0726533896	
J Mbombo		0730954890	

Name	Organisation	Phone	Email
M Dweba		0730637398	
M Madyaka		0730006428	
N Nowelike		0733344312	
N N		0782807642	
N Noluthando		0735306707	
N Mndela		0835079510	
N Ngoyi		0782325914	
N M		0739866933	
N M		0786796071	
Aviwe M	Ndimbaneni	0780029096	
Mgwane P	Ndimbaneni	0734275158	
M Sisoko	Ndimbaneni	0603290557	
N Nomgobo		0783430843	
M Voyo		0838846649	
G Mphuthumi		0737018540	
L Miya	Mrhotshozweni	0780706664	
T Ngoza	Mrhotshozweni	0739813433	
F Luyolo	Mrhotshozweni	0710740320	
Siboniso		0786278448	
Babalwa		0733344312	
L Mafanja	Mrhotshozweni	0786117745	
T Witbooi	Ndimbaneni	0732038639	
M Witbooi	Ndimbaneni	0730072861	
J Mahambehlala	Ndimbaneni	0738485781	
N Rosetta	Mrhotshozweni	0732394274	
T Ngwane	Ndimbaneni	0782103191	
M Sitshwalo	Ndimbaneni	0730403269	
M Majama	Ndimbaneni	0734440909	
Y Ngwane	Ndimbaneni	0738485781	
A Maleya	Ndimbaneni	0731132772	

Name	Organisation	Phone	Email
L Mzam	Ndimbaneni	0834750243	
N Ngwane	Ndimbaneni	0783390107	
M Mahlikihla	Mthimbe	0834971702	
A Mavovana	Mthimbe	0718410187	
M V Bomboto	Mthimbe	0797065696	
D M Mphali		0734805993	
Z Gongo	Mthimbe	0734144307	
S Mathe	Mthimbe	0833732680	
M Mtshetha	Mthimbe	0781593024	
Z Gulwana	Mthimbe	0833247950	
N Manaya	Mthimbe	0835328191	
E T Gxotho	Mthimbe	0791016038	
N Mzomi		0780865614	
N Mzomi		0781940090	
M Ngwane		0782249885	
B Madotyeni		0786656265	
N Sapho	Mthimde	0833525762	
L Ndlalo	Mthimde	0789984863	
N Mgwako	Mthimde	0730818019	
N Mathe	Mthimde	0786387525	
A N Yengwa		0794845155	
B Vusani		0738843288	
B Vusani		0738662379	
M Nomvete		0782201928	
M Jijimba		0781981827	
M Gqithile		0781981327	
N Manciya	Mthimde	0791148282	
N Manciya		0835328191	
Nonciba		0739391160	
N Manciya		0761042278	

Name	Organisation	Phone	Email
D Nontlahla	Mthimde	0786529625	
Z Wenase		0789032726	
Makhayisa	Mthimde	0784079826	
Noncedo	Mthimde	0792328534	
Nomthuhzi		0727500955	
Z Duntsula	Mthimde	0835623256	
Khalipha Masele	Mthimde	0839646096	
S Tshitshi	Mthimde	0785363563	
N Nota	Mthimde	0833514435	
N Makatana	Mthimde	0820991033	
N Ngebe	Mthimde	0837641763	
T Mtiwani	Mthimde	0781770225	
M Nombulelo	Mthimde	0810012301	
D Monde	Mthimde	0717907011	
M Bunzi	Mthimde	0836842208	
V Phulani	Mthimde	0783291552	
D Noziwendu	Mthimde	0720799951	
B Gxottho	Mthimde	0785196160	
S Mathe	Mthimde	0787154432	
S Sxakata	Mthimde	072291102	
S Nkomayitshe	Mthimde	0838611580	
N Majija	Mthimde	0603049493	
B Majija	Mthimde	0711922577	
P Sulwana	Mthimde	0730688662	
A Phuzi	Mthimde	0738446263	
P Khuthala		0737803128	
M Nana	Mthimde	0710697921	
M Nkululeko		0604083161	
S Makanya	Mthimbe	0780893994	
N Ngwane		0739596131	

Name	Organisation	Phone	Email
P Luthando	Dumezweni	0733074361	
N Sivuyile	Dumezweni	0836962664	
Pansomso	Dumezweni	0780459326	
M Malizo	Mthimde	0733166345	
L Zaphe	Mthimde	0833375169	
L Mlakalaka		0717493021	
Vuyiswa	Mthimde	0736368407	
Mbeko	Mthimde	0738591136	
Phatheka Manciya	Mthimde	0761574552	
Kholeka		0787251549	
Ntombikayise		0735112173	
N Myekethe		0739860780	
Mafaka		0793518618	
Manyatha		0732030063	
Vuyelwa		0737216304	
Selani		0729785047	
Nothembile		0734737388	
Ngolomi		0738073123	
Qokweni		0785108024	
N Nosiphiwo	Mthimde	0731000719	
T Ntombemhlophe		0719422419	
Nowezile Maijebisi		0729742912	
Nozamile Zabhoyani		0820683568	
Nomlhunzi Mathubeni		0603522550	
N Majija		0783972922	
Mantlani Mabeno		0784897674	
M Molwande	Mthimde	0717142889	
Gxobo Phumlani	Mthimde	0785842948	
Ludiya Lunga	Mthimde	0838740476	
Khangomso M	Mthimde	0834833231	

Name	Organisation	Phone	Email
S Khanyile	Mthimde	0781118550	
M Sondisilo	Mthimde	0723078732	
S Mawande	Mthimde	0781115850	
Sihawu	Mthimde	0785387321	
B Gunuza	Mthimde	0832470957	
M Jijimba	Mthimde	0782698162	
Mcebisi S		0630416319	
Mzwandile	Dumezweni	0833440071	
Sizwe		0789868866	
Sulwana Azola	Mthimde	0834793144	
M Sifisio		0733606882	
M Lindile	Dumezweni	0737054918	
S Dingi	Mthimde	0739573137	
Stembiso	Mthimde	0734568053	
S Manyukana	Mthimde	0717926398	
Xolani		0782733503	
S Gxotho	Mthimde	0781890321	
Siphelele		0733735492	
Bonga		0810064299	
T Nofikiso		0739511367	
Nowethu		0730799711	
Macabe		0784310123	
N Ngewu	Mthimde	0791866270	
M Nonhanhla	Mthimde	0734627276	
M Nokwanda	Mthimde	0719983476	
N Sidinana	Mthimde	0731848400	
Mathuwa Hoza	Mthimde	0734690184	
G Bukeka	Mthimde	0836370023	
M Nocuza	Mthimde	0710775451	
N Majija	Mthimde	0820635255	

Name	Organisation	Phone	Email
B Mkize	Mthimde	0718298807	
S Mkize	Mthimde	0784137236	
Landowners			
Mr Mluleki Fihlani	Ingquza Hill LM		nmdiya@ihlm.gov.za
Ms Feziwe Mshiywa	Port St Johns LM	0475641207	fmshiywa@psjmunicipality.gov.za
Mr Bahlekile Keikelame	Department of Rural Development and Land Reform	0437007000	BDJKeikelame@ruraldevelopment.gov.za

14.1.5 Volume 1: PPP report

14.2 Appendix B: Impact Assessment Tables

Table 14-1. Impacts associated with the Planning and Design Phase of the LRWSS.

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
PLANNING & DESIGN PHASE									
GENERAL IMPACTS (For all alternatives)									
Compliance with relevant environmental legislation and policy	Failure to adhere to existing policies and legal obligations could lead to the project conflicting with local, provincial and national policies, legislation etc. This could result in a lack of institutional support for the project, overall project failure or delays in construction and undue disturbance to the natural environment.	**DIRECT CUMULATIVE**	**Localised, study area**	**Long-term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Ensure that all relevant legislation and policy is consulted and further ensure that the project is compliant with such legislation and policy. • These should include (but are not restricted to): Local and District Spatial Development Frameworks, Eastern Cape Biodiversity Conservation Plan (ECBCP), Local Municipal bylaws • In addition, planning for the construction and operation of the proposed water supply scheme should consider available best practice guidelines.	**LOW NEGATIVE**
Traffic and transport	During the planning and design phase, inadequate planning for the transportation of construction equipment to site could result in traffic congestion	**DIRECT CUMULATIVE**	**Regional**	**Short-term**	**Possible**	**Slight**	**LOW NEGATIVE**	• Project planning should include a plan for traffic control that will be implemented, especially during the construction phase of the dam and associated infrastructure.	**LOW NEGATIVE**
	The integrity of the existing roads may be compromised by the heavy vehicle traffic delivering materials and components to site. The bridge near Palmerton Mission, for example, is an old structure with a single lane. During the construction phase this bridge will have increased traffic congestion with resultant possible damage to the bridge structure.	**DIRECT CUMULATIVE**	**Localised, Study area**	**Short-term**	**Possible**	**Moderately severe**	**LOW NEGATIVE**	• Careful planning of the routes taken by heavy vehicles must highlight areas of road that may need to be upgraded in order to accommodate these vehicles. Once identified, these areas must be upgraded if necessary. • One of the areas that will likely require upgrading is the bridge near Palmerton Mission. This will also require a WULA.	**LOW NEGATIVE**
	Road modifications which may be necessary to allow for the delivery of materials and components to site via heavy vehicles could have long lasting traffic benefits.	**INDIRECT CUMULATIVE**	**Regional**	**Long-term**	**Probable**	**Slightly beneficial**	**FEW BENEFITS**	• No mitigation necessary.	**FEW BENEFITS**
GENERAL IMPACTS (Zalu Dam alternative)									
Visual intrusion	During the planning and design phase, inadequate planning for the construction of infrastructure associated with the Zalu Dam, such as a car park or buildings, could result in the loss of scenic quality.	**DIRECT CUMULATIVE**	**Localised, study area**	**Long-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• During the planning and design phase, any buildings or structures should be painted, tiled, etc. using neutral colours such as grey, beige or dark green (roof only). • The planning and design phase should, where possible, plan for buildings and structures to be constructed in low lying areas to reduce their visual intrusion on the surrounding landscape.	**LOW NEGATIVE**
	During the planning and design phase inappropriate consideration of the design of the Zalu Dam wall could result in a visually intrusive dam wall structure.	**DIRECT CUMULATIVE**	**Localised, study area**	**Long-term**	**Probable**	**Moderately severe**	**MODERATE NEGATIVE**	• The planning and design of the Zalu Dam wall should include a plan for grassing large barren areas of the dam wall and planting trees to screen the dam wall from nearby dwellings.	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	The removal of indigenous vegetation from the inundation area will result in the degradation of the aesthetic quality of the area surrounding the dam.	**DIRECT CUMULATIVE**	**Localised, study area**	**Long-term**	**Probable**	**Slight**	**LOW NEGATIVE**	• Ensure that plans are made to replant indigenous vegetation (that is removed during the construction phase) nearby to reduce the effect of vegetation removal on the aesthetic quality of the inundation area.	**LOW NEGATIVE**
Loss of land due to Zalu Dam construction	Loss of an existing foot path through the inundation area.	**DIRECT**	**Localised**	**Long-term**	**Definite**	**Slightly severe**	**MODERATE NEGATIVE**	• An alternative site for the foot path must be planned around the inundation area. The local community must be consulted to assist in deciding on a new position for the footpath.	**LOW NEGATIVE**
GENERAL IMPACTS (Pipeline alternatives)									
Impact of proposed layout on sensitive environments	During the planning and design phase, a lack of environmental consideration in the infrastructure layouts could result in the unnecessary degradation of areas of high environmental/social sensitivity. For example, planning of the pipeline route in relation to grave sites.	**DIRECT INDIRECT CUMULATIVE**	**Study Area**	**Long-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• Sensitive environments described in the EIA must be taken into account when planning the route of infrastructure. • For example, a 20 m buffer should be kept between the edge of a grave and the edge of the pipeline.	**LOW NEGATIVE**
ECOLOGICAL IMPACT ASSESSMENT (For all alternatives)									
Loss of indigenous and sensitive vegetation	The construction of the Zalu Dam and associated infrastructure will result in the loss of 100 Ha of degraded Ngonigoni Veld.	**DIRECT**	**Localised**	**Long-term**	**Definite**	**Moderately Severe**	**MODERATE NEGATIVE**	• All species of special concern, protected or vulnerable must be avoided or transplanted. • The existing roads must be utilised for access. • New access roads must only be constructed if there is no alternative, and the width of existing roads and tracks must be kept to a minimum. • Where feasible the pipeline must be located in areas that are already impacted on and degraded. • A relocation and search and rescue plan for sensitive plant species must be developed.	**LOW NEGATIVE**
	During the planning and design phase the inappropriate routing of pipelines, access roads and other structures through sensitive areas (dense vegetation, riparian areas and wetlands) could result in degradation of these areas.	**DIRECT**	**Localised**	**Medium-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• Existing roads must be used where feasible; • Align roads and pipelines within a single corridor and keep this as narrow as feasible; • Where practical and feasible, avoid locating linear infrastructure (such as roads and pipelines) through areas of high and moderate sensitivity. • Where feasible, avoid locating the pipeline and access road alongside streams and wetlands.	**LOW NEGATIVE**
ECOLOGICAL IMPACT ASSESSMENT (For Zalu Dam alternative)									
Loss of sensitive areas	Sensitive areas (scarp forest, riparian areas and wetlands) in the planned inundation area will be completely lost	**DIRECT**	**Localised**	**Medium-term**	**Possible**	**Severe**	**VERY HIGH NEGATIVE**	• A relocation and search and rescue plan for sensitive plant and animal species must be developed. • Consideration should be given to establishing a possible conservation area near the inundation area for relocated plant species (for e.g. Scarp forest).	**HIGH NEGATIVE**
AQUATIC IMPACT ASSESSMENT (For all alternatives)									
Legal and policy	Non-compliance with the laws and	**DIRECT**	**Localised, Study**	**Short term**	**Probable**	**Moderately severe**	**MODERATE**	• All legal matters pertaining to permitting	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
compliance	policies of South Africa as they pertain to the aquatic environment could lead to unnecessary delays in construction activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.		**Area**				**NEGATIVE**	must be completed prior to construction. In particular, all necessary Water Use Licences must be in order.	
Loss of sensitive aquatic habitat	During the planning and design phase the inadequate assessment of the planned route of pipelines, positioning of the dam, and the compilation of the dam operating rules could lead to widespread degradation and loss of potentially sensitive aquatic habitats in both the inundation area, downstream of the dam and along pipeline routes.	**DIRECT**	**Regional**	**Long term**	**Definite**	**Very severe**	**VERY HIGH NEGATIVE**	• Planning of the location and routing of infrastructure must be undertaken with suitable regard for the environment. • Suitably qualified specialists MUST be consulted during the planning and design phase.	**MODERATE/LOW NEGATIVE**
Scheduling of construction	Planning/ scheduling of construction that does not take into account the seasonal requirements of the aquatic environment, e.g. allowing for unimpeded flood events, could lead to short-term (and potentially long-term) impacts such as excessive sediment mobilization, etc.	**DIRECT**	**Regional**	**Short term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• Wherever possible, construction activities must be undertaken during the driest part of the year to minimize downstream sedimentation due to excavation, etc. • When not possible, suitable stream diversion structures must be used to ensure that rivers/streams are not negatively impacted by the activity	**LOW NEGATIVE**
AQUATIC IMPACT ASSESSMENT (For Palmerton bridge upgrade)									
Changes to fluvial geomorphology	Incorrect placement and/or design of bridge pilings or culverts may result in scouring of the river bed in areas immediately surrounding the pilings or culverts	**DIRECT**	**Localised**	**Long term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• Ensure that scour countermeasures are incorporated into the design of the bridge	**LOW NEGATIVE**
	Insufficient planning for erosion prevention along the banks of the river alongside the bridge structure will result in erosion that may eventually impair the safety of the structure	**DIRECT**	**Localised and downstream**	**Long term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Adequate bank stabilisation measures must be incorporated into the design of the bridge	**MODERATE NEGATIVE**
Flood attenuation	During the planning and design phase failure to account for the 1:100 year flood event may compromise the integrity of the bridge structure.	**DIRECT**	**Localised**	**Long-term**	**Possible**	**Very severe**	**VERY HIGH NEGATIVE**	• The bridge must be designed to accommodate the risks associated with the 1:100 flood wherever possible • Flood attenuation plans must be drawn up by a qualified engineer and approved by DEA and DWS	**MODERATE NEGATIVE**
PALEONTOLOGICAL IMPACT ASSESSMENT									
No impacts identified by specialist.									
HERITAGE IMPACT ASSESSMENT (For pipeline alternatives)									
Destruction of heritage features due to incorrect placement of pipelines and associated infrastructure	Inappropriate planning of the pipeline route and other reticulation infrastructure through sensitive areas could result in destruction of heritage features.	**DIRECT**	**Localised**	**Long-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• The recommendations of the Heritage specialist must be considered in the routing of the pipeline and associated infrastructure. • For example, a 20 m buffer should be kept between the edge of a grave and the edge of the development footprint.	**LOW NEGATIVE**
SOCIAL IMPACT ASSESSMENT (For Zalu Dam alternative)									
Loss of land due to Zalu dam construction	Acquisition of the dam inundation area, currently used for grazing, could lead to dissatisfaction from the current land users especially if they are not	**DIRECT**	**Study area**	**Permanent**	**Definite**	**Slightly severe**	**MODERATE NEGATVIE**	• The process for land acquisition by DWS must be conducted through the traditional authorities operating in the areas as they have jurisdiction over land allocations.	**MODERATE NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	compensated.							• Individual land users must be identified and engaged.	
	Inundation of the dam will result in a loss of access to natural resources – livestock grazing, fuel wood, thatch grass, medicinal plant and food harvesting, etc. for current land users.	**DIRECT**	**Study area**	**Long-term**	**Probable**	**Moderately severe**	**MODERATE NEGATIVE**	• Current landowners and land users should be sufficiently compensated. Compensation must be equitable across gender and age.	**LOW NEGATIVE**
SOCIAL IMPACT ASSESSMENT (For pipeline alternatives)									
Disturbance of grave sites	During the planning and design phase inappropriate routing of the pipeline could result in disturbance of grave sites.	**DIRECT**	**Localised**	**Short-term**	**Possible**	**Very severe**	**VERY HIGH NEGATIVE**	• Pipeline routes need to be planned around grave sites as specified in the Heritage Specialist report (20m buffer around grave sites) • The community should be consulted before pipeline routes are established to ensure any grave sites that were not identified in the Heritage Specialist report are identified, mapped and taken into account in the pipeline layout.	**HIGH NEGATIVE**
SOCIAL IMPACT ASSESSMENT (For all alternatives)									
Stimulation of economic growth	Planning and design should take into account potential spin-off economic opportunities: aquaculture, irrigation, recreation and tourism.	**INDIRECT**	**Study area**	**Long-term**	**Possible**	**Beneficial**	**BENEFICIAL**	• DWS should, in their consideration of water use applications, consider the benefit to local communities. • DWS should readily facilitate water use activities that will benefit the community. • Construction camps and settlements can be converted into tourism or recreation facilities.	**BENEFICIAL**

Table 14-2. Impacts associated with the Construction Phase of the LRWSS.

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
CONSTRUCTION PHASE									
GENERAL IMPACTS (For Zalu Dam alternative)									
Socio-economic	During construction, impeding the existing flow of the Xura River will limit the volume of water available to downstream users.	**CUMULATIVE**	**Study Area**	**Short-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• During construction all care should be taken to ensure that the ecological reserve volume of water is always released into the river downstream of the dam.	**LOW NEGATIVE**
GENERAL IMPACTS (For all alternatives)									
Visual intrusion	During the construction phase, construction activity on site and the presence and use of large machinery on site and along access roads will result in a visual disturbance of the landscape.	**DIRECT**	**Localised, study area**	**Short-term**	**Definite**	**Moderately severe**	**MODERATE NEGATIVE**	• No mitigation.	**MODERATE NEGATIVE**
Socio-economic	The construction phase will create temporary jobs for local communities. It will have a positive impact by creating short term employment and improve skills of local people within the study area.	**DIRECT CUMULATIVE**	**Study Area**	**Short-term**	**Probable**	**Moderately beneficial**	**SOME BENEFITS**	• No mitigation required.	**SOME BENEFITS**
Nuisance dust	During the construction phase, generation of dust from heavy vehicles and machinery could impact on nearby communities.	**DIRECT**	**Localised**	**Short-term**	**Probable**	**Moderately Severe**	**LOW NEGATIVE**	• Nuisance dust should be reduced by implementing the following: · o Damping down of exposed areas; o Retention of vegetation where possible; o Excavations and other clearing activities must be restricted to agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas; o Implementing a speed limit of 30km/h on dirt roads; o Attending to complaints emanating from the lack of dust control.	**LOW NEGATIVE**
Construction camp	During the construction phase, unnecessary disturbance of vegetation due to sprawl of campsites can cause loss of biodiversity.	**DIRECT**	**Localised**	**Short-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• The ECO must assist in the siting of structures and supervise any bush clearing (although this is not anticipated) for the construction camp. Construction camp should be fenced to avoid sprawl.	**LOW NEGATIVE**
Alien and invasive plants	During construction, unnecessary disturbance of the areas within the site could increase the risk of spreading noxious weeds, invasive and alien plants.	**INDIRECT CUMULATIVE**	**Localised**	**Short-term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Alien plants should be removed from the site through appropriate methods e.g. hand pulling, chemical, cutting, etc. under supervision from the ECO. • Disturbed areas must be rehabilitated.	**MODERATE NEGATIVE**
Fire	During the construction phase, runaway fires from cooking or other activities in the construction camp might lead to the burning of surrounding vegetation and threaten the local community.	**DIRECT**	**Localised**	**Short-term**	**Possible**	**Very Severe**	**VERY HIGH NEGATIVE**	• Fire extinguishers should be available on site • There should be no burning of construction waste or debris onsite.	**MODERATE NEGATIVE**
Noise	During construction adverse noise effects will occur, e.g. from the movement of heavy vehicles through community areas to site.	**DIRECT**	**Localised**	**Short-term**	**Probable**	**Moderately Severe**	**MODERATE NEGATIVE**	• Machinery that causes noise must only be operated at appropriate times (during the day and at normal working hours).	**LOW NEGATIVE**
Stormwater management	During construction, sediment created as a result of construction activities could be washed into nearby drainage lines.	**DIRECT CUMULATIVE**	**Localised**	**Short-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• Stormwater control measures must be implemented to avoid soil erosion and siltation of drainage lines.	**LOW NEGATIVE**
Soil erosion	During construction disturbance of highly erosive soils and vegetation removal on	**DIRECT**	**Study Area**	**Short-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• Vegetation must be retained where possible to avoid soil erosion.	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	steep slopes could exacerbate soil erosion.							• If slopes are cleared during construction, these must be rehabilitated as soon as possible to minimize soil erosion losses using local indigenous vegetation.	
Management of general waste	During construction littering on site may attract vermin, detract from the visual appeal of the area, and pollute the surrounding areas.	**INDIRECT CUMULATIVE**	**Localised**	**Short-term**	**Possible**	**Slight**	**LOW NEGATIVE**	• Littering must be avoided and litter bins must be made available at various strategic points on site. Refuse from the construction site must be collected on a regular basis and deposited at an appropriate landfill site. • The ECO should monitor the neatness of the work sites as well as the Contractor campsite.	**LOW NEGATIVE**
Hazardous substances	During construction onsite maintenance of vehicles/machinery and equipment could result in oil, diesel and other hazardous chemicals contaminating surface and ground water. Spillage of diesel, lubricants, cement, etc. could result in surface and groundwater pollution.	**DIRECT CUMULATIVE**	**Study Area**	**Long-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• The storage of fuels and hazardous materials must be located away from sensitive water resources. • All hazardous substances (e.g. diesel, oil drums, etc.) must be stored in a bunded area or other secured areas. • Stormwater control measures must be implemented during construction.	**LOW NEGATIVE**
Management of construction waste	During the construction phase, waste from construction activities e.g. excess concrete and cement mixture, empty paint containers, oil containers, etc., could cause pollution of ground and surface water when they come into contact with run-off water.	**DIRECT CUMULATIVE**	**Study Area**	**Short-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• All construction materials must be stored in a central and secure location with controlled access and an appropriate impermeable surface. • All excess waste must be disposed of at an appropriately licensed landfill site. • Stormwater control measures must be implemented to mitigate the risk of runoff water causing pollution.	**LOW NEGATIVE**
ECOLOGICAL IMPACT ASSESSMENT (For all alternatives)									
Loss of sensitive vegetation during construction	During construction there might be a loss of plant species of conservation concern due to vegetation clearing.	**DIRECT**	**Localised**	**Permanent**	**Probable**	**Moderately Severe**	**MODERATE NEGATIVE**	• All species of special concern, protected or vulnerable must be avoided or transplanted. • The existing roads must be utilised for access. New access roads must only be constructed if there is no alternative, and the width of existing roads and tracks must be kept to a minimum width. • In the unlikely event that a protected tree species needs to be removed, a permit to do so must be obtained from DAFF. • Laydown areas and turning areas must be located in areas that have already been impacted or show evidence of degradation. The ECO must identify such areas. • The servitude of the pipeline must be kept to a minimum. • Where feasible the pipeline must be located in areas that are already impacted on and degraded. • Rehabilitation of the disturbed areas and the remaining stockpiles (if any) must take place immediately after construction. • Topsoil must be stockpiled separately to sub soil. • The dam site must be surveyed and the pipeline route should be surveyed prior to	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
								construction during spring and mid-summer in order to locate protected geophytic plant species and transplant them in the neighbouring environment. • During excavations for the dam foundation, a search and transplant of species of special concern found in the topsoil layer must be undertaken	
Disturbance to surrounding vegetation and fauna	During construction vehicular movement, noise and habitat destruction will disturb animals in the area.	**DIRECT**	**Localised**	**Short-term**	**Probable**	**Moderately Severe**	**MODERATE NEGATIVE**	• Restrict construction activities to post-dawn and pre-dusk. • Construction must be undertaken in the shortest time practical	**LOW NEGATIVE**
	During construction an influx of contractor staff could result in poaching of wild animals.	**DIRECT**	**Localised**	**Short-term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• All staff employed during construction must sign a daily register. • Construction workers should be cautioned against poaching. • No construction residence may be set up on site. • An independent ECO must inspect the immediate vegetation for evidence of snares.	**LOW NEGATIVE**
	During construction inappropriate disturbance beyond the development/construction footprint could result in excessive damage and loss of vegetation/fauna.	**INDIRECT**	**Study Area**	**Long-term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Construction activities must be demarcated and vegetation clearing and top soil removal limited to these areas. • Dense vegetation that resembles Thicket or Forest must not be removed. In cases where this is unavoidable the ECO must be consulted and an assessment of the vegetation must be undertaken. • No construction must be undertaken in an area demarcated in this report as a sensitive area, or its associated buffer, unless authorised by an independent ECO. • Construction activities must be limited to delineated development areas.	**LOW NEGATIVE**
Disturbance of sensitive aquatic areas	During construction unnecessary disturbance caused by construction of the dam wall, reticulation pipelines and access roads could result in erosion and degradation of water courses and associated riparian habitats.	**INDIRECT**	**Localised and downstream**	**Short to medium term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Construction through watercourses must only take place where necessary and must occur within the smallest possible construction footprint. • Construction through watercourses must preferably take place during the dry season, and must immediately be followed by erosion stabilisation and re-vegetation.	**MODERATE NEGATIVE**
Soil erosion and environmental degradation due to poor rehabilitation	During construction clearing and excavation will result in exposed soil. If not rehabilitated, this may result in severe topsoil erosion, bank destabilisation, downstream sedimentation and colonization by invasive alien plant species.	**INDIRECT**	**Localised and downstream**	**Short to medium term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Implement a rehabilitation programme • Monitor success of re-vegetation. Success is considered achieved when there is 80% or more vegetation cover.	**MODERATE NEGATIVE**
AQUATIC IMPACT ASSESSMENT (For Zalu dam alternative)									
Channel banks and soils	During construction of the dam wall construction activities could result in localised erosion and jeopardise bank stability. Associated vegetation removal could also destabilise banks.	**DIRECT**	**Localised**	**Medium-term**	**Probable**	**Severe**	**HIGH NEGATIVE**	• Construction activities should take place during the driest season	**MODERATE NEGATIVE**
Sedimentation	During construction excavations within	**DIRECT**	**Study area,**	**Short term**	**Possible**	**Moderately severe**	**MODERATE**	• The river must be diverted away from areas	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT		NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	the inundation area for material for dam construction, if undertaken without proper precautions, could mobilise large volumes of sediment into the Xura River, reducing aquatic habitat and decreasing water quality.			**downstream of the dam**				**NEGATIVE**	where excavation within the inundation area is to take place. • Excavation should take place in the drier months of the year in order to limit the influence of stormwater on the mobilization of sediment. • If necessary, stabilize berms must be used to prevent stormwater from carrying sediment into the existing river channel.	
Water quantity	During construction impeding the existing flow of the river will result in the degradation of the aquatic environment downstream of the dam, essentially halting all of the ecosystem functions of the river.		**DIRECT**	**Study area, downstream of the dam**	**Medium term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• During construction, all care must be taken to ensure that the ecological reserve volume of water is always released into the river downstream of the dam site.	**LOW NEGATIVE**
AQUATIC IMPACT ASSESSMENT (For all alternatives)										
Water Quality	During construction wet concrete (highly alkaline) could result in flash kills of macroinvertebrates and fish species in the vicinity.		**DIRECT CUMULATIVE**	**Localised**	**Short term**	**Probable**	**Moderately severe**	**MODERATE NEGATIVE**	• No concrete mixing will take place within 32m of the river bank. • A serviced CO_2 fire extinguisher (for releasing carbon dioxide gas into the affected area to neutralize pH levels) should be available on site in the event that wet concrete is accidentally spilled into the river.	**LOW NEGATIVE**
Riparian vegetation	During construction indiscriminate removal of riparian vegetation at the construction site may lead to disturbance of the aquatic ecosystem		**DIRECT**	**Localised**	**Medium-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• Removal of riparian vegetation must take place under the supervision of the ECO. • Removal of the alien invasive vegetation must be prioritised.	**LOW NEGATIVE**
AQUATIC IMPACT ASSESSMENT (For Palmerton Bridge upgrade)										
Hydrology	During construction of the bridge, coffer dams have the potential to permanently change the flow dynamics in a river, exacerbating scour and enhancing sedimentation. Both of these changes can impact negatively on the aquatic ecosystem.		**DIRECT**	**Localised and downstream**	**Medium term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Coffer dams during bridge construction must not be left in place for longer than 30 days. • All work within the river should be completed during the dry season, when flows are at their lowest. • Water in the river must be allowed to pass downstream of the construction. If necessary this should be achieved via a temporary diversion – this should not be in place for more than 30 days.	**MODERATE NEGATIVE**
AQUATIC IMPACT ASSESSMENT (For Pipeline alternatives)										
Water Quality	During construction of the pipelines accidental contamination of water resources with wet concrete (highly alkaline) could result in flash kills of macroinvertebrates and fish species in the vicinity.	Alternative 1- trenched pipeline	**DIRECT**	**Localised**	**Short term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• No concrete mixing must take place within 32m of the river bank. • A serviced CO_2 fire extinguisher (for releasing carbon dioxide gas into the affected area to neutralize pH levels) should be available on site in the event that wet concrete is accidentally spilled into the river.	**LOW NEGATIVE**
		Alternative 2 – above ground pipeline	**DIRECT**	**Localised**	**Short term**	**Possible**	**Slight**	**LOW NEGATIVE**	• Same as above.	**LOW NEGATIVE**
		Alternative 3 – horizontal directional drilling	**No impact**					**N/A**	• No impact.	**N/A**
	During construction of the pipelines accidental chemical spills in the vicinity of	Alternative 1 – trenched pipeline	**DIRECT**	**Localised**	**Short term**	**Possible**	**Slight**	**LOW NEGATIVE**	• No machinery should be parked overnight within 50 m of a watercourse. • All stationary equipment must be equipped with a drip tray to retain any oil leaks. • No concrete mixing must take place within 32	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT		NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	watercourses will result in water pollution.								m of the river bank	
		Alternative 2 – above ground pipeline	**DIRECT**	**Localised**	**Short term**	**Possible**	**Slight**	**LOW NEGATIVE**	• Same as above	**LOW NEGATIVE**
		Alternative 3 – horizontal directional drilling	**DIRECT**	**Downstream**	**Short-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• Monitors should be stationed 50 m upstream and downstream of the crossing site on a flowing stream. They should be trained to observe and identify bentonite releases, and have the equipment capacity to rapidly relay information to the drilling team. • Appropriate containment measures must be implemented to minimise the further release of slurry into the watercourse • The pressure levels of the lubricating slurry must be closely monitored while drilling is in progress, as a rapid or sudden loss of pressure could indicate a potential release of slurry into a fracture.	**LOW NEGATIVE**
	During construction of the pipelines, mobilisation of soil into the stream via erosion will cause sedimentation of ecological habitats downstream of construction. This could decrease the diversity of macroinvertebrate communities.	Alternative 1 – trenched pipeline	**DIRECT CUMULATIVE**	**Downstream**	**Short-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• Excavation/trenching should take place during the driest season. • Where possible, silt fences must be installed to collect sediments mobilized during construction. • Banks must be monitored for signs of erosion, and measures must be taken to minimize the erosion as soon as possible.	**LOW NEGATIVE**
		Alternative 2 – above ground pipeline	**DIRECT CUMULATIVE**	**Downstream**	**Short-term**	**Possible**	**Slight**	**LOW NEGATIVE**	• Pipe bridge pilings should not be placed on stream banks wherever possible. • Where this is not possible, ensure that appropriate sediment collection measures are put in place.	**LOW NEGATIVE**
		Alternative 3 – horizontal directional drilling	**No impact**					**N/A**	• No impact	**N/A**
Riparian vegetation	During construction, indiscriminate removal of riparian vegetation at the site of the pipelines may lead to disturbance of the aquatic ecosystem.	Alternative 1 – trenched pipeline	**DIRECT**	**Localised**	**Medium term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• Removal of riparian vegetation should take place under the supervision of the ECO. • Removal of the alien invasive vegetation should be prioritised. • Banks should be artificially stabilised as soon as possible if significant riparian vegetation is removed.	**LOW NEGATIVE**
		Alternative 2 – above ground pipeline	**DIRECT**	**Localised**	**Medium term**	**Possible**	**Slight**	**LOW NEGATIVE**	• Same as above	**LOW NEGATIVE**
		Alternative 3 – horizontal directional drilling	**No impact**					**N/A**	• No impact	**N/A**
Hydrology	During construction of pipelines, coffer dams have the potential to permanently change the flow dynamics in a river, exacerbating scour and enhancing	Alternative 1 – trenched pipeline	**DIRECT**	**Localised and downstream**	**Medium term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Coffer dams must not be left in place for longer than 30 days. • All work within the river should be completed during the dry season, when flows are at their lowest. • Water in the river must be allowed to pass downstream of the construction. If necessary this should be achieved via a temporary diversion – this should not be in place for more than 30 days.	**MODERATE NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT		NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	sedimentation. Both of these changes can impact negatively on the aquatic ecosystem.	Alternative 2 – above ground pipeline	**No impact**					**N/A**	• No impact	**N/A**
		Alternative 3 – horizontal directional drilling	**No impact**					**N/A**	• No impact	**N/A**
PALEONTOLOGICAL IMPACT ASSESSMENT (For Zalu Dam alternative)										
Destruction of underlying fossils	During construction of the Zalu Dam wall and spillway deep excavations may expose/destruct underlying fossils.		**DIRECT**	**Long-term**	**Localised**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• The ECO must be informed of the possibility that trace fossils might be exposed on the bedding planes of the Ecca Group shales during deep excavations for the construction of the Zalu Dam wall and spillway. • If fossils are recorded the palaeontologist, ECPHRA and SAHRA must be notified and the fossils recorded according to SAHRA specification.	**LOW NEGATIVE**
HERITAGE IMPACT ASSESSMENT (For all alternatives)										
Damage to heritage features	During construction there could be accidental damage to already identified heritage features.		**DIRECT**	**Medium-term**	**Localised**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• If any graves/heritage features are damaged during construction then construction must stop immediately. • It must be reported to the ECO, Heritage Specialist and SAHRA.	**LOW NEGATIVE**
	During construction there is a risk of damage to potential heritage features.		**DIRECT**	**Medium-term**	**Localised**	**Possible**	**Severe**	**HIGH NEGATIVE**	• If human graves are uncovered during construction then all activity must stop immediately. • The police and ECPHRA must to be notified immediately. • If any other archaeological artefacts are uncovered during construction then construction must stop and these should be reported to the ECO, Heritage Specialist and SAHRA/ECPHRA immediately.	**MODERATE NEGATIVE**
SOCIAL IMPACT ASSESSMENT (For all alternatives)										
Influx of job seekers	During the construction phase there may be increased community conflicts between local labour and outside workers.		**INDIRECT**	**Study area**	**Short-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• A project steering committee consisting of the DWS, contractor (community liaison person), recruitment agency, community leaders, elders, youth, ward councillors and the IHLM LED (Local Economic Development) must be established in order to: ○ Conduct an audit of the affected communities in terms of employment capacity ○ Identify potential workers from the affected communities ○ Identify possible conflicts in and between communities ○ Recommend support programmes that would assist with conflict minimisation and resolution	**LOW NEGATIVE**
	During construction there may be a change in social behaviour - elevated crime, increased prostitution, increased substance abuse and risky sexual behaviour.		**INDIRECT**	**Study area**	**Short-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• The following are mitigation measures for crime: ○ Support the Traditional Authorities role of exerting control over land allocation in order to prevent densification of people around the construction areas. ○ The DWS and contractor must encourage settlement in Lusikisiki by providing daily	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
								transport for "outside" workers who settle in the town of Lusikisiki, to and from the construction to minimise the potential crime factor in the rural areas. o All construction workers must be clearly identifiable and wear easily recognisable uniforms. They need to carry identification cards issued by the contractor. o Ensure that the SAPS has access to construction sites o Encourage the local communities to report suspicious activity to the community liaison or nearest environmental site officer. o The contractor must prevent loitering around the construction camp by providing transport to and from the camp sites. o All construction and camp sites must be fenced and secure. • Mitigation measures for increased prostitution and sexual behaviour: o Support national and local awareness programmes that discourage promiscuity, especially at schools in the project area. o Ensure that condoms are easily accessible to all construction workers.	
	During construction there may be an increased risk of the spread of HIV/AIDS and other communicable diseases.	**INDIRECT**	**Study area**	**Long-term**	**Probable**	**Severe**	**HIGH NEGATIVE**	• HIV/AIDS (non-discrimination, awareness, prevention and health care support) policy must be implemented. • Condoms must be easily accessible to all construction workers. • Develop and implement a HIV/AIDs education and behaviour change programme for all contracted construction workers. This must extend to the communities located near the construction site. • Existing public health care centres and programmes such as TAC must be involved in the HIV/AIDS campaigns. The HIV/AIDS prevalence must be monitored through these agencies. • Voluntary counselling and testing must be encouraged for all workers.	**MODERATE NEGATIVE**
	During the construction phase there will be an increase in economic stimulation and investment into business and enterprise due to an increase in demand for local services.	**INDIRECT**	**Study area**	**Medium-term**	**Probable**	**Moderately severe**	**SOME BENEFITS**	• DWS is limited in its capacity to enhance the benefits of this impact. The proponent must link the Provincial Department of Economic Development and Local Municipal LED (Local Economic Development) programmes with small to medium enterprises (including communities) in the area so that a state of "readiness" to optimise economic benefits is achieved. This may involve training in the following sectors: business, tourism, catering etc.	**BENEFICIAL**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
Stimulation of economic growth	During the construction phase, if proper labour recruitment practices are not used and the use of local resources is not prioritised the project may garner negative sentiment with local communities.	**DIRECT**	**Study area**	**Short-term**	**Probable**	**Very severe**	**HIGH NEGATIVE**	• Equal job opportunities for women and men must be promoted. • Employment must be managed by a recruitment agency/office that uses a selection system that ensures recruitment of semi and unskilled workers from all local, impacted communities in accordance with recent government policies related to local procurement. • Where appropriate, employees involved in the construction phase should be incorporated in the permanent maintenance staff for the operational phase; and • Particular attention must be paid to employment opportunities for women and disabled persons.	**VERY BENEFICIAL**
	During the construction phase, if local businesses and SMMEs (Small Medium and Micro Enterprises) are not supported and their development is not stimulated, the economic benefit of the LRWSS would be considered a missed opportunity.	**INDIRECT**	**Regional**	**Medium-term**	**Possible**	**Very severe**	**MODERATE NEGATIVE**	• The proponent must ensure that the principal of utilising local business resources (suppliers and SMMEs) in accordance with recent government policies related to local procurement forms part of the procurement specifications. Examples of local business resources that must be considered: o Catering services o Transport services o Quarries/borrow pits (where necessary) o Small civils o Accommodation o Security o Hygiene services o Fencing	**BENEFICIAL**
	During the construction phase, if a skills development programme is not developed this would be a missed opportunity to improve the livelihoods of the local community.	**INDIRECT**	**Study area**	**Long-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• Implement a skills development programme which includes training in business, project management, monitoring and evaluation.	**BENEFICIAL**
Impact on health and general quality of life	During the construction phase a number of the existing roads will be upgraded. This will be beneficial to the region and will have long term benefits for affected communities.	**INDIRECT**	**Study area**	**Long-term**	**Definite**	**Beneficial**	**SOME BENEFITS**	• No mitigation required	**SOME BENEFITS**
	During the construction phase there could be an increased demand on the existing infrastructure facilities and social services due to the influx of people wanting to take advantage of the economic opportunities associated with the LRWSS.	**INDIRECT**	**Study area**	**Short-term**	**Probable**	**Severe**	**HIGH NEGATIVE**	• DWS should promote awareness of the project (with LMs, Department of Health, SAPS, etc.) and the potential pressure to provide services for new households. • Regularly monitor the schools and clinics in order to determine whether there are sufficient resources. When resources are deemed insufficient, DWS must communicate with the relevant departments for assistance.	**MODERATE NEGATIVE**
	During the construction there could be an increase in noise and dust generated from construction activities.	**DIRECT**	**Study area**	**Short-term**	**Probable**	**Moderately severe**	**MODERATE NEGATIVE**	• Noise and dust prevention measures must be implemented. • Dust along access roads must be monitored. • Ensure that communities have an easy grievance reporting mechanism, e.g. through	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
								a project steering or liaison committee	
	During the construction phase, the safety of local community members could be reduced as a result of high vehicle activity and potential run-away fires (resulting in injuries).	**DIRECT**	**Study area**	**Short-term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Mitigation measures for traffic safety: o Develop and inform all affected communities of the formal construction routes. o All vehicle operators and drivers must undergo regular training, clearly outlining the high safety risk to local rural communities o Erect signage making communities aware of the high safety risk due to heavy construction vehicles on the road. o Traffic calming devices such as speed bumps must be considered on rural access roads. • Mitigation measures for fire safety: o No fires must be lit outside construction camps. o Fires that are lit must be in a contained area. The fire must be monitored for cinders and extinguished when no longer needed. o Fire fighting equipment must be stored onsite o The construction campsite must be surrounded by a firebreak. o Fire risks must form part of the construction worker training.	**MODERATE NEGATIVE**

Table 14-3. Impacts associated with the Operation Phase of the LRWSS.

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
OPERATIONAL PHASE									
GENERAL IMPACTS (For Zalu Dam alternative)									
Visual intrusion	During the operational phase, if grassing and tree planting screens are deemed necessary but not implemented correctly and/or maintained, the dam wall could negatively impact the aesthetic quality of the landscape surrounding the dam wall.	**DIRECT CUMULATIVE**	**Localised**	**Long-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• During the operational phase, the vegetation that has been planted (grassing and/or trees) must be maintained and rehabilitated if necessary.	**LOW NEGATIVE**
	During the operational phase the Zalu Dam could become an attractive destination for tourists.	**DIRECT CUMULATIVE**	**Localised**	**Long-term**	**Possible**	**Slightly beneficial**	**SOME BENEFITS**	• No mitigation provided.	**SOME BENEFITS**
Socio-economic	During the operational phase there may be a reduced volume of water available to downstream users.	**CUMULATIVE**	**Study Area**	**Long-term**	**Definite**	**Moderately severe**	**MODERATE NEGATIVE**	• The dam operating rules must stipulate that the ecological reserve volume is released at all times.	**LOW NEGATIVE**
GENERAL IMPACTS (For pipeline alternatives)									
Maintenance	During the operational phase, insufficient maintenance of pipelines could result in damage to the pipeline and leaks.	**DIRECT**	**Localised**	**Medium-term**	**Possible**	**Moderately Severe**	**HIGH NEGATIVE**	• Pipelines MUST be regularly monitored for leaks. If these are identified immediate actions must be taken to repair leaks. • Regular maintenance and inspections of pipelines should take place.	**LOW NEGATIVE**
GENERAL IMPACTS (For all alternatives)									
Visual intrusion	During the operational phase, if the associated infrastructure is not maintained it may become degraded and visually obtrusive.	**DIRECT CUMULATIVE**	**Localised, study area**	**Long-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• During the operational phase, the associated infrastructure must be maintained and must adhere to the planning and design phase associated infrastructure aesthetic control recommendations.	**LOW NEGATIVE**
	During the operational phase if the indigenous vegetation, planted within the offset area, is not maintained correctly it could result in sections of the site becoming visually obtrusive.	**DIRECT CUMULATIVE**	**Localised, study area**	**Long-term**	**Possible**	**Slight**	**LOW NEGATIVE**	• During the operational phase, the replanted indigenous vegetation in the offset area should be maintained.	**LOW NEGATIVE**
Socio-economic	During the operational phase there will be a reliable water supply throughout the study area.	**DIRECT CUMULATIVE**	**Study Area**	**Long-term**	**Definite**	**Highly beneficial**	**BENEFICIAL**	• No mitigation provided.	**BENEFICIAL**
	During the operational phase there will be employment opportunities for maintenance of the dam wall, pipelines and other infrastructure.	**DIRECT CUMULATIVE**	**Study Area**	**Long-term**	**Definite**	**Beneficial**	**BENEFICIAL**	• No mitigation provided.	**BENEFICIAL**
Hazardous chemical storage	During the operational phase inappropriate storage of chemicals, herbicides, diesel and other hazardous substances on site could result in soil and water contamination.	**DIRECT**	**Localised**	**Long-term**	**Possible**	**Severe**	**MODERATE NEGATIVE**	• All hazardous substances must be stored in appropriately secure locations.	**LOW NEGATIVE**
Increased stormwater run-off	During the operational phase, failure to follow the stormwater control measures could result in damage to the landscape, flooding and increased sheet erosion.	**DIRECT CUMULATIVE**	**Localised**	**Long-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• Stormwater control measures must be followed.	**LOW NEGATIVE**
Waste management	During the operational phase maintenance workers and security personnel could litter on site.	**DIRECT**	**Localised**	**Medium-term**	**Possible**	**Moderately Severe**	**MODERATE NEGATIVE**	• Ensure there are sufficient containers at all operational facilities available for collecting waste. • No waste must be buried on site. • Waste must be collected on a regular basis and disposed of at a licensed landfill site.	**LOW NEGATIVE**
ECOLOGICAL IMPACT ASSESSMENT (For all alternatives)									

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
Alien Vegetation	During the operational phase, failure to monitor rehabilitation initiatives post construction, can lead to infestation by alien plant species.	**INDIRECT**	**Study Area**	**Long-term**	**Definite**	**Severe**	**HIGH NEGATIVE**	• Design and Implement an Alien Vegetation Management and Monitoring Plan; • Eradicate alien plants as they appear; and monitor the study area for any new invasive plants. • Alien vegetation must be monitored for at least 6 months after construction has been completed.	**LOW NEGATIVE**
AQUATIC IMPACT ASSESSMENT (For Zalu Dam and abstraction weir alternative)									
Water quality	Dams typically act as nutrient "sinks", trapping excess nutrients along with sediments that would originally have moved freely down the length of the river. This may improve the quality of the water downstream of the dam. In particular, the water clarity will improve, with "clear" water becoming the predominant release from the dam.	**DIRECT**	**Localised, study area and down-stream**	**Long-term**	**Definite**	**Moderately beneficial**	**SOME BENEFITS**	• No mitigation provided.	**SOME BENEFITS**
Geomorphology	During the operational phase the condition of the river geomorphology in the scour zone will degrade since sediment will be trapped in the dam, causing clear water (sediment free) releases to the downstream reach. These clear water releases will scour the bed of this reach, causing deepening of the channel in alluvial sections and widening in sections where shallow bedrock prevents incision.	**DIRECT**	**Localised, immediately downstream of the dam to the abstraction works: Reach 1**	**Long-term**	**Definite**	**Moderately severe**	**MODERATE NEGATIVE**	• The dam operating rules must stipulate that there be infrequent but regular releases of water from the lower section of the dam, allowing sediment to move through the system.	**LOW NEGATIVE**
	During the operational phase, at the abstraction weir, the baseflows released from the dam will be abstracted from the river. This will result in the reach immediately downstream of the weir experiencing very low baseflows.	**DIRECT**	**Localised, from the abstraction works to the next major tributary: Reach 2**	**Long-term**	**Definite**	**Slight**	**MODERATE NEGATIVE**	• The effects of the reduced sediment load should be alleviated naturally by upstream erosion and tributaries at this point, so existing flows from tributaries can be used to maintain sediment flow.	**LOW NEGATIVE**
	During the operational phase reduced floods are likely to cause a degradation of the riparian and in-channel habitat conditions through reduced scour abilities of the river.	**DIRECT**	**Localised, reach from the next major tributary to the confluence with the Msikaba River: Reach 3**	**Long-term**	**Definite**	**Slight**	**LOW NEGATIVE**	• No mitigation.	**LOW NEGATIVE**
Riparian Vegetation	During the operational phase sediment-free or clear water releases and the resultant scour will decrease the availability of any riparian habitat (Instream and Marginal), particularly where incision takes place within the alluvial sections coupled by the loss of fine sediment needed for plants to root in, i.e. the riparian zone will narrow, losing its eco-tonal or transitional nature between the aquatic and terrestrial environments.	**DIRECT**	**Localised, immediately downstream of the dam to the abstraction works: Reach 1**	**Long-term**	**Definite**	**Severe**	**MODERATE NEGATIVE**	• The dam operating rules must stipulate that there be regular releases of sediment from the dam. This may lessen the overall affect.	**MODERATE NEGATIVE**
	The potential reduction in baseflows, due to abstraction at the weir, would impact on the potential availability of	**DIRECT**	**Localised, from the abstraction works to the**	**Long-term**	**Definite**	**Moderately severe**	**MODERATE NEGATIVE**	• The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained	**LOW NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT		NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	water to supply the adjacent riparian zones and could thus reduce the overall extent of these habitats.			**next major tributary: Reach 2**					in the river downstream of the dam.	
Fish	During the operational phase there could be reduced breeding success of Barbus "Transkei" n. sp. (Transkei barb), a new species. Breeding is triggered by high flows (i.e. floods), and the dam wall could reduce these high waters, thereby muting the breeding signals for the fish. The number of spawning events could also be reduced by the capture of the high flow events by the dam.		**DIRECT**	**Localised, study area and downstream**	**Long-term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.	**MODERATE NEGATIVE**
	During the operational phase the dam wall and reduction in flow may disrupt the normal migratory behaviour of eels		**DIRECT**	**Localised, study area and downstream**	**Long-term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.	**MODERATE NEGATIVE**
Macroinvertebrates	During the operational phase reduction in the sediment content of water downstream of the dam could reduce both the availability of food and habitat for macroinvertebrates		**DIRECT**	**Localised, study area and downstream**	**Long-term**	**Possible**	**Moderately severe**	**MODERATE NEGATIVE**	• The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.	**LOW NEGATIVE**
AQUATIC IMPACT ASSESSMENT (For pipeline alternatives)										
Hydrology and sediment dynamics	Once the pipelines are in position, the new infrastructure will possibly cause a permanent change to the flow dynamics of the watercourses. This could result in loss of habitat and an associated loss in aquatic biodiversity.	Alternative 1- trenched pipeline	**No impact**						• No impact	
		Alternative 2 – above ground pipeline	**DIRECT**	**Localised**	**Short-term**	**Possible**	**Moderately severe**	**LOW NEGATIVE**	• Pipe bridge pilings on the banks or bed of the watercourse must be designed to limit the effects of scour on the sediment flows in the stream	**LOW NEGATIVE**
		Alternative 3 – horizontal directional drilling	**No impact**						• No impact	
PALEONTOLOGICAL IMPACT ASSESSMENT										
No impacts identified by specialist.										
HERITAGE IMPACT ASSESSMENT										
No impacts identified by specialist.										
SOCIAL IMPACT ASSESSMENT (For Zalu Dam alternative)										
Impact on health and general quality of life	During the operational phase the unusual presence of a large water body may pose a drowning risk.		**INDIRECT**	**Study area**	**Long-term**	**Possible**	**Severe**	**HIGH NEGATIVE**	• Safe and controlled swimming sites should be developed. • A water safety awareness campaign should be implemented by DWS. • Ensure signage of drowning risks is visible in high activity areas such as the river/dam crossing. • The implementation of a swimming programme for local scholars should be considered.	**MODERATE NEGATIVE**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	During the operational phase there could be an increased demand on the existing infrastructure facilities and social services due to the influx of people wanting to take advantage of the economic opportunities associated with the LRWSS.	**INDIRECT**	**Study area**	**Long-term**	**Possible**	**Slightly severe**	**LOW NEGATIVE**	• DWS should promote awareness of the project (with LMs, Department of Health, SAPS, etc.) and the potential pressure to provide services for new households.	**LOW NEGATIVE**
	Alleviation of water shortages.	**DIRECT**	**Municipal**	**Long-term**	**Definite**	**Very beneficial**	**VERY BENEFICIAL**	• No mitigation provided	**VERY BENEFICIAL**
Stimulation of economic growth	The construction of the Zalu Dam could result in potential spin-off economic opportunities associated with aquaculture, irrigation schemes, recreation and tourism.	**INDIRECT**	**Study area**	**Long-term**	**Possible**	**Beneficial**	**SOME BENEFITS**	• The proponent is limited in terms of their input regarding the spin-off business opportunities as these depend on investor interest and market demand. However, they play a key role in permitting water use activities. DWS should therefore, in their consideration of water use applications, consider the benefit to local communities and ensure that equitable benefits are realised and readily facilitate water use activities that will benefit the community.	**BENEFICIAL**

Table 14-4. No-go Impacts associated with the LRWSS.

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (SIZE)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
NO-GO OPTION									
Socio-economic benefits	If the project does not proceed then communities in the Lusikisiki and Port St Johns area will not have access to potable water (approximately 32 800 households might be affected).	**DIRECT CUMULATIVE**	**Study Area**	**Long-term**	**Definite**	**Severe**	**HIGH NEGATIVE**	**No mitigation**	**HIGH NEGATIVE**
	If the project does not proceed then socio-economic development in the study area will be inhibited. Potential spin-off economic benefits (tourism, aquaculture, etc.) associated with the LRWSS will not materialise.	**INDIRECT CUMULATIVE**	**Study Area**	**Long-term**	**Definite**	**Moderately severe**	**MODERATE NEGATIVE**	**No mitigation**	**MODERATE NEGATIVE**
No loss of vegetation	If the project does not proceed vegetation that would otherwise be lost during the construction of the dam and other infrastructure would remain intact.	**DIRECT**	**Localised**	**Long-term**	**Definite**	**Moderately Beneficial**	**BENEFICIAL**	**No mitigation**	**BENEFICIAL**
No loss of wildlife	If the project does not proceed wildlife that otherwise be lost during construction of the dam and other infrastructure would remain intact.	**DIRECT**	**Localised**	**Long-term**	**Definite**	**Moderately Beneficial**	**BENEFICIAL**	**No mitigation**	**BENEFICIAL**
Current land use	If the project does not proceed there will be no change in the current land use of communal grazing and subsistence agriculture in the study area.	**DIRECT**	**Localised**	**Long-term**	**Definite**	**Slightly beneficial**	**FEW BENEFITS**	**No mitigation**	**FEW BENEFITS**

14.3 Appendix C: Specialist Volume

14.3.1 Volume 2: Specialist Summary 1
14.3.2 Volume 3: Specialist Summary 2
14.3.3 Volume 4: Ecological Impact Assessment
14.3.4 Volume 5: Heritage Impact Assessment
14.3.5 Volume 6: Paleontological Impact Assessment
14.3.6 Volume 7: Aquatic Impact Assessment
14.3.7 Volume 8: Social Impact Assessment
14.3.8 Volume 9: Visual Study

VOLUME 2: SPECIALIST SUMMARY 1

VOLUME 3: SPECIALIST SUMMARY 2

VOLUME 4: ECOLOGICAL IMPACT ASSESSMENT

VOLUME 5: HERITAGE IMPACT ASSESSMENT

VOLUME 6: PALEONTOLOGICAL IMPACT ASSESSMENT

VOLUME 7: AQUATIC IMPACT ASSESSMENT

VOLUME 8: SOCIAL IMPACT ASSESSMENT

VOLUME 9: VISUAL STUDY

14.4 Appendix D: Environmental Management Programme