

APPENDIX I

ENVIRONMENTAL MANAGEMENT PROGRAMME



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

PROPOSED UMKHOMAZI WATER PROJECT PHASE 1

Raw Water Component

PRE-CONSTRUCTION & CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME

FINAL

November 2016

- DEA Ref. No.:**
- Smithfield Dam - **14/12/16/3/3/3/94**
 - Water conveyance infrastructure - **14/12/16/3/3/3/94/1**
 - Balancing Dam - **14/12/16/3/3/3/94/2**

TITLE AND APPROVAL PAGE

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AMENDMENTS PAGE



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LIST OF ACRONYMS & ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
CRE	Chief Resident Engineer
DAFF	Department of Agriculture, Forestry and Fisheries
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DEA	Department of Environmental Affairs
DM	District Municipality
DMR	Department of Mineral Resources
DoT	Department of Transport
DRD&LR	Department of Rural Development and Land Reform
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KZN Wildlife
EMC	Environmental Monitoring Committee
EMPr	Environmental Management Programme
EWR	Ecological Water Requirements
GIS	Geographical Information System
GN	Government Notice
HIV	Human Immunodeficiency Virus
I&AP	Interested and Affected Party
km	Kilometre
KZN	KwaZulu-Natal
LM	Local Municipality
m	Metre
m³/a	Cubic metres per annum
masl	Meters above sea level
MSDS	Material Safety Data Sheet
NEMA	National Environmental Management Act (Act No. 107 of 1998)
OHS	Occupational Health and Safety
RAP	Relocation Action Plan
SANS	South African National Standard
TBM	Tunnel Boring Machine
uMWP-1	uMkhomazi Water Project Phase 1
WSS	Water Supply System
WTW	Water Treatment Works

DEFINITION OF KEY TERMS

Auditing	<i>A systematic and objective assessment of an organisation's activities and services conducted and documented on a periodic basis.</i>
Competent	<i>Combination of knowledge, qualifications and experience specific to the work or task being performed.</i>
Construction Area	<i>Immediate site influenced by specific construction activities, as approved by the Engineer.</i>
Construction Domain	<i>Entire footprint required for the construction of the overall project components.</i>
Environment	<p><i>The surroundings in which humans exist and which comprise:</i></p> <ul style="list-style-type: none"> <i>• The land, water and atmosphere of the earth.</i> <i>• Micro-organisms, plant and animal life.</i> <i>• Any part or combination of a) and b) and the interrelationships among and between them.</i> <i>• The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that can influence human health and well-being.</i>
Environmental Aspect	<i>Those components of the company's activities, products and services that are likely to interact with the environment.</i>
Environmental Feature	<i>Elements and attributes of the biophysical, economic and social environment.</i>
Environmental Impact	<i>The change to the environment resulting from an environmental aspect, whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.</i>
Environmental Management Programme (EMPr)	<i>A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.</i>
Environmental Objective	<i>Overall environmental goal pertaining to the management of environmental features.</i>
Environmental Target	<i>Performance requirement that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.</i>
Impervious	<i>Not permeable; not allowing liquid to pass through. Resistant to movement of water.</i>
Monitoring	<i>A systematic and objective observation of an organisation's activities and services conducted and reported on regularly.</i>
Potable Water	<i>Water that is fit or suitable for drinking.</i>
Project Area	<i>The greater area within which the project is executed. Extends beyond the construction domain.</i>
Raw Water	<i>Natural (untreated) water found in the environment, such as water from bodies like dams and rivers.</i>
Sensitive environmental	<i>Environmental features protected by legislation (e.g. heritage resources), or identified during the EIA as sensitive through specialists' findings and input</i>

features	<i>received from Interested and Affected Parties.</i>
Watercourse	<i>A geomorphological feature characterized by the presence of a streamflow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water. According to the National Water Act (Act 36 of 1998), a watercourse constitutes a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which, or from which, water flows, and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.</i>
Weeds and Invader Plants	<i>Weeds and invader plants are defined as undesirable plant growth that shall include, but not be limited to all declared category 1, 2 and 3 listed invader species as set out in the Conservation of Agricultural Resources Act (No 43 of 1983) regulations. Other vegetation deemed to be invasive should be those plant species that show the potential to occupy in number, any area within the defined construction area</i>

1 PURPOSE OF THIS DOCUMENT

The uMkhomazi Water Project Phase 1 (uMWP-1), which entails the transfer of water from the undeveloped uMkhomazi River (also known as the Umkomaas or Mkomazi) to the existing Mgeni system, is currently being investigated through a Feasibility Study. This transfer scheme is deemed to be the most viable option to provide a large volume of water to fulfil the long-term water requirements of the Mgeni system. The uMWP-1 consists of both Raw Water and Potable Water components which are being undertaken by the Department of Water and Sanitation (DWS) (previously known as the Department of Water Affairs (DWA)) and Umgeni Water, respectively.

This document serves as the **Environmental Management Programme** (EMPr), as contemplated in Regulation 33 of Government Notice (GN) No. R. 543 (18 June 2010), for the pre-construction and construction phases of the uMWP-1 Raw Water component. It was developed in support of the Environmental Impact Assessment (EIA) that was undertaken for the project.

The proposed uMWP-1 Raw Water component consists of the following:

- ❖ Smithfield Dam on the uMkhomazi River, with a full supply level of 930 masl and consisting of an earth core rockfill main embankment and a zoned earthfill saddle embankment;
- ❖ The uMkhomazi – uMlaza Tunnel, with a finished internal diameter of 3.5 m and a length of 32.5 km;
- ❖ The Tunnel – Balancing Dam – Baynesfield Pipeline, with two sections of 2.6 and 1.6 m diameters and 5.2 and 1.3 km lengths, respectively; and
- ❖ Balancing Dam, a concrete faced rockfill dam with a full supply level of 923 masl.

2 DOCUMENT ROADMAP

As a minimum, the EMPr aims to satisfy the requirements stipulated in Regulation 33 of GN No. R. 543 (18 June 2010), as promulgated in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998). **Table 1** presents the document's composition in terms of the aforementioned regulatory requirements.

Table 1: EMPr Roadmap in relation to GN No. R. 543

Chapter	Title	Correlation with G.N. No. R543	
1	Purpose of this Document	–	
2	Document Roadmap	–	
3	Project Background and Motivation	–	
4	Project Location	–	
5	Overview of Project	–	
6	EMPr Framework	–	
7	Environmental Assessment Practitioner	R33(a)	Details of – (i) the person who prepared the EMPr; and (ii) the expertise of that person to prepare an EMPr.
8	Environmental Governance Framework	–	
9	Roles & Responsibilities	R33(d)	An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b).
10	Monitoring	R33(e)	Proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon
11	Environmental Training & Awareness Creation	R33(j)	An environmental awareness plan describing the manner in which - (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.
12	EMPr Review	–	
13	Environmental Activities, Aspects and Impacts	R33(c)	A detailed description of the aspects of the activity that are covered by the environmental management programme.
14	Sensitive Environmental Features	–	
15	Implementation Programme	R33(b)	Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by the EIA Regulations, including environmental impacts or objectives in respect of – (i) planning and design;

Chapter	Title	Correlation with G.N. No. R543	
			(ii) pre-construction and construction activities; (iii) operation or undertaking of the activity; (iv) rehabilitation of the environment; and (iv) closure, where relevant.
		R33(f)	As far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures.
		R33(g)	A description of the manner in which it intends to - (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of pollutants; (iii) comply with any prescribed environmental management standards or practices; (iv) comply with any applicable provisions of the Act regarding closure, where applicable; (v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.
		R33(h)	Time periods within which the measures contemplated in the environmental management plan must be implemented.
		R33(i)	The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

3 PROJECT BACKGROUND AND MOTIVATION

The current water resources of the Integrated Mgeni Water Supply System (WSS) are insufficient to meet the long-term water requirements of the system. The Integrated Mgeni WSS is the main water source that supplies about five million people and industries in the eThekweni Municipality, uMgungundlovu District Municipality (DM) and Msunduzi Local Municipality (LM), all of which comprise the economic powerhouse of the KwaZulu-Natal (KZN) Province.

The Integrated Mgeni WSS comprises the Midmar, Albert Falls, Nagle and Inanda Dams in KZN, a water transfer scheme from the Mooi River and the newly constructed Spring Grove Dam. The current system (Midmar, Albert Falls, Nagle and Inanda Dams and Phase 1 of the Mooi Mgeni Transfer Scheme) has a stochastic yield of 334 million m³/a (measured at Inanda Dam) at a 99% assurance of supply. The short-term augmentation measure, Phase 2 of the Mooi Mgeni Transfer Scheme, currently being implemented with the construction of Spring Grove Dam, will increase water supply from the Integrated Mgeni WSS by 60 million m³/a. However, this will not be sufficient to meet the long-term requirements of the system.

Pre-feasibility investigations indicated that the development of the undeveloped uMkhomazi River, to transfer water to the existing Mgeni system, most likely will fulfil this requirement. The uMkhomazi River is the third-largest river in KZN in terms of mean annual runoff.

The uMWP-1 consists of both Raw Water and Potable Water components which are being undertaken by DWS and Umgeni Water, respectively. A simplified diagrammatic representation of the overall transfer scheme is provided in **Figure 1**. This report only focuses on the uMWP-1 Raw Water component.

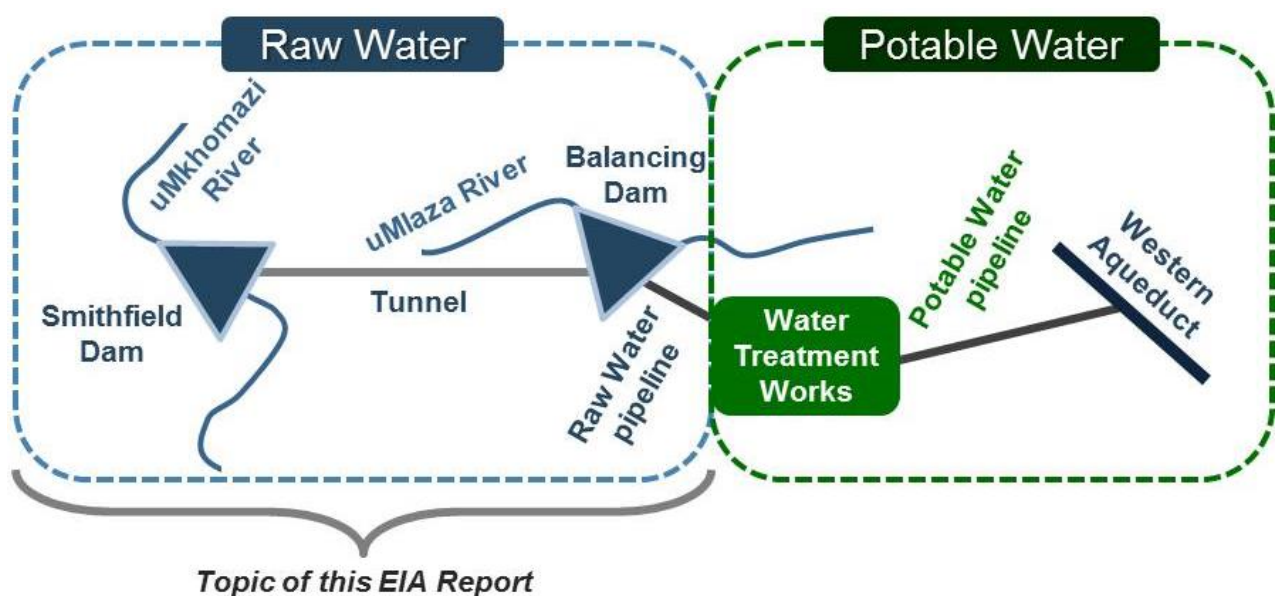


Figure 1: Simplified diagram of uMWP-1 components

4 PROJECT LOCATION

The preferred layout for the uMWP-1 Raw Water component, as established through the EIA, is shown in **Figures 2 - 3**.

The project area is situated in the southern part of KZN. The western part of the project area falls within the Harry Gwala DM (Ingwe LM), whereas the eastern portion is located in the uMgungundlovu DM (Richmond LM and Mkhambathini LM). The western portion of the project area, including Smithfield Dam and the first ± 21 km of the tunnel, falls under Traditional Authority and state land. The area is characterised by traditional homestead settlements and rural subsistence agriculture. The eastern part of the project area, which includes the remaining part of the tunnel (± 11.5 km), balancing dam and raw water pipeline, is privately owned and predominantly used for commercial farming and forestry.

A description of the location of each of the major Raw Water project components follows:

- ❖ The proposed Smithfield Dam is located 2 km upstream from the confluence of the uMkhomazi and Mfeneni Rivers, along the middle reaches of the uMkhomazi River, midway between Lundy's Hill Bridge and Deepdale. The site falls within Wards 7, 8 and 10 of the Ingwe LM.
- ❖ The proposed transfer tunnel runs in a west to east direction for approximately 32.5 km, with the inlet at Smithfield Dam and the outlet at the Baynesfield Estate. Areas passed include Ncwadi, Songizini, Mhlongo and Ndongwane (amongst others). There are access shafts and adits for maintenance purposes. The tunnel traverses Ward 7 of the Ingwe LM and Wards 7 and 3 of the Richmond LM.
- ❖ The raw water pipeline, which conveys water to the Water Treatment Works (WTW) (apart from the link to the balancing dam), traverses the Baynesfield Estate (diversified commercial farming operation) in Ward 3 of the Richmond LM
- ❖ The area affected by the balancing dam also forms part of the Baynesfield Estate.

The location of the project infrastructure was influenced by various factors, such as topography and associated elevation, impacts to the receiving environment, existing servitudes, existing structures and infrastructure, access, site constraints and geotechnical conditions (amongst others). From a technical perspective, a primary determinant in siting the infrastructure was ensuring the correct elevation to maintain a gravity fed system.

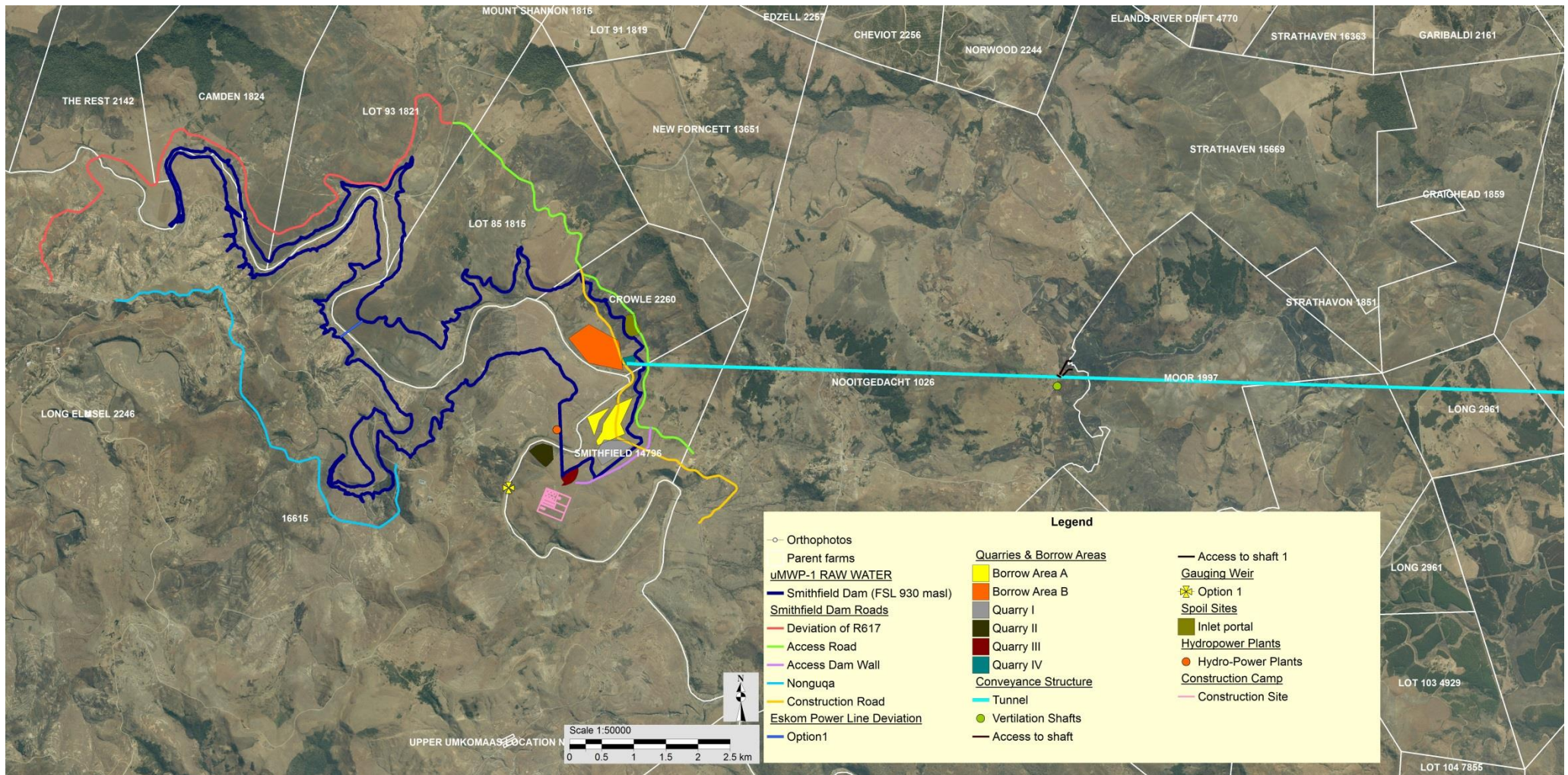


Figure 2: Locality Map of Preferred Layout – uMWP-1 Raw Water (western side)

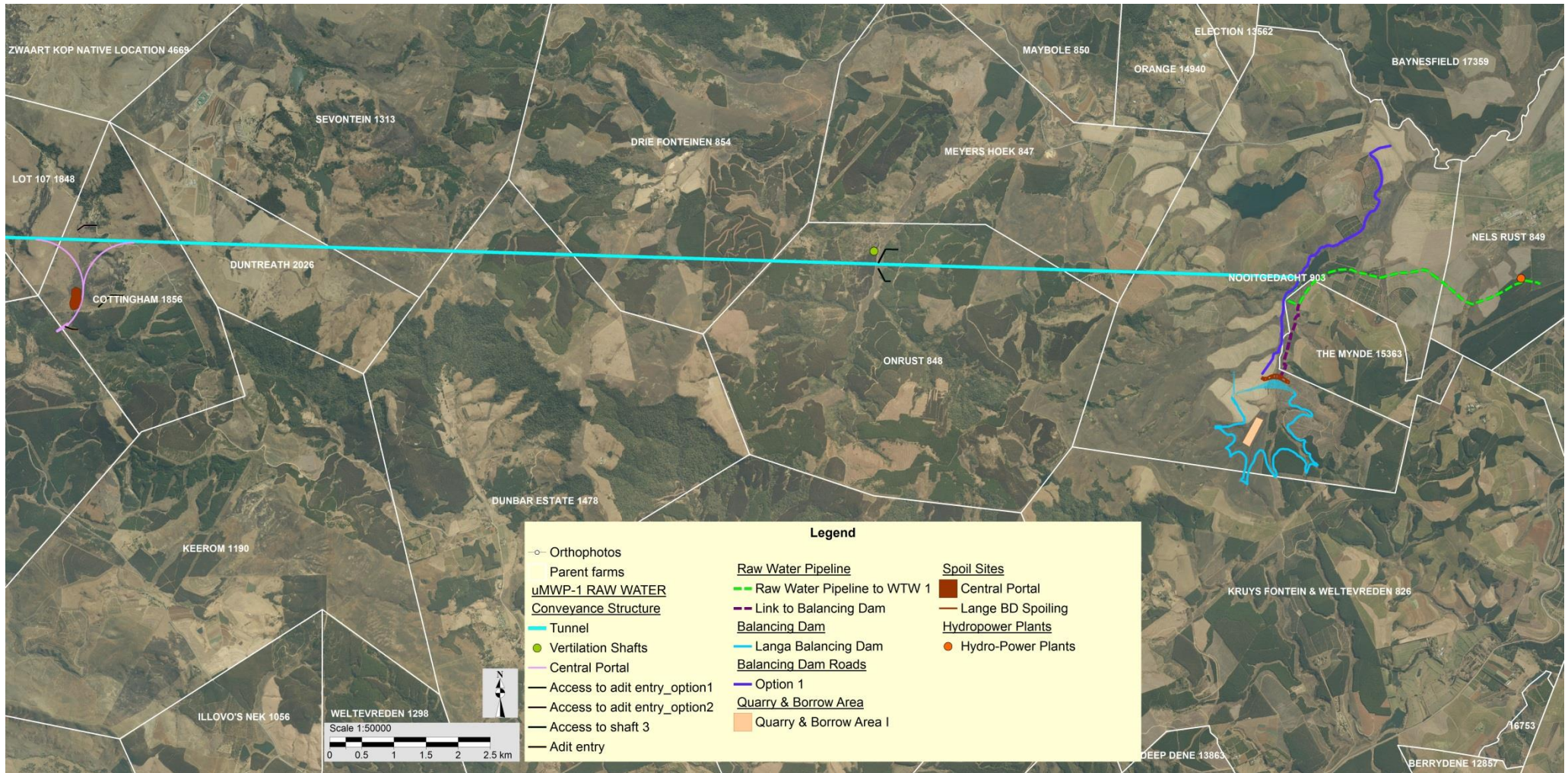


Figure 3: Locality Map of Preferred Layout – uMWP-1 Raw Water (eastern side)

5 OVERVIEW OF PROJECT

The components of uMWP-1 Raw Water are listed in **Table 2**.

Table 2: uMWP-1 Raw Water Project Components

Raw Water Component	Associated Infrastructure
Smithfield Dam	<ol style="list-style-type: none"> 1. Dam embankment 2. Saddle dam embankment 3. Spillway (including approach area and plunge pool) 4. Tunnel intake tower 5. Dam outlet works (including dam intake tower, tunnel and outlet valve house) 6. Deviation of the R617 7. Access road to Nonguqa 8. Access road to intake tower 9. Access road to tunnel inlet portal 10. Access road to damwall 11. Construction roads 12. Relocation of power line 13. Relocation of telephone lines 14. Quarries and earthfill borrow areas 15. Substation 16. Operator's offices 17. Gauging weir 18. Access road to gauging weir 19. Hydropower plant 20. Spoil site - inlet 21. Construction and permanent housing
Raw Water Conveyance Infrastructure	<ol style="list-style-type: none"> 1. Tunnel 2. Tunnel intake tower 3. Raw water pipeline 4. Spoil sites (inlet and central portals) 5. Access road to Shaft 1 6. Access road to Shaft 2 7. Access road to Shaft 3 8. Access road to adit entry 9. Access road to tunnel outlet portal 10. Ventilation shaft 11. Adits 12. Hydropower plant
Balancing Dam	<ol style="list-style-type: none"> 1. Dam embankment 2. Spillway 3. Bottom outlet / intake 4. Relocation of roads 5. Access roads 6. Quarry and earthfill borrow area 7. Construction and permanent housing 8. Spoil site - outlet

6 EMPr FRAMEWORK

This EMPr provides performance criteria required to address potential environmental impacts during the pre-construction and construction phases of the uMWP-1 Raw Water project (Smithfield Dam, Water Conveyance Infrastructure and Balancing Dam). This report must be read in conjunction with the EIA Report.

The scope of the EMPr is as follows:

- ❖ Establish management objectives during the pre-construction and construction phases in order to enhance benefits and minimise adverse environmental impacts;
- ❖ Provide targets for management objectives, in terms of desired performance;
- ❖ Describe actions required to achieve management objectives;
- ❖ Outline institutional structures and roles required to implement the EMPr; and
- ❖ Provide legislative framework.

It is recommended that the following management plans be developed to supplement the provisions in the EMPr (if relevant):

1. Relocation Action Plan (RAP) for Smithfield Dam, which needs to make provision for the following (amongst others) –
 - a. Build on the Relocation Framework Plan;
 - b. Incorporate findings of the Socio-economic Survey;
 - c. Incorporate mitigation measures included in the Social Impact Assessment and Socio-Economic Impact Assessment;
 - d. Satisfy the requirements of the Ingonyama Trust Board, Traditional Authorities, Department of Cooperative Governance and Traditional Affairs (COGTA), Harry Gwala DM and Ingwe LM;
2. Smithfield Dam Impoundment EMPr, which needs to make provision for the following (amongst others) –
 - a. Dam safety management;
 - b. Water quality management;
 - c. EWR releases;
 - d. Managing impacts to land use and biodiversity in the dam basin;
3. Balancing Dam Impoundment EMPr, which needs to make provision for the items listed above;
4. Rehabilitation Management Plan, which will include additional measures identified during construction to supplement the reinstatement and rehabilitation provisions included in the EMPr for the construction phase; and
5. Operational EMPr, which will complement the Operation and Maintenance Manual and needs to make provision for the following (amongst others) –

- a. Dam safety management;
- b. Operational Rules;
- c. Erosion management;
- d. Shoreline management;
- e. Access management;
- f. Ongoing engagement with Interested and Affected Parties (I&APs);
- g. Control of alien invasive species;
- h. Firebreak management; and
- i. Biodiversity management.

7 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by DWS as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA for the proposed uMWP-1 Raw Water component.

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

The core members of Nemai Consulting that were involved with compiling the EMPr for the project are captured in **Table 3** below, and their respective Curricula Vitae are contained in the body of the EIA Report.

Table 3: EMPr Core Team Members

Name	Qualifications	Experience
Mr D. Henning	MSc (Aquatic Science)	15 years' experience. Prepared EMPs and acted as the Environmental Control Officer (ECO) on various projects, including: <ul style="list-style-type: none"> 80km bulk water pipeline from Randfontein to Rustenburg, North-West; Construction of the Spring Grove Dam, as part of the Mooi-Mgeni Transfer Scheme Phase 2, KZN; Ncwabeni Off-Channel Storage and associated infrastructure, KZN; Mokolo Crocodile West Water Augmentation Project (water transfer scheme), Limpopo; and Foxwood Dam and associated infrastructure, Eastern Cape.
Mr C. Chidley	<ul style="list-style-type: none"> B.Sc Eng (Civil); BA (Economics, Philosophy) MBA 	22 years' experience. Prepared EMPs and acted as the ECO on various projects, including: <ul style="list-style-type: none"> Raising of Hazelmere Dam, KZN; Upgrade of the Sunderland Ridge Waste Water Treatment Works and bulk sewer line situated on the Hennops River, Gauteng; and Empangeni Bulk Outfall Sewer, 40km pipeline, KZN.

8 ENVIRONMENTAL GOVERNANCE FRAMEWORK

8.1 Legal Framework

Pre-construction and construction will be undertaken according to recognised best industry practices and will include measures prescribed within this EMPr. This EMPr shall form part of the contract documents, and informs the Contractor about his duties in the fulfilment of the project objectives, with particular reference to the mitigation of environmental impacts that may potentially be caused by construction activities associated with the project. The Contractor will note that obligations imposed by the EMPr are legally binding in terms of environmental legislation.

All project activities must comply with all relevant South African legislation and regulations. All environmental statutory requirements should be included in the Contractors' conditions. Specific legislation that must be complied with includes, but is not necessarily limited to:

- ❖ Constitution of the Republic of South Africa, (No. 108 of 1996);
- ❖ National Environmental Management Act (No. 107 of 1998);
- ❖ National Water Act (No. 36 of 1998);
- ❖ Mineral and Petroleum Resources Development Act (No. 28 of 2002);
- ❖ National Environmental Management: Biodiversity Act (No. 10 of 2004);
- ❖ National Environmental Management: Waste Act (No. 59 of 2008);
- ❖ National Heritage Resources Act (No. 25 of 1999);
- ❖ National Veld and Forest Fire Act (No. 101 of 1998);
- ❖ National Environmental Management Protected Areas Act (No. 57 of 2003);
- ❖ Environmental Conservation Act (No. 73 of 1989);
- ❖ National Environmental Management Air Quality Act (Act No. 39 of 2004);
- ❖ Integrated Coastal Management Act (Act No. 24 of 2008);
- ❖ Animal Protection Act (No. 71 of 1962);
- ❖ Conservation of Agricultural Resources Act (No. 43 of 1983);
- ❖ Hazardous Substances Act (Act No. 15 of 1973);
- ❖ Occupational Health and Safety Act (No. 85 of 1993);
- ❖ Construction Regulations (2014);
- ❖ Explosives Act (No. 15 of 2003); and
- ❖ Alien and Invasive Species Regulations (2014).

The various forms of authorisation that will be required for the project are listed in **Table 4**.

Table 4: Authorisations related to the project

Description	Legal Reference	Regulatory Authority
Approval required for listed activities in terms of the EIA Regulations (18 June 2010)	<ul style="list-style-type: none"> • National Environmental Management Act (No. 107 of 1998) 	DEA

Description	Legal Reference	Regulatory Authority
associated with the project. Scoping and EIA process conducted.	<ul style="list-style-type: none"> EIA Regulations (GN No. R. 543, R. 544, R. 545 and R. 546 of 18 June 2010) 	
<p>The project entails the following activities that constitute water uses in terms of Section 21 of the National Water Act (NWA) (No. 36 of 1998):</p> <ul style="list-style-type: none"> Section 21(a) - Taking water from a water resource (transfer scheme and taking water from the uMkhomazi and uMlaza Rivers); Section 21(b) - Storing water (Smithfield Dam and balancing dam); Section 21(c) - Impeding or diverting the flow of water in a watercourse (instream works for Smithfield Dam, balancing dam, gauging weir, road realignment, access roads, raw water pipeline, etc.); and Section 21(i) - Altering the bed, banks, course or characteristics of a watercourse (instream works for Smithfield Dam, balancing dam, gauging weir, road realignment, access roads, raw water pipeline, etc.); Section 21(g) - Disposing of waste in a manner which may detrimentally impact on a water resource (wastewater discharges from construction activities and discharges from tunnelling). 	<ul style="list-style-type: none"> National Water Act (No. 36 of 1998) 	DWS
Permits to be obtained if protected trees are to be cut, disturbed, damaged, destroyed or removed.	<ul style="list-style-type: none"> National Forests Act (No. 84 of 1998) 	Department of Agriculture, Forestry and Fisheries (DAFF)
Permits to be obtained if heritage resources are to be impacted on and for the removal of graves.	<ul style="list-style-type: none"> National Heritage Resources Act (No. 25 of 1999) KZN Heritage Act (No. 04 of 2008) 	Amafa aKwaZulu-Natali
Permits to be obtained for the removal and transportation of endangered fauna and flora.	<ul style="list-style-type: none"> National Environmental Management: Biodiversity Act (Act No. 10 of 2004) Natal Nature Conservation Ordinance (15 of 1974) 	Ezemvelo KZN Wildlife (EKZNW)
Permits required for blasting.	<ul style="list-style-type: none"> Explosives Regulations (GN R109 of 17 January 2003) 	SAPS Explosives
A permit may be issued, subject to permit conditions, for the transfer of a specimen of an alien or listed invasive species from one freshwater system in which it occurs to another fresh-water system in which it does not occur through a state inter-basin transfer scheme.	<ul style="list-style-type: none"> Alien and Invasive Species Regulations (GN No. R 598 of 1 August 2014) 	DEA

Additional legal requirements include the following:

- ❖ All waste (general and hazardous) generated during the construction phase may only be disposed of at appropriately licensed sites in terms of National Environmental Management: Waste Act (No. 59 of 2008);

- ❖ Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which include the Hazardous Substances Act (No. 15 of 1973), the Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations, and applicable SANS and international standards;
- ❖ The storage of general or hazardous waste in a waste storage facility must comply with the norms and standards in GN No. R. 926 of 29 November 2013;
- ❖ Construction Regulations (2003) published under the Occupational Health and Safety Act (No. 85 of 1993) apply to construction activities including “the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work”. A “health and safety plan” which addresses hazards identified, and includes safe work procedures to mitigate, reduce or control the hazards identified, is required under this Act; and
- ❖ DWS will need to conform to all its legal obligations as part of the acquisition of land for the construction and operation of the project.

8.2 Project Specifications

The EMPr focuses more on performance criteria for environmental compliance, whereas the detail on how the project is to meet these performance criteria is provided in the project specification in the form of minimum standards and measures to be implemented by the Contractor. The Contractor shall provide detailed method statements on how the performance criteria will be met, through the application of the specification. These methods are to be reviewed and approved by the Engineer to ensure that they are adequate.

The method statements must be project- and site specific and should explain in detail the following:

1. The manner in which the work is to be undertaken;
2. The estimated schedule for the works (timing);
3. The area where the works will be executed (location);
4. The materials and plant / equipment needed for the works;
5. The necessary mitigation measures that need to be implemented to adequately safeguard the environment, construction workers and the public (where applicable);
6. Training of employees;
7. Roles and responsibilities; and
8. Monitoring and reporting requirements.

The list of method statements required to assist in the implementation of this EMPr includes at least the following (where applicable):

- ❖ Method Statement for site clearing;
- ❖ Method Statement for establishing the construction camp;
- ❖ Method Statement with regard to waste and wastewater management;

- ❖ Method Statement to show procedures for dealing with possible emergencies that can occur, such as fire and accidental leaks and spillage of carbon fuels and oils;
- ❖ Method Statement for dust control;
- ❖ Method Statement for the storage and handling of hazardous substances;
- ❖ Method Statement for management of concrete and batching plants;
- ❖ Method Statement for river diversions;
- ❖ Method Statement for managing spoil material;
- ❖ Method Statement for controlling alien invasive species and noxious weeds;
- ❖ Method Statement for the decommissioning of the construction works area; and
- ❖ Method Statement for rehabilitation of construction footprint.

Note that the method statements are contractual requirements between the Implementing Agent and the Contractor and therefore not subject to approval by DEA.

9 ROLES & RESPONSIBILITIES

A high-level outline of the institutional arrangements for the implementation of the EMPr during the pre-construction and construction phases of the project, as well as the conditions of the Environmental Authorisation, is provided in **Figure 4**.

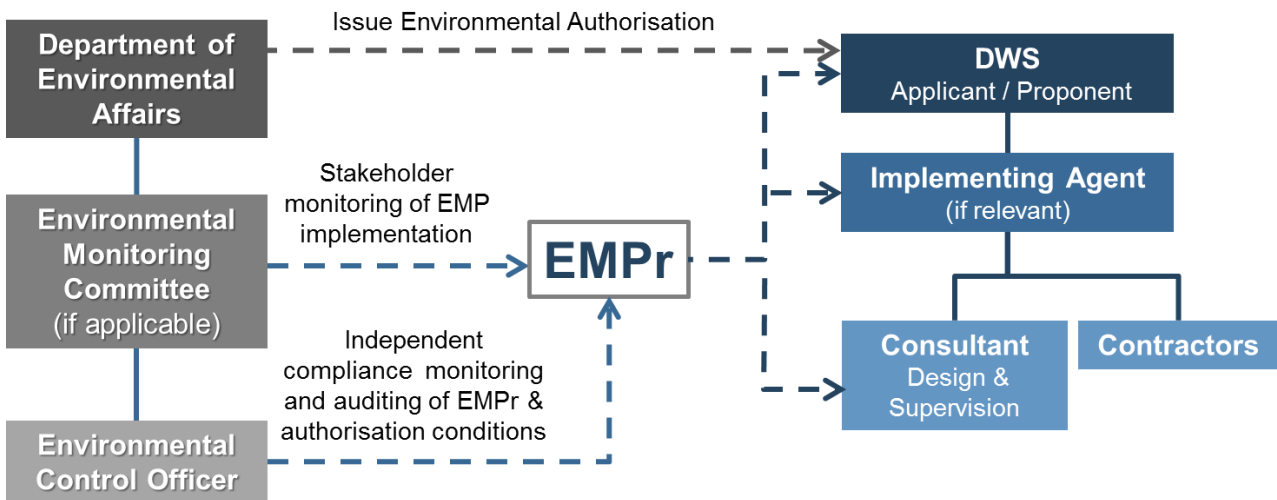


Figure 4: Institutional Arrangements: Roles & Responsibility

9.1 DEA

DEA is the mandated authority in terms of the National Environmental Management Act (No. 107 of 1998) that determines whether authorisation can be issued for the project, following a decision-making process conducted as part of the EIA. Conditions are included in the Environmental Authorisation, which need to be complied with by the project applicant.

DEA also fulfils a compliance and enforcement role with regards to the authorisation. The Department may perform random inspections to checks compliance. DEA will also serve as an active member of the Environmental Monitoring Committee (EMC) (if applicable) and will review the monitoring and auditing reports compiled by the ECO.

Amendments may be required to the EMPr or the Environmental Authorisation, based on adaptive management to the site conditions and the technical requirements of the project. These amendments will need to be approved by DEA.

9.2 DWS

DWS is the applicant in terms of National Environmental Management Act (No. 107 of 1998). DWS is also referred to as the project proponent and is ultimately responsible for the

development and implementation of the EMPr and ensuring that the conditions in the Environmental Authorisation are satisfied. The liability for non-compliance thus rests with DWS.

DWS may appoint an implementing agent for the project and arrangements for compliance need to be formalised between these parties.

9.3 The Contractor

The Contractor is appointed by the Implementing Agent to undertake construction of the works as specified in the Contract. In order to carry out the requirements of this EMPr, the Contractor must make sure that he/she has a clear understanding of all environmental matters relating to the project. The responsibilities of the Contractor will include:

- ❖ The implementation of and adherence to the Contract Specifications in accordance with the requirements of the EMPr.
- ❖ To ensure all Sub-contractors under his supervision adhere to the applicable environmental contract specifications in accordance with the requirements of the EMPr.
- ❖ Report any non-compliance to the Chief Resident Engineer (CRE) within 12 (twelve) hours of the event occurring.
- ❖ Report any non-compliance event that constitutes an emergency immediately and in line with the protocol applicable to that particular emergency event.
- ❖ To ensure that all employees and Sub-contractors attend the Environmental Awareness Training and subsequent refresher training, and are familiar with or made aware of the contents of the Environmental Authorisation and EMPr.
- ❖ To conduct any remedial work required in terms of the Specifications, the EMPr and Environmental Authorisation as a result of environmental negligence, mismanagement and/or non-compliance.

9.4 The Environmental Control Officer

The role of the ECO is primarily to act as an independent monitor on behalf of DEA and the EMC (if established) for the implementation of the uMWP-1 Raw Water in accordance with the requirements of the Environmental Authorisation and the approved EMPr.

It is recommended that the ECO undertake weekly inspections of the site, monthly monitoring and annual full compliance auditing including an audit at the end of construction and one at the end of the defects notification period. The aforementioned reports will be submitted to the Implementing Agent's Environmental Manager, EMC (if applicable) and DEA for their records.

The role and function of the ECO is to:

- ❖ Conduct third-party monitoring and auditing.

- ❖ Regularly monitor and review the progress towards achieving the specific strategies, objectives and performance targets of the EMPr.
- ❖ Independently verify that mitigation measures and conditions in the EMPr are being applied.
- ❖ Conduct regular site inspections and issue inspection reports.
- ❖ Review monitoring data and evaluate against performance targets.
- ❖ Provide independent reporting to DEA on compliance with the Environmental Authorisation and EMPr.
- ❖ After consultation with the Implementing Agent and the EMC (if established), inform decision-making authorities when there is non-compliance with conditions of approval.
- ❖ Undertake periodic formal auditing of the EMPr compliance.
- ❖ If an EMC is to be established, then the ECO will:
 - Act as the Secretariat to the EMC by providing logistical and organisational support.
 - Prepare minutes of EMC meetings and distribute to members.
 - Provide independent professional advice to the EMC in the execution of its functions.

As an independent Consultant, the ECO is not responsible for:

- ❖ EMPr implementation.
- ❖ Primary environmental data collection, monitoring and analysis.
- ❖ Resolving I&AP complaints.

The ECO is not accountable for the implementation of the Environmental Authorisation and the EMPr and is also not linked to the project authorities or the Engineer or the Contractor. Therefore, the ECO does not have the authority to:

- ❖ Make project-related decisions.
- ❖ Issue instructions to either the Engineer or the Contractor.
- ❖ Stop the construction works.
- ❖ Demand the implementation of specific mitigation and/or corrective measures to the Engineer or Contractor.

9.5 Environmental Monitoring Committee

If applicable, an EMC will be established before commencement of any construction activities and will serve as an additional mechanism for monitoring the implementation of the EMPr and compliance with the Environmental Authorisation, as well as for improving communication amongst key stakeholders. The committee will have an advisory, monitoring and “watch-dog” role for the duration of the construction phase of the project. This committee will report to the Director-General of DEA.

Appropriate Terms of Reference for the EMC will need to be prepared, which will include roles and responsibilities, membership and functionality (amongst others).

If an EMC is established then appropriate Terms of Reference (ToR) will need to be prepared that must address *inter alia* the following:

- ❖ Mandate of the EMC;
- ❖ EMC membership;
- ❖ EMC meetings;
- ❖ Chairperson's responsibilities;
- ❖ Purpose of the EMC;
- ❖ Principles for effective functioning of the EMC;
- ❖ Consent;
- ❖ Responsibility of the Implementing Agent (if applicable);
- ❖ Communication channels;
- ❖ Amendment of the ToR of the EMC;
- ❖ Conflict of interest;
- ❖ Code of ethics; and
- ❖ Adoption.

9.6 The Engineer

The Engineer is appointed by the Implementing Agent's Consultant to design the works and supervise construction. The Engineer will be represented on site for the duration of construction by the CRE. The Engineer carries a direct responsibility for the effective implementation of the environmental management requirements detailed in this EMPr. The Engineer is required to have an Environmental Monitor and Social Monitor responsible for daily monitoring on his team.

9.7 The Chief Resident Engineer

The CRE is a member of the Engineer's staff and responsible for ensuring that the Contractor complies with the construction contract, the design specifications, the Environmental Authorisation and the EMPr. The Contractor may only take instructions from the CRE. All decisions affecting programme or costs which are influenced by the specifications, procedures or protocols must be approved by the CRE. The CRE also has the authority to stop any construction activity which is in contravention of the relevant specifications. The CRE must make the findings of internal audits available to the Implementing Agent and the ECO.

9.8 The Engineer's Environmental Monitor and Social Monitor

The Environmental Monitor and Social Monitor, are part of the Engineer's staff, and are responsible for the day-to-day monitoring of construction activities in relation to their compliance with the EMPr and relevant specifications. The Environmental Monitor and Social Monitor must

ensure that any complaints related to the physical and social environment received from the public are properly recorded and dealt with. The Environmental Monitor and Social Monitor must:

- ❖ Be well versed in environmental management matters.
- ❖ Understand the relevant environmental legislation and processes.
- ❖ Understand the hierarchy of environmental compliance reporting and the implications of non-compliance.
- ❖ Know the background of the project and understand the implementation programme.
- ❖ Be able to identify issues and make recommendations in terms of the environmental management requirements.
- ❖ On a monthly basis, undertake internal audits to gauge compliance with environmental legislation, the conditions of the Environmental Authorisation, the EMPr and the specifications.
- ❖ Submit the findings of internal audits to the CRE.
- ❖ Keep accurate and detailed records of all EMPr-related activities on site.
- ❖ Check that the Contractor keeps all the permits and certificates on site as required by this EMPr.
- ❖ Advise on the rectification of any pollution, contamination or damage to the project site, rights of way or adjacent land.
- ❖ Ensure that the CRE is made aware of all applicable DEA-approved changes to the EMPr

More specifically the Environmental Monitor should maintain the following on site:

- ❖ A daily site diary.
- ❖ A non-conformance register.
- ❖ A register of audits.
- ❖ Copies of Method Statements
- ❖ Monitoring reports of the Contractor.
- ❖ Compliance and audit reports.
- ❖ Copies of the EA and EMPr.
- ❖ Copies of all permits required during the construction phase.

The Social Monitor is responsible for all landowner and I&AP interaction and must maintain a public complaint and issues register.

9.9 The Contractor's Environmental Officer and Social Officer

The Environmental Officer and Social Officer are part of the Contractor's staff and are responsible for all activities related to the day-to-day on-site implementation of this EMPr and compliance with the environmental specifications, and for the compilation of regular (daily, weekly and monthly) Monitoring Reports for the Engineer. The Environmental Officer and Social Officer must liaise with the Engineer on all environmental and related issues when necessary and ensure that any complaints received from the public are properly recorded and dealt with. The Contractor must

ensure that all his employees, visitors and sub-contractors receive Environmental Awareness Training as specified. The Environmental Officer and Social Officer must:

- ❖ Be well versed in environmental matters.
- ❖ Understand the relevant environmental legislation and processes.
- ❖ Understand the hierarchy of environmental compliance reporting, and the implications of non-compliance.
- ❖ Know the background of the project and understand the implementation programme.
- ❖ Be able to resolve conflicts and make recommendations (to the Contractor) in terms of the requirements of this EMPr.
- ❖ Keep accurate and detailed records of all EMPr-related activities on site.
- ❖ Keep the following on file:
 - Material Safety Data Sheets (MSDSs) for all hazardous material stores.
 - Waste disposal certificates.
 - Training registers.
- ❖ Arrange the presentation of environmental awareness training courses/toolbox talks to all site staff, Contractors and Sub-contractors, and monitor the environmental awareness training for all new site personnel employed by the Contractor.
- ❖ Advise on the rectification of any pollution, contamination or damage to the project site, rights of way and adjacent land.

10 MONITORING

Monitoring is required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project.

10.1 Baseline Monitoring

10.1.1 *General*

Baseline monitoring aims to determine the pre-construction state of the receiving environment, and serves as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects.

10.1.2 *Preconstruction Survey*

A pre-construction survey needs to be conducted for all areas that are to be affected by construction activities. The survey needs to include the following:

- ❖ Site investigations by appropriate members of the project team and specialists (as relevant);
- ❖ Generate records from survey which include site details, photographs, explanatory notes, etc. (as required);
- ❖ Record the condition of existing structures and infrastructure on the site; and
- ❖ Identify site-specific mitigation measures.

The records from the pre-construction survey must be used to establish and inform the reinstatement and rehabilitation requirements for the affected areas.

Note that separate provision is made for Specialist Environmental Investigations in **Section 15.2** that need to take place prior to construction activities.

10.1.3 *Wetland Assessment*

A suitably qualified specialist will be required to assess wetlands outside of the impoundment areas of Smithfield Dam and the balancing dam that will be impacted by construction activities. This is required to establish specific rehabilitation requirements.

10.1.4 *Environmental Parameters*

The environmental parameters to be included in the baseline monitoring, which is to be undertaken by DWS, are shown in **Table 5**.

Table 5: Baseline Monitoring Requirements

Environmental Parameter	Monitoring Locations	Requirements
Water Quality	<ul style="list-style-type: none"> • All major watercourses to be affected by the project, including the uMkhomazi and Mlaza Rivers and their tributaries (including drainage lines). Sites to be located at suitable spots up- and downstream of the construction sites and in-stream works, to be determined in consultation with the ECO. • <i>In situ</i> water quality monitoring to be conducted. 	<ul style="list-style-type: none"> • Comply with relevant standards - SANS 5667. • Water Quality variables to be tested include: <ul style="list-style-type: none"> ○ Chemical oxygen demand ○ Total ammonia ○ Copper ○ Iron ○ Lead ○ Nitrite/Nitrate ○ Orthophosphate ○ Zinc ○ Faecal coliform bacteria ○ Sodium (Na) ○ Soap, oil and grease ○ Manganese ○ Fluoride
Air Quality	<ul style="list-style-type: none"> • Dust fallout units to be located taking into consideration significant sources of air pollution, sensitive receptors, and dominant wind direction. Dust fallout to be measured at / around the following sites (as a minimum) – <ul style="list-style-type: none"> ○ Batching plant; ○ Aggregate stockpiles; ○ Crusher area; ○ Dam wall construction area; ○ Borrow areas and quarries; ○ Sensitive features – <ul style="list-style-type: none"> ▪ Communities surrounding Smithfield Dam; ▪ Baynesfield Estate Lodge; ▪ Homesteads located on The Mynde Farm and Kyalami Farm; ▪ Dwellings situated in close proximity to the pipeline route; ▪ Dust-intolerant crops such as avocado orchards located alongside the proposed access road to the tunnel outlet and balancing dam on the Baynesfield Estate; • Particulate matter (PM₁₀) – strategic monitoring point(s) to be selected. 	<ul style="list-style-type: none"> • Dust fallout – comply with ASTM D1739; SANS 1929, SANS 69. • Particulate matter (PM₁₀) – comply with the National Ambient Air Quality Standards.
Groundwater	<ul style="list-style-type: none"> • Establish monitoring locations in consultation with the Engineer, based on the following: <ul style="list-style-type: none"> ○ Existing production boreholes and springs located within a pre-determined corridor along the tunnel; ○ Boreholes established as part of the project's geotechnical investigations; and ○ Long-term and temporary bores installed to monitor groundwater impacts in specific areas (e.g. tunnel route). 	<ul style="list-style-type: none"> • Monitor groundwater levels and chemical properties. • Groundwater monitoring programme to be established which includes the following: <ul style="list-style-type: none"> ○ Monitoring frequency; ○ Indicators; ○ Thresholds of significance / probable concern (trigger remedial action or other intervention); ○ Groundwater drawdown contingency plan, which includes emergency responses (e.g. immediate action, remedial action and investigation).
Noise & Vibration	<ul style="list-style-type: none"> • Noise and vibration monitoring sampling sites to be located taking into consideration significant sources of noise, sensitive receptors (e.g. see sensitive features listed under Air Quality above), and dominant wind direction. Sites to coincide with dust 	<ul style="list-style-type: none"> • Comply with SANS 10103:2008.

Environmental Parameter	Monitoring Locations	Requirements
	fallout sites (where relevant). <ul style="list-style-type: none"> Develop and implemented a noise and vibration monitoring programme that includes sensitive avifauna (including Blue Swallow and Cranes). Incorporate recommendations from specialist Vibration Opinion (Appendix H13 of the EIA Report) 	<ul style="list-style-type: none"> Establish requirements of environmental authorities and stakeholders, including DEA, EKZNW, BirdLife SA and WESSA.
Traffic	Implement traffic monitoring which includes baseline traffic monitoring, 1 year ahead of construction, to confirm the traffic status quo on the road links that are to be worst affected.	<ul style="list-style-type: none"> KZN Department of Transport (DoT)

10.2 Environmental Monitoring

Environmental monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded. The parameters and sampling localities used during the baseline monitoring will form the basis of the environmental monitoring programme.

The environmental parameters to be included as part of the environmental monitoring programme, which is to be undertaken by the Contractor, include the following:

1. Air Quality –
 - Dust fallout;
 - Particulate matter (PM₁₀);
2. Noise;
3. Vibration;
4. Water quality;
5. Groundwater levels and quality; and
6. Traffic.

The following requirements need to be incorporated into the programme:

- ❖ Monitoring during normal operations, abnormal situations and emergency situations (e.g. unexpected spillage of hazardous substance);
- ❖ Measuring equipment must be accurately calibrated;
- ❖ Adequate quality control of the sampling must be ensured;
- ❖ Analysis is to be undertaken at a SANS 17025 certified laboratory;
- ❖ Certified methods of testing must be employed;
- ❖ Where legal specifications exist for testing and sampling methods, these must be taken into account; and
- ❖ Establish a process for identifying and implementing corrective measures.

10.3 Compliance Monitoring and Auditing

Compliance monitoring will commence in the pre-construction phase, where those conditions in the Environmental Authorisation that need to be adhered to prior to project implementation will need to be checked and recorded, as well as to check compliance with the provisions in the EMPr. Compliance monitoring will be completed at the end of the defects liability period to check the performance of rehabilitation measures and whether the related objectives have been met.

It is recommended that the ECO undertake weekly inspections of the site, monthly monitoring and annual full compliance auditing including an audit at the end of construction and one at the end of the defects notification period.

Auditing of compliance with the Environmental Authorisation and EMPr must be conducted in accordance with Regulation 34 of GN No. R 982 (4 December 2014) in terms of the following:

1. The holder of an Environmental Authorisation must, for the period during which the Environmental Authorisation and EMPr, remain valid -
 - a. Ensure that the compliance with the conditions of the Environmental Authorisation and EMPr is audited; and
 - b. Submit an environmental audit report to DEA.
2. The environmental audit report must-
 - a. Be prepared by an independent person with the relevant environmental auditing expertise;
 - b. Provide verifiable findings, in a structured and systematic manner, on-
 - i. The level of performance against and compliance of an organization or project with the provisions of the requisite Environmental Authorisation and EMPr; and
 - ii. The ability of the measures contained in the EMPr to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity;
 - c. Contain the information set out in Appendix 7 of GN No. R 982 (4 December 2014); and
 - d. Be conducted and submitted to DEA at intervals as indicated in the Environmental Authorisation.
3. The environmental audit report must determine-
 - a. The ability of the EMPr to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an ongoing basis and to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and
 - b. The level of compliance with the provisions of Environmental Authorisation and EMPr.

A document handling system must be established to ensure accurate updating of EMPr documents, and availability of all documents required for the effective functioning of the EMPr. Supplementary EMPr documentation could include:

- ❖ Method Statements;
- ❖ Site instructions;

- ❖ Emergency preparedness and response procedures;
- ❖ Record of environmental incidents;
- ❖ Non-conformance register
- ❖ Training records;
- ❖ Site inspection reports;
- ❖ Monitoring reports;
- ❖ Auditing reports; and
- ❖ Public complaints register (single register for maintained for overall site).

11 ENVIRONMENTAL TRAINING & AWARENESS CREATION

Training aims to create an understanding of environmental management obligations and prescriptive measures governing the execution of the project. It is generally geared towards project team members that require a higher-level of appreciation of the environmental management context and implementation framework for the project.

Awareness creation strives to foster a general attentiveness amongst the construction workforce to sensitive environmental features and an understanding of implementing environmental best practices. The various means of creating environmental awareness during the pre-construction and construction phases of the project may include:

- ❖ Induction course for all workers before commencing work on site;
- ❖ Refresher courses (as and when required);
- ❖ Daily toolbox talks, focusing on particular environmental issues (task- and area specific);
- ❖ Courses must be provided by suitably qualified persons and in a language and medium understood by the workers. It is noted that Zulu and English are the dominant languages in the area;
- ❖ Erect signage and barricading (where necessary) at appropriate points in the construction domain, highlighting sensitive environmental features (e.g. grave sites, protected trees); and
- ❖ Place posters containing environmental information at areas frequented by the construction workers (e.g. eating facilities).

Training and awareness creation will be tailored to the audience, based on their designated roles and responsibilities. Records will be kept of the type of training and awareness creation provided, as well as containing the details of the attendees.

The Contractor must compile a project-specific Environmental Training and Awareness Programme, taking into consideration the abovementioned factors, to be approved by the Engineer.

12 EMPr REVIEW

Due to its dynamic nature, the EMPr for uMWP-1 Raw Water will be reviewed and revised when necessary to ensure continued environmental improvement.

Following detailed design and planning, the EMPr may need to be revised to render the management actions more explicit and accurate to the final project specifications. Changes to the EMPr shall also be required where the existing system:

- ❖ Does not make adequate provision for protecting the environment against the pre-construction and construction activities;
- ❖ Needs to be modified to meet conditions of statutory approval;
- ❖ It is not achieving acceptable environmental performance;
- ❖ Requires changes due to the outcome of a monitoring or auditing event or management review;
- ❖ Provides redundant, impracticable or ineffective management measures; and
- ❖ Based on provisions in Regulation 34 of GN No. R 982 (4 December 2014).

The amendment of the EMPr will be undertaken in terms of Regulation 34 – 37 of GN No. R 982 (4 December 2014), as applicable. For minor amendments, an EMPr Amendment Register should be maintained in discussion with the ECO and EMC (if appointed), however significant changes will require formal approval from DEA.

13 ENVIRONMENTAL ACTIVITIES, ASPECTS AND IMPACTS

13.1 Environmental Activities

13.1.1 *Pre-construction Phase*

The main project activities as well as high-level environmental activities undertaken in the pre-construction phase are listed in **Table 6**.

Table 6: Activities associated with Pre-Construction Phase

<u>Project Phase: Pre-construction</u>
Project Activities
<ul style="list-style-type: none"> • Negotiations and agreements with the affected landowners (including Ingonyama Trust, Traditional Authorities, Department of Rural Development and Land Reform (DRD&LR), Baynesfield Trust and private landowners), tenants, occupiers of land, stakeholders and authorities • Initiate legal process required for land acquisition • Detailed engineering design • Detailed geotechnical investigations, including geophysical investigations • Survey and mark construction servitude • Survey and map topography for determination of post-construction landscape, rehabilitation and shaping (where necessary) • Possible removal of trees within construction servitude • Procurement process for Contractors • Review Contractor's method statements (as relevant) • Selective improvements of access roads to facilitate the delivery of construction plant and materials • Arrangements for accommodation of construction workers • The building of a site office and ablution facilities • The harvesting of timber that will be inundated (if deemed necessary); • Confirmation of arrangements with individual landowners / tenants / occupiers of land for managing and mitigating issues such as fencing and gate dimensions for traversing servitude, traversing patterns of livestock over servitude, access to livestock drinking points, security, opening and closing of gates and access to private property • Confirmation of the location and condition of all buildings, assets and structures within the servitude • Determining and documenting the road conditions for all identified haul roads • Conduct detailed hydraulic analysis to determine the optimum positioning of the scour valves • Site establishment
High Level Environmental Activities
<ul style="list-style-type: none"> • Diligent compliance monitoring of the EMPr, environmental authorisation and other relevant environmental legislation • Develop RAP (Smithfield Dam basin) and implement based on area of influence of the construction activities • Undertake Phase 2 Heritage Impact Assessment and Archaeological Impact Assessment

<u>Project Phase: Pre-construction</u>
• Commence with Resource Management Plan process
• Conduct further investigations in terms of biodiversity offsets, based on EIA findings and recommendations
• Undertake a walk through survey of the project footprint by the relevant environmental specialists to identify sensitive environmental features
• Search, rescue and relocation of red data, protected and endangered species and medicinal plants (based on area of influence of the construction activities)
• Search, rescue and relocation of heritage resources and graves (based on area of influence of the construction activities)
• Develop environmental monitoring programme (air quality, water quality, noise, traffic, social)
• Conduct further baseline environmental studies for environmental monitoring programme
• Barricading of sensitive environmental features (e.g. graves)
• Permits if protected trees are to be cut, disturbed, damaged, destroyed or removed
• Permits if heritage resources are to be impacted on and for the relocation of graves
• Establish Environmental Monitoring Committee (EMC) (if applicable)
• On-going consultation with I&APs
• Other activities as per Pre-Construction EMPr

13.1.2 Construction Phase

The main project activities as well as high-level environmental activities undertaken in the construction phase are listed in **Table 7**.

Table 7: Activities associated with Construction Phase

<u>Project Phase: Construction</u>
Project Activities
• Relocation of infrastructure
• Prepare access roads
• Establish construction camps
• Bulk fuel storage
• Delivery of construction material
• Transportation of equipment, materials and personnel
• Storage and handling of material
• Construction employment
• Site clearing (as necessary)
• Excavation
• Blasting
• Tunnel excavation including TBM activities and shaft sinking operations
• River diversion for building of major storage dam and balancing dam
• Establishment and operation of crusher
• Establishment and operation of batching plant

<u>Project Phase: Construction</u>
• Establishment and operation of materials testing laboratory
• Create haul roads
• Create quarry and borrow areas
• Construction of embankments, bottom outlets, tunnel outlets, spillways
• Concrete Works
• Steel works
• Mechanical and Electrical Works
• Temporary river diversion for gauging weir and pipeline crossings
• Electrical supply
• Construction of spoil disposal sites
• Construction of pipeline
• Cut and cover activities
• Stockpiling (sand, crushed stone, aggregate, etc.)
• Waste and wastewater management
High Level Environmental Activities
• Diligent compliance monitoring of the EMPr, environmental authorisation and other relevant environmental legislation
• Ongoing search, rescue and relocation of red data, protected and endangered species and medicinal plants (based on area of influence of the construction activities) – permits to be in place
• Ongoing search, rescue and relocation of heritage resources and graves (based on area of influence of the construction activities) – permits to be in place
• Implement environmental monitoring programme (air quality, water quality, noise, traffic, social)
• Finalise Resource Management Plan process prior to impoundment
• Develop Rehabilitation Management Plan for approval by DEA
• Reinstatement and rehabilitation of construction domain (outside of inundation areas, as necessary)
• Develop EMPr for Operational Phase for approval by DEA
• Continued implementation of RAP
• Convene EMC Meetings (if applicable)
• Biodiversity offset requirements, based on area of influence of the construction activities
• On-going consultation with I&APs
• Other activities as per Construction EMPr

13.2 Environmental Aspects

Environmental aspects are regarded as *those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact.*

13.2.1 Pre-construction Phase

The environmental aspects listed in **Table 8** have been identified for the proposed project during the pre-construction phase, which are linked to the project activities (note that only high level aspects are provided):

Table 8: Environmental Aspects associated with Pre-Construction Phase

<u>Project Phase: Pre-construction</u>
Environmental Aspects
• Inadequate consultation with landowners/ tenants / occupiers of land
• Inadequate environmental and compliance monitoring
• Poor construction site planning and layout
• Land occupancy by temporary buildings, provisional on-site facilities and storage areas
• Inaccurate pre-construction environmental walk through survey (including search and rescue)
• Absence of relevant permits (e.g. for protected trees, heritage resources)
• Lack of barricading of sensitive environmental features
• Poor waste management
• Absence of ablution facilities

13.2.2 Construction Phase

The environmental aspects listed in **Table 9** have been identified for the proposed project during the construction phase, which are linked to the project activities (note that only high level aspects are provided):

Table 9: Environmental Aspects associated with Construction Phase

<u>Project Phase: Construction</u>
Environmental Aspects
• Inadequate consultation with landowners/ tenants / occupiers of land
• Inadequate environmental and compliance monitoring
• Lack of environmental awareness creation
• Indiscriminate site clearing
• Poor site establishment
• Poor management of access and use of access roads
• Inadequate provisions for working on steep slopes
• Poor transportation practices
• Poor fencing arrangements
• Erosion
• Disruptions to existing services
• Disturbance of topsoil

<u>Project Phase: Construction</u>
• Poor management of excavations
• Inadequate storage and handling of material
• Inadequate storage and handling of hazardous material
• Poor maintenance of equipment and plant
• Poor management of labour force
• Pollution from ablution facilities
• Inadequate management of construction camp
• Poor waste management practices – hazardous and general solid, liquid
• Wastage of water
• Disturbance to landowners / tenants / occupiers of land
• Poor management of pollution generation potential
• Damage to significant flora
• Damage to significant fauna
• Influence to resource quality of the uMkhomazi River and its tributaries, as well as tributaries of the uMlaza River, from river diversions, in-stream works and activities in the riparian zones (and a buffer area of 50m)
• Environmental damage where drainage lines are crossed
• Environmental damage of sensitive areas
• Disruption of archaeological and cultural features
• Poor reinstatement and rehabilitation
• Inadequate RMP development process
• Inadequate provisions for relocation of affected community members in dam basin

13.3 Potential Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable.

13.3.1 Pre-construction Phase

Refer to **Table 10** for the potential significant impacts associated with the activities and environmental aspects for the pre-construction phase.

Table 10: Potential Significant Environmental Impacts - Pre-Construction Phase

Environmental Factor	Potential Issues / Impacts	Smithfield Dam	Water Conveyance Infrastructure	Balancing Dam
Land Use	• Loss of land used for subsistence agriculture and communal grazing within construction domain	✓		
	• Servitude restrictions	✓	✓	✓
	• Loss of cultivated land and timber land within construction domain		✓	✓

Environmental Factor	Potential Issues / Impacts	Smithfield Dam	Water Conveyance Infrastructure	Balancing Dam
Climate	<ul style="list-style-type: none"> Greenhouse gas emissions 	✓	✓	✓
Topography	<ul style="list-style-type: none"> Visual impact in river valleys Erosion of affected areas on steep slopes 	✓	✓	✓
Soil	<ul style="list-style-type: none"> Soil erosion 	✓	✓	✓
	<ul style="list-style-type: none"> Soil contamination 	✓	✓	✓
Water Quality	<ul style="list-style-type: none"> Sedimentation from runoff from cleared areas 	✓	✓	✓
Aquatic Ecology	<ul style="list-style-type: none"> Disruptions to aquatic biota community due to water contamination. 	✓	✓	✓
Riparian Habitat	<ul style="list-style-type: none"> Loss of fuelwood, medicinal and herbal plants, building material and raw products for handicrafts within construction domain 	✓	✓	✓
Terrestrial Ecology	<ul style="list-style-type: none"> Impacts to sensitive terrestrial ecological features Potential loss of significant flora and fauna species (e.g. Blue Swallows, Oribi, Hilton Daisy, Pennington's Protea Butterfly) Damage / clearance of habitat of conservation importance Proliferation of exotic vegetation Loss of medicinal plants 	✓	✓	✓
Socio-economic Environment	<ul style="list-style-type: none"> Loss of land within construction domain Risk to livestock Nuisance from dust and noise Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS) Land claims Safety and security Use of local road network Impacts to tourism and environmental education activities at The Baynesfield Estate Lodge Impact to visual quality and sense of place Light pollution 	✓	✓	✓
Agriculture	<ul style="list-style-type: none"> Impacts to subsistence farming undertaken within construction domain Loss of grazing land within construction domain Loss of stock watering points within construction domain 	✓		
	<ul style="list-style-type: none"> Disruptions to farming operations as a result of construction-related use of existing access roads 		✓	✓
	<ul style="list-style-type: none"> Loss of cultivated land within construction domain Loss of fertile soil through land clearance 	✓	✓	✓
	<ul style="list-style-type: none"> Loss of timber land within construction domain 			✓
Air Quality	<ul style="list-style-type: none"> Excessive dust levels Greenhouse gas emissions 	✓	✓	✓
Noise & Vibration	<ul style="list-style-type: none"> Localised increases in noise during construction 	✓	✓	✓
Historical and Cultural Features	<ul style="list-style-type: none"> Destruction or damage of heritage resources through construction activities Relocation of graves 	✓	✓	✓
Transportation	<ul style="list-style-type: none"> Increase in traffic on the local road networks 	✓	✓	✓
	<ul style="list-style-type: none"> Re-alignment of R617 and access roads 	✓		
Solid Waste	<ul style="list-style-type: none"> Waste generated from site preparations (e.g. plant material) Domestic waste 	✓	✓	✓
Aesthetics	<ul style="list-style-type: none"> Visual quality and sense of place to be adversely affected by construction activities 	✓	✓	✓

Environmental Factor	Potential Issues / Impacts	Smithfield Dam	Water Conveyance Infrastructure	Balancing Dam
Tourism	<ul style="list-style-type: none"> Influence to tourism potential 	✓	✓	✓

13.3.2 Construction Phase

Refer to **Table 11** for the potential significant impacts associated with the activities and environmental aspects for the construction phase.

Table 11: Potential Significant Environmental Impacts - Construction Phase

Environmental Factor	Potential Issues / Impacts	Smithfield Dam	Water Conveyance Infrastructure	Balancing Dam
Land Use	<ul style="list-style-type: none"> Loss of land used for subsistence agriculture and communal grazing within construction domain 	✓		
	<ul style="list-style-type: none"> Servitude restrictions 	✓	✓	✓
	<ul style="list-style-type: none"> Loss of cultivated land and timber land within construction domain 		✓	✓
Climate	<ul style="list-style-type: none"> Greenhouse gas emissions 	✓	✓	✓
Geology	<ul style="list-style-type: none"> Unsuitable geological conditions 	✓	✓	✓
	<ul style="list-style-type: none"> Sourcing of construction material 	✓		✓
	<ul style="list-style-type: none"> Blasting 	✓	✓	✓
	<ul style="list-style-type: none"> Disposal of high volume of spoil material 	✓	✓	✓
Topography	<ul style="list-style-type: none"> Visual impact in river valleys 	✓	✓	✓
	<ul style="list-style-type: none"> Erosion of affected areas on steep slopes 			
Soil	<ul style="list-style-type: none"> Soil erosion 	✓	✓	✓
	<ul style="list-style-type: none"> Soil contamination 	✓	✓	✓
Geohydrology	<ul style="list-style-type: none"> High groundwater inflows Lowering of the local water table 		✓	
	<ul style="list-style-type: none"> Groundwater pollution due to spillages and poor construction practices 	✓	✓	✓
Hydrology	<ul style="list-style-type: none"> Alteration of flow regimes 	✓		✓
Water Quality	<ul style="list-style-type: none"> Sedimentation from instream works 	✓	✓	✓
	<ul style="list-style-type: none"> Water quality impacts due to spillages and poor construction practices 			
	<ul style="list-style-type: none"> Water quality impacts caused by discharge from the tunnel (dewatering due to groundwater ingress) 			
Aquatic Ecology	<ul style="list-style-type: none"> Disruptions to aquatic biota community due to water contamination, alteration of flow and disturbance to habitat during construction 	✓	✓	✓
Riparian Habitat	<ul style="list-style-type: none"> Loss of riparian and instream vegetation within construction domain 	✓	✓	✓
	<ul style="list-style-type: none"> Loss of fuelwood, medicinal and herbal plants, building material and raw products for handicrafts within construction domain 	✓		
Water use	<ul style="list-style-type: none"> With the building of Smithfield Dam the people in the tribal areas may not be able to access the watercourse for subsistence purposes during the construction phase 	✓		
Wetlands	<ul style="list-style-type: none"> Various wetlands are affected by the project, where some wetlands will be inundated by the Smithfield Dam and balancing dam and other wetlands are traversed by infrastructure (raw water pipeline, access roads, gauging weir, power line and road deviations) 	✓	✓	✓
	<ul style="list-style-type: none"> Impacts to wetland characteristics 			

Environmental Factor	Potential Issues / Impacts	Smithfield Dam	Water Conveyance Infrastructure	Balancing Dam
Estuary	<ul style="list-style-type: none"> Impacts to the uMkhomazi Estuary in terms of flow alterations, sediment regime, habitat alteration, water quality and overall ecosystem health 	✓		
Terrestrial Ecology	<ul style="list-style-type: none"> Impacts to sensitive terrestrial ecological features Potential loss of significant flora and fauna species (e.g. Blue Swallows, Oribi, Hilton Daisy, Pennington's Protea Butterfly) Damage / clearance of habitat of conservation importance Proliferation of exotic vegetation Loss of medicinal plants 	✓	✓	✓
Socio-economic Environment	<ul style="list-style-type: none"> Loss of land within construction domain Risk to livestock Nuisance from dust and noise Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS) Land claims Safety and security Relocation of access roads Use of local road network Impacts to tourism and environmental education activities at The Baynesfield Estate Lodge Impact to visual quality and sense of place Light pollution 	✓	✓	✓
Agriculture	<ul style="list-style-type: none"> Impacts to subsistence farming undertaken within construction domain Loss of grazing land within construction domain Loss of stock watering points within construction domain 	✓		
	<ul style="list-style-type: none"> Loss of stock watering points due to possible drop in ground water table 		✓	
	<ul style="list-style-type: none"> Disruptions to farming operations as a result of construction-related use of existing access roads 		✓	✓
	<ul style="list-style-type: none"> Loss of cultivated land within construction domain Loss of fertile soil through land clearance 	✓	✓	✓
	<ul style="list-style-type: none"> Loss of timber land within construction domain 			✓
Air Quality	<ul style="list-style-type: none"> Excessive dust levels Greenhouse gas emissions 	✓	✓	✓
Noise & Vibration	<ul style="list-style-type: none"> Localised increases in noise during construction Excessive vibration as a result of tunnelling and major construction activities 	✓	✓	✓
Historical and Cultural Features	<ul style="list-style-type: none"> Destruction or damage of heritage resources through construction activities Relocation of graves 	✓	✓	✓
Existing Structures & Infrastructure	<ul style="list-style-type: none"> Impoundment to affect the following – <ul style="list-style-type: none"> Two sections of road R617 High voltage Eskom power line Access dirt roads to traditional areas Telephone line; Homesteads (with associated kraals and other structures) 	✓		
	<ul style="list-style-type: none"> Balancing dam options affect the following – <ul style="list-style-type: none"> Section of power line Private farm road Access roads to cultivated areas and timber 			✓

Environmental Factor	Potential Issues / Impacts	Smithfield Dam	Water Conveyance Infrastructure	Balancing Dam
	<ul style="list-style-type: none"> plantations ○ Farming-related infrastructure (e.g. irrigation pipelines) 			
Transportation	<ul style="list-style-type: none"> • Increase in traffic on the local road networks • Re-alignment of R617 and access roads 	✓	✓	✓
Solid Waste	<ul style="list-style-type: none"> • Waste generated from site preparations (e.g. plant material) • Domestic waste • Surplus and used building material • Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags) • Wastewater (sanitation facilities, washing of plant, operations at the batching plant, etc.) • Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks 	✓	✓	✓
Aesthetics	<ul style="list-style-type: none"> • Visual quality and sense of place to be adversely affected by construction activities 	✓	✓	✓
Tourism	<ul style="list-style-type: none"> • Influence to tourism potential 	✓	✓	✓

14 SENSITIVE ENVIRONMENTAL FEATURES

Within the context of the project area, cognisance must be taken of the following sensitive environmental features for which mitigation measures are included in the EIA Report and EMPr:

- ❖ This project is situated in an area of generally high avifaunal sensitivity with Blue Swallow as the primary bird species of concern since there are so few breeding pairs left in South Africa (only 35 known breeding pairs according to Little & McKechnie, 2012), and it is a species known to be susceptible to disturbance. This project is also located in a core area for the species. Overall it is estimated that 40% of the remaining Blue Swallow population occurs in the project area, and may be threatened by the project in the absence of adequate mitigation. Specific measures are included in the EIA Report and EMPr, as recommended by the avifauna specialist, that aim to manage the impacts to sensitive bird species.
- ❖ Other endangered species that may possibly occur in the project area include the Hilton Daisy, Pennington's Protea Butterfly and Oribi.
- ❖ Steep slopes are encountered in the project area and measures to prevent erosion would need to be employed for construction activities in these areas. Steep areas include –
 - Left- and right flank at dam walls (Smithfield Dam and balancing dam);
 - Gullies along the R617 deviation route, access roads (Smithfield dam and balancing dam) and raw water pipeline;
 - Tunnel inlet and outlet areas;
- ❖ All watercourses, including the uMkhomazi and uMlaza Rivers and their tributaries (including drainage lines), are regarded as sensitive and require suitable protection from the construction activities. All construction activities to comply with the National Water Act (Act No. 36 of 1998).
- ❖ All existing infrastructure and structures are regarded as sensitive and need to be safeguarded from construction activities until they have been relocated and the redundant sections removed (as relevant).
- ❖ Protected fauna and flora species occur in the area, which need to be protected against the project's potential adverse impacts. All construction activities to comply with the National Environmental Management: Biodiversity Act (No. 10 of 2004), National Forests Act (No. 84 of 1998) and Natal Nature Conservation Ordinance (15 of 1974). Sensitive species to be identified as part of the pre-construction survey. If relocation is not required, then these species need to be adequately protected from construction activities.
- ❖ All traffic and pedestrians on the public roads are regarded as sensitive and measures need to be implemented to safeguard these road users.

- ❖ The community around Smithfield Dam need to be consulted at appropriate milestones during the course of the project. In addition, their concerns need to be adequately addressed in the RAP (including arrangements for resettling and compensating affected households), RMP (including future access to and use of the dam), Phase 2 Heritage Impact Assessment and search, rescue and relocation of medicinal plants. Existing communication channels need to be duly respected and adhered to when engaging with the community, which includes the involvement of the Harry Gwala DM, the local councilors, Traditional Authorities and the Ingonyama Trust Board.
- ❖ Baynesfield Estate is strategically located in terms of the project footprint and key infrastructure components (including the uMWP-1 tunnel outlet, balancing dam, raw water pipeline and WTW). Impacts to agricultural activities on the property need to be controlled to ensure minimal loss of high potential agricultural land. Ongoing communication and engagement with the Baynesfield Trust needs to be maintained during the project life-cycle. The construction activities associated with the uMWP-1 Raw Water and Potable Water need to be synchronised in such a way as to reduce the overall disturbances to the farming operations and tourism activities at the estate.
- ❖ Dust-intolerant crops such as avocado orchards are located alongside the proposed access road to the tunnel outlet and balancing dam on the Baynesfield Estate, and suitable mitigation measures need to be implemented to suppress dust caused by construction activities.
- ❖ A number of grave sites and structures older than 60 years were identified within the project area. The final locations of all heritage and cultural features will be confirmed as part of the Phase 2 Heritage Impact Assessment, Archaeological Impact Assessment and Paleontological Impact Assessment. These features may not be disturbed without following legal protocol.
- ❖ Prevent construction-related nuisance (including noise, dust, vibration) to sensitive socio-economic receptors, which include:
 - Communities surrounding Smithfield Dam;
 - The community residing on The Mynde Farm; and
 - Dwellings situated in close proximity to the project infrastructure (e.g. along raw water pipeline).
- ❖ Properties may not be accessed unless consent has been granted by the landowner, or until the land acquisition process has been concluded, or a construction servitude has been secured.
- ❖ Livestock and unauthorised access to the construction domain needs to be prevented. Excavations to be adequately safeguarded.

15 IMPLEMENTATION PROGRAMME

The framework for the subsequent management measures consists of the following:

- ❖ **Management objectives** – i.e. desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources);
- ❖ **Targets** – i.e. level of performance to accomplish management objectives;
- ❖ **Management actions** – i.e. practical actions aimed at achieving management objectives and targets;
- ❖ **Responsibilities**; and
- ❖ **Monitoring requirements**.

15.1 General Requirements

General requirements during the construction phase include the following:

- ❖ Design to consider and incorporate environmental requirements and sensitive environmental features.
- ❖ Define and communicate roles and responsibilities for the implementation of the EMP.
- ❖ Undertake negotiations and confirm arrangements with landowners and/or land users regarding:
 - Use of all private roads, with associated traffic arrangements;
 - Land occupancy (construction facilities);
 - Domestic animals (avoiding impacts to livestock);
 - Protocol for lodging complaints;
 - Possible loss of access;
 - Existing structures and infrastructure (including temporary and permanent water management structures and infrastructure);
 - Fencing and gate dimensions for traversing servitude;
 - Traversing patterns of game and/livestock;
 - Access to game and/livestock drinking points;
 - Security; and
 - Opening and closing of gates and access to private property.
- ❖ Ensure that all existing structures within the construction area are identified and recorded.
- ❖ Construction and operational activities need to be planned and coordinated in consultation with the affected farmers in order to minimise impacts on crop production.
- ❖ If applicable, establish an Environmental Monitoring Committee (EMC) in the pre-construction phase with suitable representation of authorities, stakeholders and I&APs.

- ❖ For Smithfield Dam and the balancing dam (where relevant), the construction domains need to be contained within the respective dam basin areas as much as possible to avoid disturbance outside of the eventual impoundment footprints. All external areas that are not associated with permanent infrastructure and the operation of the scheme need to be adequately rehabilitated.
- ❖ Spoil sites (tunnel inlet and central portals) to stay further than 32 m from any watercourse.
- ❖ Project components to avoid watercourses, as far as possible, with suitable buffers (minimum of 32 m) and mitigation measures in place. This includes the spoil sites (tunnel inlet and central portals) and the camp site at Langa Balancing Dam.
- ❖ Establish specific requirements of EKZNW for the encroachment of the deviated R617 into Impendle Nature Reserve. Ensure protection of the patches of forest on the slopes to the north of the R617 deviation.
- ❖ Implement the mitigation strategy for endangered species, as contained in the EIA Report.
- ❖ Prevent interruption of services associated with the relocation of the telephone line and power line.
- ❖ To mitigate impacts to the Baynesfield Estate Lodge it is recommended that this facility be recreated by DWS at Baynesfield Dam prior to construction.

15.2 Specialist Environmental Investigations

Management Objective:

Identify sensitive and protected environmental features in addition to those that have been identified as part of the EIA process.

Target:

1. All sensitive and protected environmental features to be identified in the construction domain (all the components of the project) and inundation area.
2. All relevant approvals to be obtained prior to relocation of red data, protected and endangered flora and fauna species, medicinal plants, heritage resources and graves.

Management Actions:

- Phase 2 Heritage Impact Assessment (HIA), Archaeological Impact Assessment (AIA) and Paleontological Impact Assessment (PIA) to be conducted. Refer to recommendations of Phase 1 HIA undertaken for EIA.
- Conduct environmental sensitivity walk down survey of entire project footprint prior to construction. Specialists to advise on necessity for surveying multiple seasons. Mitigation measures to be included in final EMPr. Survey team to include the following specialists:
 - Avifaunal specialist;

- Terrestrial ecologist;
- Aquatic ecologist; and
- Heritage specialist.
- Mitigation Strategy for Endangered Species
 - Establish uMWP-1 Biodiversity Monitoring Committee;
 - Implement uMWP-1 Biodiversity Monitoring Programme –
 - a) Pre-construction Phase -
 - i. Compile ToR for the uMWP-1 Biodiversity Monitoring Programme with the uMWP-1 Biodiversity Monitoring Committee;
 - ii. Relevant specialists to conduct a thorough ecological walk-through of all project components to identify any areas of particularly high sensitivity and requiring mitigation. Develop case specific mitigation measures to supplement current provisions in the EMPr. Sensitive sites to be mapped and recorded;
 - iii. Ongoing baseline monitoring of recorded sites and other areas with high probability of occurrence of sensitive ecological features (minimum of 12 month prior to construction);
 - iv. Implement a noise and vibration monitoring programme during the pre-construction phase to compliment the uMWP-1 Biodiversity Monitoring Programme. Predict noise and vibration levels at areas where risks exist to sensitive ecological features. Include recommendations from Vibration Opinion (Appendix H13);
 - v. Develop uMWP-1 Biodiversity Management and Mitigation Plan, which needs to be reviewed by the uMWP-1 Biodiversity Monitoring Committee before submission to DEA for decision-making. This plan must make provision for the following –
 - Management Objectives & Targets;
 - Management Actions;
 - Implementation Timeframes;
 - Monitoring;
 - Corrective Measures;
 - Responsibilities; and
 - Reporting.
 - b) Construction Phase -
 - i. Monitoring the status of sensitive ecological features and impacts against baseline and predetermined thresholds during construction; and
 - ii. Implement a noise and vibration monitoring programme during the construction phase to compliment the uMWP-1 Biodiversity Monitoring Programme.
 - c) Post-construction Phase -
 - i. Monitoring the status of sensitive ecological features during post-construction. Timeframes to be established with the uMWP-1 Biodiversity Monitoring Committee.
 - Based on the findings of the uMWP-1 Biodiversity Monitoring Programme and technical feasibility, areas where construction activities pose high risk to Blue Swallows need to be avoided during the breeding season. This may be of particular relevance to drilling as part of geotechnical investigations as well as the construction of Air Shaft 3.

- Noise and Vibration Attenuation –
 - Predict noise and vibration levels at areas where risks exist to sensitive ecological features. Consider findings of detailed geotechnical investigations that form part of the design phase.
 - Determine thresholds for sensitive ecological features, with input from the uMWP-1 Biodiversity Monitoring Committee.
 - Controlled blasting using lower chargers controlled by the peak particle velocity in rock to 12 m/s 30m away from the blasting front.
- Search, rescue and relocation of red data, protected and endangered species and medicinal plants. This is to be implemented taking into consideration the project programme to ensure that these sensitive environmental features are rescued prior to potential impact occurrence. DEA, KZN Department of Economic Development, Tourism and Environmental Affairs (DEDTEA), EKZNW and DAFF are to be consulted to ensure that requirements are satisfied. For fauna and flora species, the following factors need to be considered (amongst others):
 1. Detailed plan of action (including timeframes, methodology and costs);
 2. Site investigations to identify and record sensitive species;
 3. Consultation with authorities and stakeholders;
 4. Marking of species to be relocated;
 5. Seeking of permits;
 6. Identification of suitable areas for relocation;
 7. Aftercare; and
 8. Monitoring (including targets and indicators to measure success).
- Search, rescue and relocation for heritage resources and graves. This is to be implemented taking into consideration the project programme to ensure that these sensitive environmental features are rescued prior to potential impact occurrence. Amafa aKwaZulu-Natali is to be consulted to ensure that their requirements are satisfied.

Responsibilities:

- DWS / implementing agent to appoint suitably qualified specialists.
- Specialists to execute the management actions.

Monitoring Requirements:

Approvals, permits and licences are to be in place with due consideration to the project programme.

Implementation Timeframe:

Prior to any construction activities.

15.3 Approvals, Permits and Licensing Requirements

Management Objective:

Compliance with applicable legislation to prevent unauthorised activities and negative impacts to protected environmental features.

Target:

Obtain requisite approvals for the relevant protected environmental features.

Management Actions:

- Seek permit from DAFF in terms of the National Forests Act (No. 84 of 1998) for protected trees that are to be cut, disturbed, damaged, destroyed or removed.
- Seek permit from EKZNW in terms of the Natal Nature Conservation Ordinance (15 of 1974) for the removal and transportation of endangered fauna and flora (if relevant).
- Seek permit from Amafa aKwaZulu-Natali in terms of the KZN Heritage Act (No. 04 of 2008) if heritage resources are to be impacted on (relocated or destroyed), and for the removal of graves.
- Seek approval from DMR in terms of the National Environmental Management Act (No. 107 of 1998) and the Mineral and Petroleum Resources Development Act (No. 28 of 2002) for quarries and borrow pits.
- Seek Water Use Licence from DWS for water uses in terms of the National Water Act (No. 36 of 1998).
- Seek all other approvals, permits and licenses required for the project, in accordance with the protocols prescribed by the governing bodies.
- Approvals are to be in place prior to the potential impacts to the protected environmental features.

Responsibilities:

- DWS / implementing agent to appoint suitably qualified specialists.
- Specialists to seek and obtain relevant approvals.

Monitoring Requirements:

Approvals, permits and licences are to be in place with due consideration to the project programme.

Implementation Timeframe:

Prior to any potential adverse impacts to protected environmental features, based on legal provisions and requirements of mandated authorities.

15.4 Administrative Requirements**Management Objective:**

- Ensure that all administrative measures and arrangements associated with the compliance with the Environmental Authorisation and EMPr are in place.

Target:

- Administrative measures and arrangements are confirmed, checked and maintained.
- Document control procedure is in place, in accordance with the Environmental Management System to be employed on site.

Management Actions:

- Financial provision is made for the implementation of the conditions of the Environmental Authorisation and the mitigation measures contained in the EMPr. Differentiate between those requirements that relate to the Proponent, Contractor, environmental team and other responsible parties.
- Document control procedure is to be provided and adhered to.
- Filing system is to be provided and maintained.

Responsibilities:

- Proponent – administrative provisions for compliance.
- Engineer and ECO - checking.
- Contractor – administrative provisions for compliance.

Monitoring Requirements:

- Document control procedure.
- Filing systems.
- Financial provisions (e.g. bill of quantities, budgets, etc.).

Implementation Timeframe:

Throughout the duration of the construction period.

15.5 Construction Site Planning and Layout

Management Objective:

Proper planning and layout of the construction domain to ensure protection of sensitive environmental features. Refer to features highlighted in **Section 14**, findings from pre-construction survey, further environmental studies, etc.

Target:

1. No negative impacts to sensitive environmental features as a result of poor construction site planning and layout.
2. A 100% of the construction footprint is to be included in the pre-construction survey.

Management Actions:

- Conduct a pre-construction survey of the area to be affected by construction activities. This must include site investigations with photographic records.
- Suitable specialist(s) are to identify sensitive environmental features (including fauna, flora and heritage sites) where special care needs to be taken, and implement the required suitable mitigation measures to safeguard these features (e.g. barricading, signage and awareness creation). Refer to the findings of the EIA specialist studies.
- A suitable specialist is to identify protected plants and trees. Any protected plants or trees in proximity to the construction domain that will remain, should be marked clearly (danger tape, fencing, etc.) and must not be disturbed, defaced, destroyed or removed, unless otherwise specified by the Engineer. Acquire the necessary permits under the National Forests Act (No. 84 of 1998) if avoidance of protected trees is not possible.
- The Contractor is to produce a site plan for the approval of the Engineer prior to the establishment of the site, which aims to identify construction activities, facilities and structures in relation to sensitive environmental features. This plan will serve as a spatial tool that facilitates the execution of the construction phase with due consideration of sensitive environmental features. The plan must show the following (as relevant):
 - Buildings and structures;
 - Contractors' camp and lay down areas;
 - Site offices;
 - Site laboratories;
 - Batching plants;
 - Crusher plants;
 - Roads and access routes;
 - Gates and fences;

- Essential services (permanent and temporary water, electricity and sewage);
- Solid waste storage and disposal sites;
- Site toilets and ablutions;
- Hazardous waste storage and disposal sites;
- Firebreaks;
- Excavations and trenches;
- Cut and fill areas;
- Topsoil stockpiles;
- Spoil areas;
- Construction material stores;
- Vehicle and equipment stores;
- Workshops;
- Wash bays;
- Fuel stores;
- Hazardous substance stores;
- Sensitive environmental features; and
- Any other activities, facilities and structures deemed relevant.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Photographic record as part of the pre-construction survey of areas to be affected by construction activities.
- Approved site plan.
- Barricading and signage.
- Records of awareness creation.

Implementation Timeframe:

Prior to the establishment of any construction site for the overall project.

15.6 Managing Geotechnical Investigations

Management Objective:

Manage the possible negative environmental impacts associated with detailed geotechnical investigations.

Target:

1. No deviations from agreements made with the landowners.
2. No damage to sensitive environmental features (e.g. marked and barricaded heritage resources, protected trees, watercourses, structures and infrastructure).
3. Rehabilitation of test pits.

Management Actions:

- Suitable access arrangements are to be made in accordance with agreements prior to site investigations.
- Safe operation of plant and equipment required for geotechnical investigations.
- Adequate management of domestic and construction waste produced during investigations.
- Implement measures to mitigate soil erosion, loss of vegetation and pollution associated with the investigations.
- Prevent damage to sensitive environmental features. Refer to mitigation measures for Blue Swallows.
- Landscape and rehabilitate test pits, if located outside of dam basins (Smithfield Dam and balancing dam).

Responsibilities:

- Project Manager/Engineer and ECO - checking.
- Geotechnical team to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Approval from DMR for borrow areas and quarries.

Implementation Timeframe:

Prior to geotechnical investigations up to reinstatement and rehabilitation of affected areas.

15.7 Environmental Awareness Creation

Management Objective:

Ensure that the Contractor, construction workers and site personnel are aware of the relevant provisions of the EMPr, sensitive environmental features and agreements made with the affected landowners and community members.

Target:

1. All construction workers and employees are to have completed appropriate environmental training before being allowed on the construction site.
2. A record of environmental training undertaken is to be kept on site.

Management Actions:

- Environmental Training and Awareness Programme to be developed, which is to be approved by the Engineer.
- The Contractor must arrange that all of his employees and those of his sub-contractors go through the project specific environmental awareness training courses before the commencement of construction and as and when new staff or sub-contractors are brought on site.
- The environmental training is compulsory for all employees and structured in accordance with their relevant rank, level and responsibility, as well as the Environmental Specification as they apply to the works and site.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Records of environmental training and awareness creation.

Implementation Timeframe:

Throughout the duration of the construction period.

15.8 On-going Consultation with Community and Affected Parties

Management Objective:

- Establish and maintain a record of all complaints and claims against the project and ensure that these are timeously and effectively verified and responded to.
- Adhere to agreements made with Local Authorities, Traditional Authorities, individual landowners and community members regarding communication.

Target:

1. All complaints and claims are to be acknowledged within 5 working days and are to be responded to within 10 working days of receipt, unless additional information and / or clarification are required.
2. No deviations from agreements made with individual landowners and community members.

Management Actions:

- Establish lines of communications with landowners and community members.
- Existing communication channels need to be duly respected and adhered to when engaging with the Traditional Authorities surrounding Smithfield Dam.
- Establish processes and procedures to effectively verify and address complaints and claims received.
- Complaints or liaison with landowners and community members with regard to environmental aspects, compensation or disturbance to activities or animals, must be recorded, reported to the correct person and a record of the response is to be entered in the complaints register.
- Provide the relevant contact details to landowners and community members for queries / raising of issues or complaints.
- Provide all information, especially technical findings, in a language that is understandable to the general public. The dominant local languages include English and Zulu.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.

Implementation Timeframe:

Throughout the duration of the construction period.

15.9 Site Clearing

Management Objective:

- Manage environmental impacts associated with site and basin clearing.
- External to the dam basins (Smithfield Dam and balancing dam), ensure that only areas that are specifically required for the construction purposes are cleared.

Target:

No damage is caused to sensitive environmental features outside of the demarcated construction areas, including marked and barricaded heritage resources, protected trees, watercourses, cultivated areas, structures and infrastructure.

Management Actions:

- Restrict site clearing activities to the construction area / domain and dam basins (Smithfield Dam and balancing dam).
- Clearing of vegetation is to be conducted in a phased manner (where possible), with due consideration of the search and rescue activities. Vegetative cover for sensitive areas such as riparian zones is to remain for as long as possible.
- A Method Statement is to be developed, which will provide the details of how site clearing will be executed. Where possible, clearing by hand is recommended in order to create employment opportunities.
- Maintain barricading around sensitive environmental features.
- Avoid any disturbance to demarcated sensitive environmental features.
- Suitably experienced personnel (relevant to the potentially affected environmental features) are to monitor the clearing activities, with particular focus on heritage resources and graves, as well as protected fauna and flora species.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- No clearing outside of construction domain and dam basins.
- Intact barricading.
- Public complaints register.
- Contractor's method statement.

Implementation Timeframe:

Prior to and during clearing of any construction site.

15.10 Site Establishment**Management Objective:**

Minimise negative environmental impacts associated with site establishment.

Target:

1. No deviations from agreements made with individual landowners and community members.
2. No damage to sensitive environmental features outside demarcated construction areas during site establishment.
3. No access or encroachment into no-go areas.
4. No justifiable complaints regarding general disturbance and nuisance received from the affected landowners and community members.

Management Actions:

- The Contractor is to produce a site plan for the approval by the Engineer prior to the establishment of the site, which aims to identify construction activities, facilities and structures in relation to sensitive environmental features. This plan will serve as a spatial tool that facilitates the execution of the construction phase with due consideration of sensitive environmental features.
- Locate construction camps in areas where sensitive environmental features will not be impacted on.
- Facilities and structures shall be located with due cognisance of the terrain and geographical features of the project site.
- Positioning of the storage and lay-down areas should aim to minimise visual impacts.
- Maintain barricading around sensitive environmental features until the cessation of construction works.

- Control the movement of all vehicles and plant (including suppliers), such that they remain on designated routes and comply with relevant agreements.
- Ensure noise levels of construction activities and equipment are within their lawfully acceptable limits as per SANS 10103.
- Minimise public disturbance from lighting of the construction camp and site. For example, proper design of the placing (zones), height, type, direction (inward rather than outward) and intensity of floodlights, without compromising safety.
- Give preference to local SMMEs.
- Land required for the construction servitude must be acquired in accordance with statutory requirements.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Intact barricading.
- Public complaints register.
- Contractor's method statement.
- Secured construction servitude.

Implementation Timeframe:

Prior to and during site establishment.

15.11 Management of Existing Services

Management Objective:

- Prevent impacts to existing services.
- Adhere to agreements made with owners/custodians of the services.

Target:

1. No unwarranted complaints regarding adverse impacts to existing services.
2. No adverse impacts to existing services.
3. All relevant approvals to be obtained prior to working within existing servitudes (including roads, railway line, gas pipeline, power lines, telephone lines, etc.).

Management Actions:

- Identify and record all existing services.
- Conform to requirements of relevant service providers. Agreements to be in place.
- Ensure access to infrastructure is available to service providers at all times.
- Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site.
- Notify landowners of any disruptions to essential services.
- Deviate landowners' existing services (e.g. reticulation, irrigation lines), where possible, to accommodate construction activities.
- Land acquisition and compensation to adhere to legal framework.
- Adequate reinstatement and rehabilitation of affected environment.
- See requirements in EMPr for *Management of Waste*.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Contractor's method statement.
- Agreements with owners of services.

Implementation Timeframe:

Throughout the duration of the construction period.

15.12 Management of Relocation of Services

The following existing structures and infrastructure are affected by the proposed Smithfield Dam and associated works –

- *R617;*
- *High voltage Eskom power line;*
- *Municipal water abstraction works;*
- *Access roads to traditional areas;*
- *Telephone line;*
- *Dwellings in areas of Traditional Authorities;*

The following existing structures and infrastructure are affected by the proposed Balancing Dam and associated works –

- Private farm road;
- Access roads to cultivated areas and timber plantations; and
- Farming-related infrastructure (e.g. irrigation pipelines).

Management Objective:

- Prevent adverse environmental impacts associated with the relocation of existing services.
- Adhere to agreements made with owners/custodians of the services.

Target:

1. No unwarranted complaints regarding improper relocation of services.
2. No impacts caused by the relocation of services.
3. All relevant approvals to be obtained prior to working within existing servitudes (including roads, railway line, gas pipeline, power lines, telephone lines, etc.).

Management Actions:

- Identify and record all existing services.
- Conform to requirements of relevant service providers (e.g. KZN DoT, Telkom, Eskom, Local Authorities). Agreements to be in place.
- Determine requirements for services within inundation areas, which may include decommissioning, demolition, removal, leave as is.
- Existing septic tanks to be opened and filled with un-compacted soil.
- Land acquisition and compensation to adhere to legal framework.
- Adequate reinstatement and rehabilitation of affected environment.
- See requirements in EMPr for *Management of Waste*.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Contractor's method statement.
- Agreements with owners of services.

Implementation Timeframe:

Prior to and during relocation of services, up to signing off by service provider.

15.13 Management of Access and Traffic

Management Objective:

- Ensure that all construction vehicles use only dedicated access routes to construction sites.
- Ensure proper access control.
- Prevent unlawful access to the construction domain.
- Adhere to agreements made with individual landowners and community members regarding access.
- Ensure the safety of all road users by implementing proper signage and traffic control measures.
- Limit construction-related nuisance to service nodes.

Target:

1. No reports of construction vehicles using other unauthorised routes.
2. No complaints regarding blocking of access to properties.
3. No direct harm to livestock and wild animals due to inadequate access control.
4. No transporting of unsafe loads. Permits are to be obtained for abnormal loads.
5. No speeding.
6. No accidents.

Management Actions:

- Undertake negotiations and confirm arrangements with the private landowners regarding the use of private roads and associated traffic arrangements.
- Determine and document the road conditions of the R617, P334, P124, D41, D1211, D1212 (and all other public roads, as relevant), as well as all private access roads that will be affected by construction traffic, as relevant.
- Mitigate measures related to managing access required for farming and forestry operations on Baynesfield Estate during construction:
 - The access road to the tunnel outlet and balancing dam shall not cross over the dam wall of the Mbangweni Dam;
 - Access road to be tarred from the P334 until the tunnel outlet;
 - Exiting access road on eastern side of Mbangweni River up to P334 will be upgraded (as necessary) to allow for movement of vehicles from Baynesfield Estate, NCT Forestry,

landowners and tenants. No construction vehicles will be permitted to use this road, apart from the sections along the raw water pipeline (link to Balancing Dam and WTW). Right of way to be established by DWS to allow for the use of this road;

- Provision needs to be made for the suitable and safe use of all roads that need to accommodate vehicles associated with construction, farming and forestry activities, as well as private landowners and tenants; and
- The section along the access road that passes the avocado orchards needs to be fenced off to prevent access.
- Selective upgrade of the relevant access roads to ensure that they are capable of accommodating the type of vehicles and/or mechanical plant using these roads.
- Obtain the necessary approval for road upgrades, pipe-jacking and wayleave for road construction from the KZN Department of Transport (DoT), as applicable.
- Any clearing for access or haul roads outside the demarcated works area shall only be undertaken after approval from the Engineer.
- Temporary access roads constructed outside of the dam basin are to be suitably rehabilitated.
- Ensure temporary accommodation of traffic where any public or private roads are to be affected by construction activities (river crossings).
- Make provision for community members to access their properties safely.
- Strict adherence to speed limits by construction vehicles on the R617, R56 and access roads. Appropriate speed limits need to be posted on all access roads according to the geometric design and limitations of heavy vehicles.
- The access roads need to provide sufficient width for heavy vehicles to navigate around curves in the road.
- When construction vehicles are required to cross the R617 or R56 appropriate safety and traffic calming measures need to be in place. This will include flag men, speed reductions and warning signage.
- Ensure appropriate traffic safety measures are implemented to make provision for blind rises and sharp bends on relevant roads to be used by construction vehicles in the construction domain.
- The payloads delivered by heavy vehicles need to be recorded and audited to prevent overloading of heavy vehicles.
- Abnormal load permits must be acquired for the transport of abnormal loads.
- Traffic accommodation to South-African Road Traffic Signs Manual standards where any construction affects an existing road.
- Time restrictions for delivery vehicles through built-up and socially sensitive areas.
- Permission is required from the Engineer for the movement of any vehicles and/or personnel outside of designated working areas.
- Access roads are to be maintained in a suitable condition.

- Clearly mark pedestrian-safe access routes within the construction areas.
- Suitable erosion protective measures are to be implemented for access roads during the construction phase.
- Traffic safety measures (e.g. traffic warning signs, flagmen) are to be implemented where applicable.
- Clearly demarcate all construction access roads.
- Proper access control is to be maintained to prevent livestock from accessing construction areas.
- All fences erected for construction purposes (e.g. fences around camp sites, fencing around trenches, etc.) should be inspected on a daily basis to detect whether any damage has occurred. Damaged fences / barricading is to be repaired immediately.
- Consult with property owners, local authorities and communities to ensure that all affected parties are informed of the timing and extent of any disruptions.
- Ensure that service nodes, such as community facilities around Smithfield Dam, remain easily and safely accessible at all times. Limit the construction-related nuisance to these areas.
- Implement traffic monitoring which includes –
 - Baseline traffic monitoring, 1 year ahead of construction, to confirm the traffic status quo on the road links that are to be worst affected.
 - Traffic Monitoring during the construction period, to confirm whether the traffic increase is similar to forecasted increase, whether the contractor complies with activity time restrictions, whether posted speed limits are adhered to, etc.
 - Overloading Management through auditing of bulk construction material delivery slips to ensure high-level adherence to current legislation.
 - Monitoring of dangerous locations (e.g. truck crossings, schools, road diversions etc.).
 - Traffic monitoring after completion of construction (operation phase), 6 months after construction to confirm the new level of traffic resulting from normal operations.
 - Evidence of the actual impact on the local road network as well as the effect of implemented mitigation measures can then be readily made available.
- From a road maintenance point of view:
 - Based on the observed condition of the R617 and R56 pavement it is recommended that a more detailed pavement investigation be done to determine the pavement condition to refine the pavement maintenance action plan for the construction phase;
 - To reduce the impact and prevent dust clouds the access road to the balancing dam at Baynesfield Estate as well as the access road to the Smithfield main dam embankment need to be paved.

Responsibilities:

- Engineer and ECO - checking.

- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Signage displayed and maintained.
- Contractor's method statement.
- Maintenance of access control to construction sites.
- Maintenance of private access roads.

Implementation Timeframe:

Throughout the duration of the construction period.

15.14 Fencing Arrangements

Management Objective:

- Protect and maintain existing fences.
- Fencing arrangements to adequately protect livestock and game animals from construction activities.
- Adhere to agreements made with individual landowners and/or land users regarding fencing.
- Minimise disturbance to animals.

Target:

1. No deviations from agreements made with individual landowners and/or land users regarding fencing.
2. No direct harm to livestock and game animals due to inadequate fencing arrangements.
3. Disturbed or damaged fencing to be reinstated / replaced to meet pre-existing conditions.

Management Actions:

- Any damaged fencing is to be replaced to meet pre-existing conditions.
- All fences erected for construction purposes (e.g. fences around camp sites, fencing around trenches, etc.) should be inspected on a daily basis to detect whether any damage has occurred, and should be repaired immediately, to prevent animals from escaping, to prevent easy access for poaching, and intrusion by predators.

- On farms or in areas where livestock / game occur, erect fences according to appropriate specifications (depending on the type on animals that occur on the farms) for the construction camps and construction servitude to protect animals from construction-related activities.
- Fences on game farms should be constructed to meet the following requirements:
 - The fence should be straight and vertical;
 - All the straining posts should be firmly and vertically anchored;
 - All the posts should extend to the same height above ground level by corresponding to the terrain form;
 - The straining posts and droppers should not be too far apart – the closer they are, the firmer the fence;
 - Each wire strand should be firmly attached to the standards or line posts at a specific height above ground level and should be a certain distance apart from each other;
 - The droppers should be neatly and evenly spaced between the standards. The wire strands should be firmly attached to maintain the proper space between the strands and to prevent vertical movement;
 - Fences should never be constructed of inferior quality material. Therefore, fencing material with the SABS mark should be used; and
 - Comply with the Natal Nature Conservation Ordinance (15 of 1974) with regards to the accommodation of relevant large mammal species.
- The height on fences on game farms should be constructed depending on the type of animals that occurs on the farm.
- Where necessary, fences on game farms should be erected according to appropriate specifications depending on the type of animals that occur on the property.
- Fences to be constructed over dongas or streams should meet specific requirements as fences over such features can become insecure and lead to the escape of valuable animal or provide access to predators.
- Where necessary, game screens should be erected to minimise construction-related impacts (e.g. noise) to animals on game farms.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Agreements with landowners.

- Fencing register.

Implementation Timeframe:

Throughout the duration of the construction period.

15.15 Management of Labour Force

Management Objective:

- Ensure suitable management of the labour force to prevent security-related issues or disturbance to landowners and community members.
- Optimise the use of local labour.
- Provide a work environment that is conducive to effective labour relations.

Target:

1. No complaints from landowners and community members regarding trespassing or misconduct by construction workers.
2. All unskilled labour to be sourced from local area.

Management Actions:

- Prohibit trespassing of construction workers on private property.
- Workers should be provided with identity cards and should wear identifiable clothing.
- Creating nuisances and disturbances in or near communities shall be prohibited.
- Machine / vehicle operators shall receive clear instructions to remain within demarcated access routes and construction areas.
- Designated smoking areas should be provided, with special bins for discarding of cigarette butts.
- Establish a 'labour and employment desk' in consultation with local authorities, which is not to be situated at the site.
- Create opportunities for the employment of women.
- Prioritise and articulate gender inclusivity and equity in the project documents by including specific strategies and guidelines for implementation.
- Where possible use labour-intensive methods of construction.
- Use local labour as far as possible, where necessary (e.g. unskilled labour).
- Implement applicable training of labour to benefit individuals beyond completion of the project.

- Implement a STD and HIV/AIDS awareness and prevention programme amongst labourers. The contractor should provide an adequate supply of free condoms to all workers. Condoms should be located in the bathrooms and other communal areas on the construction site and at the construction camps. If viable, a voluntary counselling and testing programme should be introduced.
- Liaise with the South African Police Services (SAPS) and Community Policing Forums to ensure that construction sites are monitored.
- Prevent loitering within the vicinity of the construction camp as well as construction sites.
- Communicate the limitation of opportunities created by the project through the Traditional Authorities and Ward Councillors.
- Draw up a recruitment policy in conjunction with the Traditional Authorities and Ward Councillors of the area and ensure compliance with this policy.
- Liaise with the appropriate local authorities to ensure that they are aware of the increase of population.
- Alert local businesses to the fact that with the arrival of construction workers the population of the area will increase and they are likely to be faced with a higher demand and will need to prepare for this.
- A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction.
- Sensitise construction workers from outside the area to the traditions and practices of local communities.
- Include a section in the induction programme for incoming construction workers that cover local traditions and practices.
- Ensure the infrastructure and social facilities within the host communities will not be compromised with the arrival of additional people into the area.

Responsibilities:

- Proponent – employment targets.
- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Labour-related targets.

Implementation Timeframe:

Throughout the duration of the construction period.

15.16 Management of Construction Camp

The construction camp for Smithfield Dam is located to the south of the dam wall, within the purchase line. Provision is made for construction accommodation at the camp.

Management Objective:

- Minimise environmental impacts associated with construction camp and eating areas.

Target:

1. No environmental contamination associated with construction camp and eating areas.
2. Minimise visual impact associated with construction camp and eating areas.
3. Prevent socio-economic impact associated with the construction camp.

Management Actions:

- Erect suitable fencing around the construction camp.
- The construction camp may not be situated within 100 meters of any water body or within the 1:100 year flood line.
- Provide essential services (including showers, appropriate sanitation and drinking water facilities) at the construction camp. Maintain essential services in a functional state.
- Provide safe potable water for food preparation, drinking and bathing.
- All services required for the camp need to be arranged with the Ingwe Local Municipality and other relevant service providers. Requisite approvals to be in place.
- Provide adequate parking for site staff and visitors.
- Open uncontrolled fires will be forbidden at the site camp. Rather, 'contained' cooking mechanisms will be used (e.g. gas stoves or an enclosed braai facility).
- The cooking area will be positioned such that no vegetation is in close proximity thereto, including overhanging trees. An area around the cooking area will be cleared such that any escaping embers will not start an uncontrolled fire.
- Eating areas will be designated and demarcated.
- The feeding, or leaving of food for animals, is strictly prohibited.
- Allow for areas for social interaction.
- Sufficient vermin / weatherproof bins will be present in this area for all waste material.

- Dish washing facilities will be provided.
- Ensure that wastewater is appropriately disposed of.
- Locate all storage areas and material laydown sites within predetermined zones as per the approved site plan (refer to Pre-Construction EMPr).
- Keep the camp and all its storage and laydown areas secure and neat at all times.
- Employ appropriate access control measures.
- Suitable security to be provided at the construction camp.
- Manage stormwater from construction camp to avoid environmental contamination and erosion.
- Failure to comply with the general code of conduct, or the rules and procedures implemented at the construction camp will result in disciplinary actions.
- Prohibit the felling of trees for firewood.
- Provide medical and first aid facilities at the camp area.
- Prepare de-establishment plan for construction camp for approval by the Engineer.
- See requirements in EMPr for *Management of Waste, Management of Water, Management of Labour Force, Management of Ablution Facilities, Management of Storage and Handling of Non-Hazardous Material, Management of Workshop and Equipment, etc.*

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Contractor's method statement.
- Disposal certificates.
- Service agreements with Ingwe Local Municipality and other relevant service providers.

Implementation Timeframe:

Period from when the construction camp is created up to de-establishment.

15.17 Management of Ablution Facilities

Management Objective:

Minimise environmental impacts associated with ablution facilities.

Target:

1. No environmental contamination associated with ablution facilities.
2. Minimise visual impact associated with ablution facilities.

Management Actions:

- Provide sufficient ablution facilities (e.g. mobile / portable / VIP toilets) at the construction camp and along construction sites, which conform to all relevant health and safety standards and codes.
- No pit latrines, french drain systems or soak away systems shall be allowed. Install and maintain conservancy tanks for any site offices. The location of conservancy tanks is to be approved by the Engineer.
- Toilets may not be situated within 50 meters of any water body.
- A sufficient number of toilets shall be provided to accommodate the number of personnel working in any given area. Toilets may not be further than 100 m from any working area. Toilet facilities supplied by the Contractor for the workers shall occur at a maximum ratio of 1 toilet per 15 workers.
- All temporary / portable / mobile toilets shall be secured to the ground to prevent them from toppling over due to wind or any other cause.
- Ensure the proper utilisation, maintenance and management of toilet, wash and waste facilities.
- The entrances to the toilets shall be adequately screened from public view.
- These facilities will be maintained in a hygienic state and serviced regularly.
- Toilet paper shall be provided.
- The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that a licensed service provider removes the contents from site. Disposal of such waste is only acceptable at a licensed waste disposal facility.
- Should shower facilities be provided for use by staff on site, the following controls must be imposed:
 - Proper positioning of the shower, and specifically its discharge point, shall be carried out to ensure that erosion and build-up of detergents does not occur.

- All discharge from the shower and other washing facilities must be managed to prevent environmental contamination.
- Use of the shower facilities must be limited to staff or authorised persons only.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Maintenance register for ablution facilities.
- Waste disposal certificates.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

15.18 Management of Visual Aspects

Management Objective:

- Minimise impacts to the aesthetics / visual quality.
- Ensure that the visual appearance of the construction site is not an eyesore the adjacent areas.

Target:

1. No complaints regarding impacts to visual quality.

Management Actions:

- Advertising and lighting will be in accordance with relevant standards.
- Lighting must not constitute an eyesore / hazard to users of the road and the surrounding community.
- Lighting will be sufficient to ensure security but will not constitute 'light pollution' to the surrounding areas.
- The site will be shielded /screened to minimise the visual impact, where practicable.

- Where practicable, development designs to compliment the natural surroundings in order to preserve a sense of place.
- On-going housekeeping to maintain a tidy construction area.
- After the construction phase, the areas disturbed that are not earmarked for operational purposes (part of infrastructure footprint) and are outside of the dam basins must be suitably rehabilitated.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

15.19 Management of Water

During the construction stage, water will be required for various purposes, such as concrete batching, washing of plant and equipment in dedicated areas, dust suppression, potable use by construction workers, etc.

Management Objective:

- Minimise environmental impacts associated with stormwater as well as water services for construction workers.

Target:

1. No visual evidence of erosion caused by wastewater or stormwater practices.
2. No environmental contamination associated with wastewater or stormwater practices.

Management Actions:

- All construction activities to comply with the National Water Act (Act No. 36 of 1998).

- Water for construction purposes will be sourced directly from watercourses on site and groundwater (boreholes) will also be utilised. Water tankers will also supply water to the site.
- Prevent leakages from pipes or taps.
- Establish a dedicated vehicle maintenance area and wash-bay, where suitable stormwater management measures are in place to prevent pollution.
- Manage stormwater from construction site to avoid environmental contamination and erosion.
- Stormwater runoff from workshops, vehicle maintenance area, wash-bay and other potential pollution sources shall be collected and treated in hydrocarbon separation pits/tanks before discharged to drains and waterways.
- All wastewater discharges to comply with legal requirements associated with the National Water Act (Act No. 36 of 1998), including the General Authorisation that specifically deals with S21 (f) and (g) water uses.
- Wastewater discharges to form part of water monitoring programme.
- Prevent erosion on access roads due to construction traffic.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Water monitoring programme – discharges.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

15.20 Management of Topsoil

Management Objective:

Ensure suitable removal, storage, and transportation of topsoil for re-use during rehabilitation.

Target:

1. At least 95% of recovered topsoil from disturbed areas is to be stored for future use.
2. No visual evidence of erosion from topsoil stockpiles.

3. No visual evidence of erosion from areas where topsoil has been reinstated.

Management Actions:

- Determine the average depth of the topsoil prior to excavations.
- Identify suitable areas to store topsoil.
- Remove topsoil from areas to be affected by construction activities.
- Prevent mixing of topsoil with subsoil.
- Topsoil is to be adequately protected from contamination from construction activities and material.
- Protect stored topsoil from compaction.
- Wind and water erosion-control measures are to be implemented to prevent loss of topsoil.
- Following the construction phase, the topsoil should be placed as the final soil layer prior to seeding, on areas to be rehabilitated outside of the dam basins.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Condition of topsoil stockpiles.
- Dust monitoring.
- Rehabilitated areas.
- Contractor's method statement.

Implementation Timeframe:

Prior to site clearing up to when topsoil is used for rehabilitation.

15.21 Management of Excavations

Management Objective:

- Minimise environmental impacts associated with excavations.

Target:

1. No damage to sensitive environmental features outside construction area during excavations.
2. No harm to people or animals as a result of excavations.

Management Actions:

- Construction activities to remain within the designated construction servitude.
- Subsoil and overburden should be stockpiled separately to be returned for backfilling in the correct soil horizon order.
- Suitable barricading to be erected around open excavations / trenches, as per the Construction Regulations (2014). Provide signage as a warning of open excavations.
- Divert runoff away from excavations, where necessary.
- Trench lengths will be kept as short as practically possible.
- Trench walls are to be stabilised using battering, shoring and bracing or similar techniques depending on the stability of the trench sides.
- Inspect open trenches at least daily to ensure that animals have not become trapped. Such animals will be safely removed and released, where possible. Special equipment for handling of venomous snakes should be available on site to ensure safe removal.
- Filing of trenches to make provision for subsidence.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Barricading of excavations.
- Excavation register.
- Contractor's method statement.

Implementation Timeframe:

Prior to excavations up to reinstatement.

15.22 Management of Storage and Handling of Non-Hazardous Material**Management Objective:**

- Effective and safe management of materials on site, in order to minimise the impact of non-hazardous materials on the environment.

Target:

1. No pollution due to handling, use and storage of non-hazardous material.

Management Actions:

- Materials to be suitably stored to prevent environmental contamination and visual impacts. Storage requirements to be determined based on chemical qualities of material and MSDS.
- Where required, stored material to be protected from rain and run-off to avoid environmental contamination.
- Materials to be appropriately transported to avoid environmental contamination.
- Loose loads (e.g. sand, stone chip, refuse, paper and cement) to be covered when vehicles travel on public roads.
- Suitable remedial measures, depending on the nature of the contaminant and the receiving environment, to be instituted for spillages.
- Materials to be suitably used to prevent environmental contamination.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- MSDS register.
- Contractor's method statement.

Implementation Timeframe:

Period during which materials are stored and handled on site.

15.23 Management of Storage and Handling of Hazardous Material

Management Objective:

- Ensure the protection of the natural environment and the safety of personnel on site, by the correct management and handling of hazardous substances.

Target:

1. No pollution due to handling, use and storage of hazardous material.
2. In the event of a spill, appropriate containment, clean up and disposal of contaminated material. Spills to be cleaned within 24 hours.

Management Actions:

- Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which include the Hazardous Substances Act (Act No. 15 of 1973), the Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations, and applicable SANS and international standards.
- Storage and use of hazardous materials will be strictly controlled to prevent environmental contamination, and must adhere to the requirements stipulated on the MSDS.
- Appropriate signage to be displayed at storage areas for hazardous substances.
- Where flammable liquids are being used, applied or stored the workplace must be effectively ventilated.
- No person may smoke in any place in which flammable liquid is used or stored.
- Install an adequate number of fire-fighting equipment in suitable locations around the flammable liquids store.
- Where flammable liquids are decanted, the metal containers must be are bonded or earthed.
- No flammable material (e.g. paper, cleaning rags or similar material) may be stored together with flammable liquids.
- Staff that will be handling hazardous materials must be trained to do so.
- Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor. Suitable ventilation to be provided.
- All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material.
- MSDSs, which contain the necessary information pertaining to a specific hazardous substance, must be present for all hazardous materials stored on the site.
- Spill kits must be available for the cleanup of hazardous material spillages.
- Provide secondary containment where a risk of spillage exists.
- Drip trays to be placed under parked heavy vehicles, equipment and other receptacles of hazardous material to prevent spillages.
- In the event of spillages of hazardous substances the appropriate clean up and disposal measures are to be implemented.

- Spill reporting procedures to be displayed at all locations where hazardous substances are being stored.
- Hazardous materials will be disposed of at registered sites or handed to registered hazardous waste disposal facilities for disposal / recycling.
- Proper and timeous notification of any pollution incidents associated with hazardous materials.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- MSDS register.
- Training register.
- Disposal certificates.
- Contractor's method statement.

Implementation Timeframe:

Period during which hazardous materials are stored and handled on site.

15.24 Management of Waste

Management Objective:

- Minimise negative environmental impacts associated with waste.
- Apply waste management principles to prevent, minimise, recycle or re-use material, with disposal as a last option.

Target:

- No littering on construction site.
- Maintain a clean and tidy construction site.
- A 100% record of all waste generated and disposed of at waste disposal facilities.
- Valid disposal certificates for all waste disposed.
- Provision of adequate waste containers that are easily accessible and maintained.
- Waste bins are to be removed and cleaned weekly.

Management Actions:

- Waste management activities must comply with the National Environmental Management: Waste Act (No. 59 of 2008).
- The storage of general or hazardous waste in a waste storage facility must comply with the norms and standards in GN No. R. 926 of 29 November 2013.
- Vermin / weatherproof bins shall be provided in sufficient numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overflowing and other associated nuisances.
- Where possible, waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes).
- Establish and monitor recycling targets.
- Provide waste skips at the construction areas. These skips should be sufficient in number, the skip storage area should be kept clean, and skips should be emptied and replaced before overflowing or spillage occurs.
- Ensure suitable housekeeping. .
- The Contractor shall ensure that no burying, dumping or burning of waste materials, vegetation, litter or refuse occurs. All waste will be disposed of at suitable licensed disposal sites, based on the waste type (general versus hazardous). Note that provision is made for burying inert material within the dam basins (Smithfield Dam and balancing dam).
- Ensure that waste is transported so as to avoid waste spills en-route.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Waste register.
- Recycling targets.
- Disposal certificates.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

15.25 Management of Blasting

Management Objective:

- Minimise environmental impacts associated with blasting.

Target:

1. Compliance with blasting-related legislation and standards.
2. No blasting-related impacts to private property, livestock or human health.
3. Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels.

Management Actions:

- Prior to commencing with blasting activities, the blasting Contractor should submit a Method Statement which should comply with the Explosives Regulations (2003) and all relevant SANS standards and health and safety standards for mitigating blasting.
- The Contractor shall employ industry standard methods to control the impact of blasting and limit the risk of damage to buildings and structures by reducing blast vibrations induced in the rock mass, eliminating fly rock and limiting air-blast and noise to acceptable levels.
- Blast mats should be used wherever fly-rock may result in damage to any infrastructure or where it could result in death or injury of animals, or where damage could be caused to sensitive environmental features.
- Blasting operations should be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels.
- All explosives shall be transported, stored and handled in accordance with applicable laws and good design engineering and constructions practices.
- Include specific provisions for managing impacts to sensitive bird species (including Blue Swallow and Cranes), as established as part of the environmental sensitivity walk down survey as well as the noise and vibration monitoring programme (refer to Pre-Construction EMPr).
- Undertake controlled blasting using lower chargers controlled by the peak particle velocity in rock to 12 m/s 30m away from the blasting front, in sensitive areas.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Noise and vibration levels.
- Public complaints register.
- Contractor's method statement.

Implementation Timeframe:

Prior to blasting up to safe completion of blasting.

15.26 Management of Workshop and Equipment

Management Objective:

- Minimise environmental impacts associated with workshops and equipment use.

Target:

1. No environmental contamination associated with workshops and equipment use.

Management Actions:

- Maintenance of equipment and vehicles will be performed in such a manner so as to avoid any environmental contamination (e.g. use of drip trays).
- No washing of plant may occur on the construction site. Plant to be washed in dedicated areas.
- Drip trays will be provided for the stationary plant and for the "parked" plant.
- All vehicles and equipment will be kept in good working order and serviced regularly. Leaking equipment will be repaired immediately or removed from the site.
- Suitable storage and disposal of hydraulic fluids and other vehicle oils (see section on *Management of Storage and Handling of Hazardous Material*).
- Wastewater from workshop to be disposed in accordance with the EMPr section on *Management of Water*.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- Water monitoring programme – discharges.
- Training register.
- Contractor's method statement.

Implementation Timeframe:

- Period from when the workshop is created up to de-establishment.
- Period during which equipment is utilised.

15.27 Management of Pollution Generation Potential

Management Objective:

- Ensure that all possible causes of pollution are mitigated as far as possible to minimise impacts to the surrounding environment.

Target:

1. No complaints regarding pollution.
2. No measurable signs of pollution.
3. Dust fallout -
 - a. Fenceline sites = Industrial Band (600 to 1200 mg/m²/day);
 - b. Community sites = Residential Band (< 600 mg/m²/day);
 - c. Comply with ASTM D1739; *SANS 1929*, *SANS 69*.
4. Particulate matter (PM₁₀) -
 - a. 24 hr = 120 µg/m³ (more than four times a year);
 - b. Annual = 50 µg/m³;
 - c. Comply with the National Ambient Air Quality Standards.
5. Noise -
 - a. L_{Aeq} (equivalent continuous sound level) during daytime hours (07:00 to 22:00) = 45 dBA;
 - b. L_{Aeq} during night-time hours (22:00 to 07:00) = 35 dBA;
 - c. Comply with SANS 10103:2008.
6. Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels.
7. Water quality – construction activities may not cause an adverse impact that results in more than a 10% change in baseline values.

8. All water discharges to comply with legal requirements associated with the National Water Act (Act No. 36 of 1998), including GN No. 399.

Management Actions:

- **Noise** -
 - The remote nature of the construction domain needs to be factored in to the mitigation of noise-related aspects.
 - The provisions of SANS 10103:2008 will apply to all areas at the perimeter of the site, within audible distance of residents.
 - Working hours to be agreed upon with Engineer, so as to minimise disturbance to landowners and community members.
 - No amplified music will be allowed on the site. The use of radios, tape recorders, compact disc players, television sets etc. will not be permitted unless at a level that does not serve as an intrusion to adjacent land-owners.
 - The Contractor will take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools.
- **Dust** -
 - Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of construction activities to sensitive receptors.
 - Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area, access roads, borrow pits, site yard, etc.
 - Speed limits to be strictly adhered to.
 - The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties).
- **Lights** -
 - Prior to construction the position and type of lighting will be planned to ensure unnecessary light pollution will be eliminated.
 - All lighting installed on site must not lead to unacceptable light pollution to the surrounding community and natural environment (e.g. use of down-lighters).
- **Erosion** -

- Protect areas of the construction site that are susceptible to erosion (e.g. steep sections noted in **Section 14**), through suitable measures (e.g. watering, planting, retaining structures, commercial anti-erosion compounds).
- Any erosion channels caused by construction activities to be suitably stabilised and rehabilitated.
- All efforts to prohibit ponding on surface and ensure stormwater runoff is channelled from the site must be made. The method used will be appropriate to the expected stormwater flows and the topography and geology of the site.
- **Cement and Concrete Batching** -
 - Cement mixing to take place on an impervious surface (e.g. cement mixing pit).
 - Batching operations to take place in a designated area, which will be kept clean at all times.
 - Location of batching plant to be approved by the Engineer, with due consideration of the relevant management measures contained in the EMPr (see EMPr sections on *Site Clearing, Site Establishment, Management of Water, Management of Waste*, etc.).
 - Ensure separation of clean and dirty water from batching plant.
 - Wastewater from batching operations to be disposed in accordance with the EMPr section on *Management of Water*. Contaminated water will not be discharged to the environment. Prevent overflow from contaminated wastewater storage area.
 - Waste concrete and cement sludge to be removed on a regular basis (to prevent overflowing) and to be disposed of at a suitable facility.
 - Unused cement bags will be stored in an area not exposed to the weather and packed neatly to prevent hardening or leakage of cement.
 - Used cement bags will be stored so as to prevent windblown dust and potential water contamination. Used bags will be disposed of adequately at a licenced waste disposal facility.
 - Concrete transportation will not result in spillage.
 - Cleaning of equipment and flushing of mixers will not result in pollution, with all contaminated wash water entering the waste water collection system.
 - To prevent spillage onto roads, ready mix trucks will rinse off the delivery shoot into a suitable sump prior to leaving the site.
 - Suitable screening and containment will be in place to prevent windblown contamination from cement storage, mixing, loading and batching operations.
 - All contaminated water and fines from exposed aggregate finishes will be collected and stored in sumps and will be adequately disposed of.
 - All visible remains of excess concrete will be physically removed on completion of the plastering or concrete pouring and disposed of in an acceptable manner.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.
- Contractor to conduct environmental monitoring for air quality (dust and PM₁₀), noise and water quality.

Monitoring Requirements:

- Public complaints register.
- Evidence of pollution.
- Review periodic results from environmental monitoring (water quality, groundwater, noise, vibration, air and dust).
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

15.28 Management of Flora

Management Objective:

- Preserve protected flora species outside of construction areas.
- Control alien plants and noxious weeds.

Target:

1. No unpermitted disturbance to protected flora species.
2. Ongoing eradication of alien plants and noxious weeds.

Management Actions:

- Comply with the requirements of the National Environmental Management: Biodiversity Act (No. 10 of 2004), National Forests Act (No. 84 of 1998), National Veld and Forest Fire Act (No. 101 of 1998) and Natal Nature Conservation Ordinance (15 of 1974).
- Include mitigation measures identified as part of environmental sensitivity walk down survey (refer to Pre-Construction EMPr).
- Search, rescue and relocation of red data, protected and endangered species and medicinal plants.

- Search, rescue and relocation to be undertaken by a specialist.
- Ongoing identification of protected plants and trees.
- Any protected plants or trees in proximity to construction areas (outside of basins) that will remain, should be clearly marked and must not be disturbed, defaced, destroyed or removed, unless permitted and otherwise specified by the Engineer.
- Acquire the necessary permits under the National Forests Act (No. 84 of 1998) if avoidance of protected trees is not possible.
- Control of alien invasive species and noxious weeds for disturbed areas, in accordance with the requirements of the Conservation of Agricultural Resources Act (No. 43 of 1983) and GN No. R. 598 (Alien and Invasive Species Regulations, 2014) in terms of the National Environmental Management: Biodiversity Act (No. 10 of 2004).
- Eradication method to be approved by the Engineer and ECO.
- Implement a monitoring programme for eradication of alien invasive plants and noxious weeds.
- A compensation ratio of 1:3 should apply for every conservation-worthy indigenous tree removed. *This is a requirement stipulated by DAFF during the EIA process.*
- Retain vegetation within the construction site, wherever possible.
- Where possible, transplant plant material to designated areas.
- Rehabilitation Management Plan to be developed, which will include additional measures identified during construction to supplement the reinstatement and rehabilitation provisions included in the EMPr. Targets to be specified for re-growth.
- No construction equipment, vehicles or unauthorised personnel will be allowed onto areas that have been rehabilitated. Only persons / equipment required for maintenance thereof will be allowed to operate on rehabilitated areas.
- Removal of medicinal plants by construction workers will not be allowed. Programme to be implemented to source medicinal plants, in consultation with the relevant authorities.
- No trees to be felled for fuel purposes.
- Branches, leaves and non-useable wood to be chipped and used as mulch during rehabilitation.
- Where feasible, felled timber to be made available to the local community free of charge only after ensuring that material for mulching for rehabilitation is secured.
- Contractor to test top 15 cm soil at predetermined distances for fertilizer requirements. All testing to occur at SANS 17025 laboratory.
- Grass shall be established on areas to be rehabilitated by sowing appropriate seed mixtures only between 1 October and 31 January.

- The rehabilitated and seeded areas must be harrowed after spreading the topsoil and fertilizer uniformly.
- Inspect rehabilitated area at three monthly intervals during the first and second growing season to determine the efficacy of rehabilitation measures.
- Take appropriate remedial action where vegetation establishment has not been successful or erosion is evident.
- Ensure that rehabilitation is in line with the surrounding natural environment and pre-construction state of the affected area.
- Revegetation must match the vegetation type which previously existed, unless otherwise indicated by a suitable specialist.
- Although the use of indigenous vegetation is promoted, where there is a risk of soil erosion (e.g. steep slopes) a suitable specialist must be consulted to determine the most appropriate stabilisation measures.
- Photographs of protected and sensitive flora species must be displayed in the construction camp to heighten awareness.
- Refer to sections on construction site planning and layout, as well as site establishment for additional control measures for the protection of flora.

Responsibilities:

- Proponent - acquire permits.
- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Permits.
- Targets and objectives established as part of the search, rescue and relocation efforts.
- Barricading of protected flora species.
- Encroachment of alien invasive plants and noxious weeds.
- Successful rehabilitation.
- Contractor's method statement.

Implementation Timeframe:

From pre-construction phase up to end of defects liability period (as relevant for specific management actions).

15.29 Management of Fauna

Management Objective:

- Ensure the protection of animals (including livestock).
- Adhere to agreements made with landowners and community members regarding animals.

Target:

1. No direct / indirect harm to animals from construction activities.
2. No deviations from agreements made with individual landowners and community members regarding animals.

Management Actions:

- Comply with the requirements of the National Environmental Management: Biodiversity Act (No. 10 of 2004), Natal Nature Conservation Ordinance (15 of 1974) and Animal Protection Act (No. 71 of 1962).
- Include mitigation measures identified as part of environmental sensitivity walk down survey (refer to Pre-Construction EMPr).
- Search, rescue and relocation of red data, protected and endangered faunal species.
- Proper access control to be maintained to prevent livestock from accessing construction areas.
- Stringent and dedicated control of poaching.
- No fishing allowed.
- No wilful harm to any animals, unless a direct threat is posed to a worker's health or safety.
- Captured animals to be safely released to a similar habitat.
- Prepare emergency response procedure for dealing with snake bites, as venomous species may occur in the area.
- Photographs of protected and sensitive fauna species must be displayed in the construction camp to heighten awareness.
- Refer to sections on construction site planning and layout, as well as site establishment for additional control measures for the protection of animals.
- Include specific provisions for managing impacts to sensitive bird species (including Blue Swallow and Cranes), as established as part of the environmental sensitivity walk down survey as well as the noise and vibration monitoring programme (refer to Pre-Construction EMPr).
- Include requirements from BirdLife SA and EZKZW regarding encroachment of the deviated R617 into the Impendle Important Bird Area and Impendle Nature Reserve, respectively.

- Ensure protection of the patches of forest on the slopes to the north of the R617 deviation.
- Animals that become stranded on islands during the impoundment of the Smithfield Dam and balancing dam basins need to be rescued and released in appropriate areas.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Proponent - acquire permits.
- Permits.
- Contractor's method statement.

Implementation Timeframe:

From pre-construction phase up to end of defects liability period (as relevant for specific management actions).

15.30 Management of Watercourses

Management Objective:

- Ensure that the watercourses (including the uMkhomazi and uMlaza Rivers and their tributaries, natural channels, drainage lines) are protected and incur minimal negative impact to their resource quality (i.e. flow, water quality, riparian habitat, morphology and aquatic biota).
- Existing water use entitlements not to be affected.
- Structure and functions of watercourses affected by construction activities to be returned to pre-construction state.

Target:

1. Unaltered downstream flow regime.
2. Downstream water quality to remain within acceptable ranges, as determined through baseline monitoring.
3. Existing water use entitlements not to be affected.
4. Ecological Water Requirements (EWR) for the uMkhomazi River and Estuary to be satisfied during the construction period.

Management Actions:

- **Flow** -
 - Water quality and quantity released from the Smithfield Dam site during construction will need to satisfy the EWR for the uMkhomazi River and Estuary.
 - Minimise construction footprint where the construction activities take place in-stream or in close proximity (< 50 m) to watercourses.
 - Prevent erosion on steep slopes.
 - Minimise influence to downstream flow regime when diverting and impeding flow for cofferdams, temporary river crossings or for any other purposes.
 - Do not hinder flow in natural drainage lines.
 - Construction activities not to interfere with downstream water users.
- **River morphology** -
 - Reinststate (shaping) and rehabilitate (riparian vegetation) affected areas in riparian zone and watercourse channel, outside of dam basins. Structure and function to be returned to pre-construction state.
 - Install suitable buttressing to prevent future erosion, if required.
 - No illegal crossing of watercourses with construction plant. Suitable temporary river crossing to be built. Select most appropriate crossing point based on geotechnical conditions, sensitivity of riparian habitat (e.g. protected trees, large trees that afford bank stabilisation) and instream habitat, depending on technical feasibility. Crossing points to be approved by Engineer.
 - No construction facilities (including storage areas, containers, chemical toilets, etc.) to be located within natural drainage lines.
- **Water quality** -
 - Conduct water quality monitoring at suitable up- and downstream sites on the affected watercourses.
 - All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area.
 - Storage area and ablution facilities not to be located closer than 50m from edge of riparian habitat.
 - Where necessary, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be maintained and serviced on a regular basis. The style of silt trap will depend on materials used and the water movement patterns. If silt traps are not deemed feasible, other suitable measures need to be taken to limit unnaturally high sediment volumes in the watercourses.

- Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses.
- No wastewater to be released to natural drainage lines.
- Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand.
- Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. straw bales). These are to be serviced regularly and removed when no longer in use. Materials can be re-used.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Review periodic results from water quality environmental monitoring.
- Erosion monitoring.
- Contractor's method statement.

Implementation Timeframe:

- Measures pertaining to the general protection of water resources - throughout the duration of the construction period.
- Measures pertaining to working within the riparian zones of watercourses - prior to watercourse crossings up to reinstatement and rehabilitation of affected watercourses.

15.31 Management of Groundwater

Management Objective:

- Management of impacts to groundwater levels and quality.

Target:

1. Groundwater quality to remain within acceptable ranges, as determined through baseline monitoring.
2. Yields of boreholes not to be adversely affected by construction activities.

Management Actions:

- Consider findings from geotechnical investigations during project design phase and incorporate mitigation measures (as relevant).
- Monitor groundwater levels in dedicated boreholes to assess impacts on the groundwater regime (see Section 10).
- Groundwater quality must be monitored at strategic boreholes during construction (see Section 10).
- Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. constructed out of geo-textiles and hay bales).
- Sealing of areas where excessive groundwater is encountered by grouting of rock or providing mass concrete plugs where necessary.
- Convey and discharge excessive seepage water in a controlled manner.
- Analyse and treat (as necessary) seepage water to an acceptable quality prior to discharge.
- Seek relevant environmental approvals for discharge.
- Prevent erosion and siltation as a result of the discharge.
- Implement measures to safeguard groundwater quality (see sections on *Management of Storage and Handling of Hazardous Material*, *Management of Water and Management of Pollution Generation Potential*).
- Contractor to develop a Groundwater Drawdown Contingency Plan, based on groundwater monitoring programme (see Section 10).

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Review periodic results from groundwater monitoring.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

15.32 Management of Archaeological and Cultural Features

Management Objective:

- Comply with legislative requirements with regards to archaeological and cultural resources, as well as graves.

Target:

1. No archaeological and cultural resources or graves to be damaged during construction.

Management Actions:

- Comply with provisions of the Heritage Management Plan (contained in Appendix A).
- Incorporate findings from Phase 2 Heritage Impact Assessment, Archaeological Impact Assessment and Palaeontological Impact Assessment. Refer to findings of heritage specialists in EIA for scope of Phase 2 investigations.
- For any chance finds, all work will cease in the area affected and the Contractor will immediately inform the Engineer. A registered heritage specialist must be called to site for inspection. The relevant heritage resource agency (i.e. Amafa) must be informed about the finding. Works in the area may only proceed once all the requirements have been met to the satisfaction of the CRE in consultation with the heritage specialist.
- Permits to be obtained in terms of the KZN Heritage Act (No. 04 of 2008) if heritage resources are to be impacted on and for the removal of graves.
- Exhumation and relocation of graves once families and affected communities have been consulted and permission received for relocation. All cultural practices in terms of removal of graves as requested by family / community to be complied with.
- All homesteads and graves situated in close proximity to the construction areas to be protected by a 20m buffer in which no construction can take place. The buffer to be highly visible to construction crews.
- Should any remains be found on site that is potentially human remains apply the change find procedure as described above. The South African Police Service should also be contacted.

Responsibilities:

- Proponent - acquire permits.
- Proponent - appoint archaeologist and palaeontologist.
- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Permits.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

15.33 Management of Borrow Pits and Quarries

Management Objective:

- Minimise environmental impacts associated with borrow pits and quarries.

Target:

1. No environmental damage or pollution incidents associated with the use of borrow pits and quarries.

Management Actions:

- Obtain approval from DMR for all borrow pits and quarries at Smithfield Dam and the balancing dam. Implement specific management measures, as approved by DMR.
- Implement suitable stormwater management measures at borrow pits / quarries.
- No direct discharge of sediment laden water without treatment.
- Manage dangerous conditions (e.g. steep slopes, loose and unstable material).
- Subject to approval, certain borrow pits and / or quarries may be utilised for the disposal of spoil material and inert building rubble.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

15.34 Management of Emergency Procedures

Management Objective:

- Minimise environmental impacts associated with emergency procedures.

Target:

1. Approved emergency response procedures, where relevant.
2. No site fires to be caused by construction activities and workers.

Management Actions:

- **Fire** -
 - Comply with the National Veld and Forest Fire Act (No. 101 of 1998).
 - Work closely with the local fire protection association. Determine requirements and add to list of emergency telephone numbers. Keep a fire danger index displayed on site and comply with requirements. Fire breaks are to be agreed with neighbours and the local fire protection association.
 - Proper emergency response procedure to be in place for dealing with fires.
 - Burning of waste is not permitted.
 - Suitable precautions will be taken (e.g. suitable fire extinguishers, water bowsers, welding curtains) when working with welding or grinding equipment.
 - All fire control mechanisms (fire-fighting equipment) will be routinely inspected by a qualified investigator for efficacy thereof and be approved by local fire services.
 - All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to alert to the presence of a fire.
 - No fires are allowed on site, unless in dedicated areas approved by the Engineer.
 - Firebreaks to be made for construction areas, as required.
 - Dedicated smoking areas to be provided. Cigarette butts may not be disposed of onsite.
- **Accidental Leaks and Spillages** -
 - Proper emergency response procedure to be in place for dealing with spills and leaks.
 - Ensure that the necessary materials and equipment for dealing with spills and leaks are available on site, where practicable.
 - Remediation of the spill areas will be undertaken to the satisfaction of the Engineer.
 - In the event of a hydrocarbon spill, the source of the spillage will be isolated and contained. The area will be cordoned off and secured. The Contractor will ensure that there is always a supply of an appropriate absorbent material readily available to absorb, breakdown and where possible, encapsulate a minor hydrocarbon spillage.

- All staff on site will be made aware of actions to be taken in case of a spillage.
- Provide contact details of person to be notified in a case of spillages – signage to be displayed at strategic points within the construction domain (e.g. workshop, fuel storage area, hazardous material containers).
- All Major Incidents (i.e. uncontrolled release of a hazardous substance, including from a major emission, fire or explosion, that causes, has caused or may cause significant harm to the environment, human life or property) to be reported to DEA.

Responsibilities:

- Engineer and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Approved Emergency Response Plan.
- Training and awareness creation records.
- Signage displayed.
- Contractor's method statement.
- Incident Register and Report.

Implementation Timeframe:

Throughout the duration of the construction period.

15.35 Management of Health and Safety

Management Objective:

- Provide a safe working environment to construction workers and the public.

Target:

1. Approved Health and Safety Plan.
2. No incidents.
3. Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993), Construction Regulations (2014) and other relevant regulations.

Management Actions:

- Contractor to submit a Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval prior to the commencement of work. These requirements are aligned with the Construction Regulations (2014).
- Fencing and barriers will be in place in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993).
- Comply with the provisions of the Fencing Act (Act No. 31 of 1963).
- Applicable notice boards and hazard warning notices will be put in place and secured. Night hazards will be indicated suitably (e.g. reflectors, lighting and traffic signage).
- Emergency contact details will be prominently displayed.
- Two-Way Radio Systems should be used where cell phone coverage is poor.
- All construction personal must be clearly identifiable. All employees must also be issued with employee cards for identification purposes.
- All workers will be supplied with the required Personal Protective Equipment as per the Occupational Health and Safety Act (Act No. 85 of 1993).
- Maintain access control to prevent access of the public to the construction areas, as far as practicable.
- Use approved communication channels to inform the community of Occupational Health and Safety measures to prevent incidents involving community members.

Responsibilities:

- Engineer and ECO - checking.
- Dedicated Occupational Health and Safety system to be implemented by Contractor's Safety Officer. To be monitored and audited by the Client's Safety Agent, in terms of the Construction Regulations (2014).
- Contractor to implement management actions.

Monitoring Requirements:

- Occupational Health and Safety system – checked by Safety Agent.

Implementation Timeframe:

Throughout the duration of the construction period.

15.36 Management of Reinstatement and Rehabilitation

Management Objective:

- Adequate reinstatement and rehabilitation of construction areas.
- Conduct concurrent or progressive rehabilitation of areas affected by construction activities.

Target:

1. Complete site clean-up.
2. Reinstatement and rehabilitate areas disturbed by construction activities.

Management Actions:

- **Removal of structures and infrastructure**
 - Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, and fixtures.
 - Ensure that all temporary access roads utilised during construction and which are not earmarked for use during the operational phase, are returned to a usable state and/or a state no worse than prior to construction.
 - Ensure that no existing man-made objects and structures within the dam basins are left to become a danger to people and animals.
- **Inert waste and rubble**
 - Clear the site of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates. After the material has been removed, the site shall be reinstated and rehabilitated.
 - Load and haul excess spoil and inert rubble to fill in borrow pits/dongas or to dump sites indicated/approved by the Engineer.
- **Domestic waste**
 - Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site.
- **Hazardous waste and pollution control**
 - Remove from site all pollution containment structures.
 - Remove from site all temporary sanitary infrastructure and waste water disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.

- Comply with relevant provisions under the following EMPr sections: *Management of Storage and Handling of Hazardous Material, Management of Water, Management of Waste, Management of Pollution Generation Potential.*
- **Final shaping**
 - Make safe all dangerous excavations by backfilling and grading, as required.
 - In general, no slopes steeper than 1(V):3(H) are permitted in cut-and-fill areas, unless otherwise specified by the Engineer. Steeper slopes require protection. New slopes must mimic the natural slopes and topography, where possible.
 - Programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results.
 - Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.
 - Shape all disturbed areas to blend in with the surrounding landscape, where possible.
 - Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is landscaped to blend in with the surrounding landscape.
- **Topsoil replacement and soil amelioration**
 - Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
 - Execute topsoil placement only after all construction work has ceased.
 - Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes. Replace topsoil to the original depth.
 - Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
 - The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage.
 - Do not use topsoil suspected to be contaminated with the seed of alien vegetation (e.g. black wattle). Alternatively, the soil is to be appropriately treated.
 - Ensure that storm water run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it.
 - Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.
 - After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.
- **Ripping and scarifying**

- Rip and/or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary will be based on the site conditions immediately before these works begin.
- Rip and/or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the works.
- Rip and/or scarify along the contour to prevent the creation of down-slope channels.
- Do not rip and/or scarify areas under wet conditions, as the soil will not break up.
- **Planting**
 - Transplanted plants
 - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
 - Transplanting entails the removal of plant material and replanting the same plants in another designated position.
 - Transplant trees and shrubs into designated positions.
 - Establish further specifications for transplanted plants.
 - Nursery plants
 - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
 - Plant all trees, shrubs and individual plants in designated positions.
 - Planting should preferably be done during the rainy season.
 - After planting, each plant must be well watered, adding more soil upon settlement if necessary.
 - Establish further specifications for nursery plants.
 - Seeds and seedlings
 - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
 - Tree seedling material should be fresh and of local origin. Resist using plants from far afield as they may not be best suited to local climatic or soil conditions.
 - Small seedlings are likely to transplant more successfully than will large ones. These should be potted and kept under nursery conditions until they are large enough to plant out.
 - Establish further specifications for seeds and seedlings.
- **Grassing**
 - Suitably trained personnel must undertake grassing by making use of the appropriate equipment and grass species as specified by the terrestrial ecologist.

- Sodding may be done at any time of the year, but seeding must be done by sowing appropriate seed mixtures only between 1 October and 31 January.
- Hydroseeding with a winter mix will only be specified where regrassing is urgent, and cannot wait for the summer.
- Establish further specifications for sods, runners and hand seeding.
- **Maintenance**
 - Monitor the re-growth of invasive vegetative material.
 - Cordon off areas that are under rehabilitation as no-go areas.
 - Revegetation must match the vegetation type, which previously existed, unless otherwise indicated by a suitable specialist.
 - Control invasive plant species and noxious weeds by means of extraction, cutting or other approved methods.
 - For planted areas that have failed to establish, replace plants with the same species as originally specified.
 - Establish further specifications for maintenance.

Implementation Timeframe:

Throughout the duration of the construction period, as relevant to the concurrent or progressive reinstatement and rehabilitation of affected areas. Up to end of defects liability period.

16 REFERENCES

Little, I.T. & McKechnie, A.E. 2012. Injecting technology to save a species: Blue Swallows, Pit tags and a race against the clock for answers. in "A review of the Blue Swallow International Action Plan and Regional Red List Assessments" : Summary of an International Workshop 2012.

APPENDIX A

HERITAGE MANAGEMENT PLAN

PROPOSED UMKHOMAZI WATER PROJECT PHASE 1 RAW WATER COMPONENT

Heritage Management Plan

May 2015

Prepared by:

Name	Qualification	Professional Registration
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DEFINITIONS

Alter: means any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or other decoration or any other means.

Archaeological: means

- *Material remains resulting from human activity which is in a state of disuse and is in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.*
- *Rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10m of such representation.*
- *Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act 15 of 1994, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation.*
- *Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.*

Conservation: in relation to heritage resources includes identification, protection, maintenance, preservation and sustainable use of places or objects in order to safeguard their cultural significance.

Council: means Amafa aKwaZulu-Natali Heritage Council established in terms of section 5(1) of the KwaZulu-Natal Heritage Act

Cultural significance: aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Development: any physical intervention, excavation, or action, other than those caused by natural forces, which may, in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including—

- *construction, alteration, demolition, removal or change of use of a place or a structure at a place;*

- *carrying out any works on or over or under a place;*
- *subdivision or consolidation of land comprising, a place, including the structures or airspace of a place;*
- *constructing or putting up for display signs or hoardings;*
- *any change to the natural or existing condition or topography of land; and*
- *any removal or destruction of trees, or removal of vegetation or topsoil.*

Grave: means a place of interment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such a place.

Heritage resource: means any place or object of cultural significance. i.e. of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Heritage site: in relation to the Province of KwaZulu-Natal, means –

- (a) a Heritage Landmark site;
- (b) a Provincial Landmark site; or (c) those heritage resources referred to in sections 33, 34, 35 and 42 of the KwaZulu-Natal Heritage Act

Intangible heritage: means the intangible aspects of inherited culture, and may include

- (a) cultural tradition;
- (b) oral history;
- (c) performance;
- (d) ritual;
- (e) popular memory;
- (f) skills and technique;
- (g) indigenous knowledge systems; and
- (h) the holistic approach to nature, society and social relationships

Palaeontological means any fossilized remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilized remains or trace.

Public monuments and memorials: all monuments and memorials:

- *erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organization funded by or established in terms of the legislation of such a branch of government; or*

- *which were paid for by public subscription, government funds, or a public-spirited or military organization, and are on land belonging to any private individual.*

Structures: means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.

A. BACKGROUND

The current water resources of the Integrated Mgeni Water Supply System (WSS) are insufficient to meet the long-term water requirements of the system. Pre-feasibility investigations indicated that Phase 1 of the uMkhomazi Water Project (uMWP-1), which entails the transfer of water from the undeveloped uMkhomazi River to the existing Integrated Mgeni WSS, is the scheme most likely to fulfil this requirement.

The overall uMWP-1 project consists of two components, namely a Raw Water component and a Potable Water component (see Table 1 below):

Table 1: Simplified overview of uMWP-1 Components

uMWP-1 Component	Infrastructure	Proponent
Raw Water	<ol style="list-style-type: none"> 1. A new dam at Smithfield on the uMkhomazi River near Bulwer. 2. Water conveyance infrastructure (including a ± 32 km long tunnel and a pipeline) to a balancing dam in the Baynesfield area. Alternatives under consideration for the tunnel alignment and location of the balancing dam. 	Department of Water and Sanitation
Potable Water	<ol style="list-style-type: none"> 3. A water treatment works in the uMlaza River valley. 4. A gravity pipeline to the Umgeni Water bulk distribution reservoir system, below the reservoir at Umlaas Road. 	Umgeni Water

This document serves as the Heritage Management Plan for the uMWP-1 Raw Water component.

This document will be submitted in support of the environmental authorisation application for the Raw Water component of the project to the Department of Environmental Affairs (DEA). The Heritage Management Plan (HMP) is considered part the Environmental Management Programme (EMPr) for the uMWP Raw Water Component and should therefore be read in conjunction with the EMPr.

B. OBJECTIVES OF THE HMP

Heritage resources are considered to be very sensitive, and many are considered symbolic, spiritual and sacred by communities. Many heritage resources are formally protected and require permits or licences from Amafa aKwaZulu-Natali (Amafa) to be disturbed, damaged or destroyed.

The HMP aims to facilitate the protection of known or newly discovered cultural heritage or archaeological resources ('chance finds') during the pre-construction, construction and operational phases of the project by establishing a protocols/standard procedures for project role

players for dealing with such resources. The HMP will provide guidance regarding heritage resources that will be unavoidably impacted by the proposed development in terms of mitigation measures that will alleviate to some degree such impacts.

The HMP will refer to the legislation and permitting requirements associated with the destruction or disturbance of such resources.

The HMP aims to provide procedures/guidelines:

- To prevent the disturbance, destruction and/or removal of known or discovered heritage resources without the necessary permits or licences;
- To manage or prevent any development activities taking place within a specified distance of a heritage resource that are to remain in situ in close proximity to the project;
- To prevent any structures older than sixty years from being demolished, damaged or altered without the necessary permits or licences;
- To prevent any destruction, alteration or exhumation from taking place at traditional burial places and graves of victims of conflict without following the necessary and regulated processes and protocols;
- To control the destruction, alteration or disturbances of battlefield sites, archaeological sites, paleontological sites, historic fortifications, meteorite and meteorite impact sites without the necessary permits or licences; and
- To encourage an integrated approach to heritage and natural resource management among all stakeholders.

C. LEGAL CONTEXT

Heritage resources in KwaZulu-Natal (KZN) are currently protected and regulated by the KZN Heritage Act, 2008 (No. 4 of 2008) (KZNHA) which came into effect on the 12 February 2009 and the KZN Heritage Regulations, 2012 that were gazetted on 02 April 2012. The regulations provide the process that must be followed when applications are contemplated to disturb, remove or destroy heritage resources in the Province.

Amafa implements both the KZNHA and the National Heritage Resources Act (No. 25 of 1999) (NHRA), the latter in terms of a Memorandum of Understanding with SAHRA. All authorizations in the Province are submitted to and reviewed by Amafa. Where the KZNHA does not regulate a matter pertaining to a KZN heritage resource, this will then fall under the provisions of the NHRA.

In terms of Chapter 8 of the KZNHA, the following heritage resources are afforded general protection:

- Section 33(1)(a) - Structures: No structure which is, or may be reasonably expected to be older than 60 years may be demolished, altered or added to without prior written approval of the Council having been obtained on written application to the Council;
- Section 34 - Graves of victims of conflict: No person may damage, alter, exhume or remove from its original position (a) the grave of a victim of conflict (b) a cemetery made up of such graves (c) any part of a cemetery made up of such graves without prior written approval of the Council having been obtained on written application to the Council;
- Section 35(1)(a) - Traditional burial places: No grave not otherwise protected by this Act, and (1)(b) graves not located in a formal cemetery...may be damaged, altered, exhumed, removed from its original position, or otherwise disturbed without the prior written approval of the Council having been obtained on written application to the Council;
- Section 36(1) - Battlefield sites, archaeological sites, rock art sites, paleontological sites, historic fortifications, meteorite or meteorite impact sites: No person may destroy, damage, excavate, alter, write or draw upon, or otherwise disturb (any of the above) ...without prior written approval from the Council on written application to the Council”.

D. RESPONSIBILITIES

Refer to roles and responsibilities specified in the EMPr.

Amafa are the heritage authority in KZN who will ensure the preservation of known heritage resources, or that the demolition or disturbance of known heritage resources are undertaken with the necessary authorisations. Amafa will also provide guidance, where necessary, when chance finds of heritage resources are found.

E. HERITAGE RESOURCE MANAGEMENT

1) General

According to section 5 (1)(a) of the NHRA, heritage resources have lasting value in their own right and provide evidence of the origin of South African society and as they are valuable, finite, non-renewable and irreplaceable, they must be carefully managed to ensure their survival.

Section 3 of the NHRA provides an extensive list of heritage resources that form part of the national estate:

- (a) places, buildings, structures and equipment of cultural significance;
- (b) places to which oral traditions are attached or which are associated with living heritage;
- (c) historical settlements and townscapes;

- (d) landscapes and natural features of cultural significance;
- (e) geological sites of scientific or cultural importance;
- (f) archaeological and paleontological sites;
- (g) graves and burial grounds, including—
 - (i) ancestral graves;
 - (ii) royal graves and graves of traditional leaders;
 - (iii) graves of victims of conflict;
 - (iv) graves of individuals designated by the Minister by notice in the *Gazette*;
 - (v) historical graves and cemeteries; and
 - (vi) other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
- (h) sites of significance relating to the history of slavery in South Africa;
- (i) movable objects, including:
 - (i) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
 - (ii) objects to which oral traditions are attached or which are associated with living heritage;
 - (iii) ethnographic art and objects;
 - (iv) military objects;
 - (v) objects of decorative or fine art;
 - (vi) objects of scientific or technological interest; and
 - (vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

2) Known Heritage Resources

There are a number of heritage sites with the project area that, where possible, will be incorporated into the design of the Smithfield Dam and associated infrastructure, or alternatively protected during construction or demolished on receipt of written authorization following written application to Amafa.

The sites are tabulated below together with a description, applicable protection in terms of the KZNHA and proposed mitigation measures.

Table 1: Identified Heritage Sites

Description	Location	Protection	Significance	Mitigation
Lundys Hill Supply Store	29°44'28.97"S 29°54'53.75"E	Protected i.t.o Section 33 (1)(a)	Low - Medium	Outside of FSL; 10 m buffer to be implemented around store throughout construction phase
Deepdale Bridge	29°44'28.75"S 29°54'40.07"E	Protected i.t.o Section 33 (1)(a)	High	Prevention of inundation if possible Application to Amafa for permit to destroy bridge Complete record of bridge (photographic, architectural, historical) before inundation
Drystone wall	29°44'40.57"S 29°53'56.16"E	Protected i.t.o Section 33 (1)(a)	High	Re-align R617 deviation to avoid wall; 15m buffer around wall to prevent damage through construction activities / <i>alternatively, families will be given the option to choose an alternate reburial site</i>
Graves at Kheswa's Kraal	29°45'20.26"S 29°56'36.33"	Protected by Section 35 (1)(a)(b)	High	Engage with family members Application to Amafa for permit to remove graves
Grave at Mbele's Kraal	29°45'26.49"S 29°56'41.50"E	Protected by Section 35 (1)(a)(b)	High	Engage with family members Application to Amafa for permit to remove grave
Graves at Mncwabe's Kraal	29°45'24.67"S 29°56'49.44"E	Protected by Section 35 (1)(a)(b)	High	Engage with family members Application to Amafa for permit to remove graves
>10 graves east of Mncwabe's Kraal	Between 29°45'25.72"S 29°56'50.41 and 29°45'29.92"S 29°56'54.58"E	Protected by Section 35 (1)(a)(b)	High	Engage with family/community members; Application to Amafa for permit to remove graves
Circular structure (possibly Late Iron Age/Sotho herder hut)	29°45'26.33"S 29°57'4.15"E	Protected i.t.o Section 33 (1)(a) & Section 36	Medium to High	Second Phase Archaeological Impact Assessment required before destruction. This will also include application for a permit to allow for a rescue excavation
Graves at Borrow Area A	29°46'38.26"S 29°56'41.89"E	Protected by Section 35 (1)(a)(b)	High	Engage with family/community members; Application to Amafa for permit to remove graves
Remains of stone structure / abandoned African homestead (late 19 th – early 20 th Century)	29°46'40.32"S 29°56'16.70"E	Protected i.t.o Section 33 (1)(a) & Section 36	Medium to High	Second Phase Archaeological Impact Assessment (AIA) required before destruction; Permit required from Amafa to allow for a rescue excavation
Remains of dwelling / abandoned homestead (late 19 th – early 20 th Century)	29°46'33.06"S 29°56'47.43"E	Protected i.t.o Section 33 (1)(a) & Section 36	Medium to High	Second Phase AIA required before destruction; Permit required from Amafa to allow for a rescue excavation
Remains of stone structure / abandoned African homestead (late 19 th – early 20 th Century)	29°46'30.73"S 29°56'43.73"E	Protected i.t.o Section 33 (1)(a) & Section 36	Medium to High	Second Phase AIA required before destruction; Permit required from Amafa to allow for a rescue excavation

Description	Location	Protection	Significance	Mitigation
Graves and remains of structure	29°46'06.39"S 29°55'21.41"E	Protected by Section 35 (1)(a)(b) & Section 33	High	Outside FSL; must be fenced with 10 m buffer
Graves at Hlope's Kraal	29°46'05.19"S 29°55'14.35"E	Protected by Section 35 (1)(a)(b)	High	Engage with family/community members; Application to Amafa for permit to remove graves
Ngcobo's Kraal and grave	29°46'7.09"S 29°55'11.21"E	Protected by Sections 33 and 35	High	Engage with family/community members; Application to Amafa for permit to remove grave/s and for destruction of structure
Palaeontological finds (fossil plants)	Western section of raw water component including Dam	Fossil finds are protected i.t.o Section 36	High	Phase 2 site inspection and recovery where necessary after application to Amafa for permit

a) Structures

According to the permit application procedures of the KwaZulu-Heritage Regulations (2012), any person wishing to demolish, alter or make an addition to a structure which is, or which may reasonably be expected to be older than 60 years, must make written application to the Amafa Council in terms of Regulation 2 of the KwaZulu-Natal Heritage Regulations (2012).

This procedure would apply, for instance, to the inundation of the Deepdale Bridge or to construction activities that will impact on the drystone wall. During the operational phase, this could apply to damage to the Lundy's Hill Supply Store if roads in the immediate vicinity of the shop are widened for example.

b) Graves

The graves affected by the proposed development all mostly traditional graves found close to homesteads and graves not found in a formal cemeteries. The graves that will be inundated by the proposed Smithfield dam will need to be exhumed / removed from their original positions to a site agreed upon with the family.

According to Regulation 4, a person intending to damage, alter, exhume, or remove from its original position or otherwise disturb a grave not located in a formal cemetery, must obtain prior written approval from the Council.

A Phase 2 HIA will confirm the location of all the graves to be removed from the proposed dam basin. During this phase intensive engagement with family and community members will take place obtain approval of the proposed exhumation as well as establishing where the graves will be moved to and the customs and cultural practices that will have to be adhered to.

Some graves will be left in close proximity to the proposed dam and associated infrastructure. These graves are protected by Section 35 of the KZNHA and should not be disturbed. However, if graves are damaged during the construction and operational phases of the project or if they need to be moved due to unforeseen circumstances, then Amafa must be consulted regarding the repair and/or removal of the graves.

c) Archaeological and Palaeontological Sites

In terms of Regulation 5 of the KZN Heritage Regulations (2012), a person wishing to destroy, damage, excavate, alter, write or draw upon, or otherwise disturb any battlefield site, archaeological site, rock art site, palaeontological site, or meteorite or meteorite impact site must obtain prior written approval of the Council.

This regulation, for example, applies to the stone structures listed above and possible fossil plants that may be found in the western side of the Raw Water component. A Phase 2 AIA and palaeontological impact assessment (PIA) are recommended to ensure that all sites are identified, researched and excavated where necessary.

d) General Procedures

Amafa will issue a permit to the person who will undertake or directly supervise the proposed work, i.e. the person who will take legal responsibility for ensuring that the work is undertaken according to the permit requirements. This might be a DWS official (in the case of a permit to destroy a structure, for example); or an archaeologist (in case of a permit to undertake sampling or excavation of an archaeological site, or undertake or supervise the exhumation and/or reinterment of a burial).

All permit applications be advertised in the Government Gazette, allowing for a 30-day period for objections/responses to be lodged prior to the issuing of any permits. In addition, stakeholders – such as the municipality, the neighbours, and heritage conservation bodies – must be notified via registered mail. The applicant must bear the costs involved.

The KwaZulu-Heritage Regulations (2012) require that anyone wishing to make representations regarding any application must notify Amafa within 14 days of the Gazette notice of their intention to lodge objections. If no objections are received within that period, Amafa will issue the permit.

The regulations allow 90 days for the processing of applications from the date when all required documentation has been received. Amafa urge applicants to consult stakeholders before submitting their applications to obviate delays.

e) Protection of Heritage Resources During Construction Phase

Some heritage resources close to the dam and associated infrastructure will remain *in situ*. These heritage sites need to be protected from impacts that could take place through construction activity.

Typically buffers are placed around these heritage sites using highly visible barrier fencing to prevent construction staff from having free access and to preserve the heritage resource/s. The barrier fence must be supported by vertical droppers that are planted into the ground at requisite intervals. Red and white danger tape shall be woven through the fence in order to increase visibility to drivers of vehicles and construction crew on the ground.

Construction staff must be made aware that buffer areas are 'no go' areas. Barricading cannot be moved, removed or altered in any way without the approval of the ECO in consultation with the Engineer and a heritage specialist.

Family members must be allowed access to the graves that are left *in situ* close to the dam during and after the construction phase.

f) Protection of Heritage Resources During Operational Phase

Permanent barricading must be checked by the maintenance teams to ensure that the barricading is in good condition. If there is damage or removal of such barricading then the maintenance team must have the mandate to repair or replace the barricading.

Upon inspection of protected sites, if damage is noted to the heritage resource, the maintenance team must inform the DWS as well as Amafa about the damage. A registered heritage specialist must be called to site to inspect the damage and report to both Amafa and the DWS about what needs to be done to repair the damage (if possible) and to protect the site / remains from further damage.

3) Newly Discovered Heritage Resources ('Chance Finds')

It is possible that not all heritage resources were identified during the HIA and subsequent assessments either due to poor visibility (overgrown vegetation, for example) or sub-surface archaeological remains not visible until excavations start.

When such finds occur, then the following protocol must be adhered to in order to ensure that the heritage resources are not damaged and mitigation measures can be implemented so to avoid delaying the project unduly:

- *All management and construction staff involved in construction on site are to be advised of the nature of heritage resource material and informed of their obligation to report any item that they may deem to be heritage sites that they may happen upon during the construction processes;*
- *If heritage resources are found during construction, all work will cease in the area affected and the Contractor will immediately inform the Engineer;*
- *The site foreman must cease all work at the site where the item / site has been uncovered;*
- *The site must be cordoned using fencing and / or danger tape;*
- *The ECO must be advised immediately of the discovery of such material;*
- *A registered heritage specialist must be called to site for inspection. Amafa must be informed about the finding;*
- *The heritage specialist will assess the significance of the resource and provide guidance on the way forward;*
- *Permits to be obtained from Amafa if heritage resources are to removed, destroyed or altered;*
- *All heritage resources found in close proximity to the construction area to be protected by a 10m buffer (or as recommended by the ECO) in which no construction can take place. The buffer to be highly visible to construction crews;*
- *Under no circumstances may any heritage material be destroyed or removed from site unless under direction of a heritage specialist;*
- *Should any remains be found on site that is potentially human remains, the South African Police Service should also be contacted; and*
- *If there are chance finds of fossils during construction, a palaeontologist must be called to the site in order to assess the fossils and rescue them if necessary (with an Amafa permit). The fossils must then be housed in a suitable, recognized institute.*