GA Environment

ENVIRONMENTAL MANAGEMENT PROGRAMME
LOWER COERNEY BALANCING DAM – DFFE Reference: 14/12/16/3/3/2/2222

THE PROPOSED LOWER COERNEY BALANCING DAM, SUNDAYS RIVER VALLEY LOCAL MUNICIPALITY, EASTERN CAPE PROVINCE

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

February 2023

ENVIRONMENTAL MANAGEMENT PROGRAMME
FOR THE
PROPOSED LOWER COERNEY BALANCING DAM, SUNDAYS RIVER VALLEY LOCAL MUNICIPALITY, EASTERN CAPE PROVINCE

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PROJECT INFORMATION

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Competent Authority:	Department of Forestry, Fisheries and the Environment (DFFE)
DFFE Reference No.:	14/12/16/3/3/2/2222
Applicant:	Department of Water and Sanitation
Environmental Assessment Practitioner:	GA Environment (Pty) Ltd.
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SIGNING OF THE ORIGINAL DOCUMENT

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ABBREVIATIONS

ADD	Average Day Demand
AWSS	Algoa Water Supply System
CA	Competent Authority
CBA	Critical biodiversity area
CMA	Catchment Management Agency
CPA	Communal Property Association
DEDEAT	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism
DFFE	Department of Forestry, Fisheries and the Environment
DN	Nominal diameter
DSR	Draft Scoping Report
DWA	Department of Water Affairs (currently Department of Water and Sanitation)
DWAF	Department of Water Affairs and Forestry (which then changed to DWA and is currently the Department of Water and Sanitation)
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (Act 73 of 1989
ECO	Environmental Control Officer
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Plan
EMPR	Environmental Management Programme Report
EO	Environmental Officer
ER	Engineer's Representative
ESA	Ecological Support Area
ESR	Environmental Site Representative
FSR	Final Scoping Report
FSL	Full Supply Level
GA	General Authorisation
Ha	hectares
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
LSRGWS	Lower Sundays River Government Water Scheme
LSRWUA	Lower Sundays River Water Use Association
Mℓ	Mega litre

NEMA	National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Protected Area
NMBM	Nelson Mandela Bay Municipality
PM	Project Manager
SACNASP	South African Council for Natural Scientific Professions
SBDM	Sarah Baartman District Municipality
SRIB	Sundays River Irrigation Board
SRVM	Sundays River Valley Local Municipality
WUA	Water Use Authorisation
WUL	Water Use Licence
WULA	Water Use Licence Application
NWA	National Water Act (Act No. 36 of 1998)
mamsl	Meters above mean sea level
NOC	Non-overspill Crest
RDF	Recommended Design Flood
SEF	Safety Evaluation Flood
KPC	Kirkwood Primary Canal
NGP	Nooitgedacht / Nooitgedagt Pipeline
CA	Competent Authority
HIA	Heritage Impact Assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
WTW	Water Treatment Works

DEFINITIONS

Aspect - Element of an organisation's activities, products or services that can interact with the environment.

Auditing - A systematic, documented, periodic and objective evaluation of how well the Environmental Management Programme (EMPr) is being implemented and is performing with the aim of helping to safeguard the environment by facilitating management control which would include meeting regulatory requirements. Results of the audit help the organisation to improve its environmental policies and management systems, while keeping track of their compliance with the Environmental Authorization.

Clearing of vegetation - Clearing refers to the removal of vegetation through permanent eradication and in turn no likelihood of regrowth. 'Burning of vegetation (e.g. fire- breaks), mowing grass or pruning does not constitute vegetation clearance, unless such burning, mowing or pruning would result in the vegetation being permanently eliminated, removed or eradicated.

Corrective (or remedial) action - Response required in addressing an environmental problem that is in conflict with the requirements of the EMPr. The need for corrective action may be determined through monitoring, audits or management review.

Degradation - The lowering of the quality of the environment through human activities, e.g. river degradation, soil degradation.

Developer– Entity which applies for environmental approval and is ultimately accountable for compliance to conditions stipulated in the EA (Environmental Authorisation) and EMPr.

Environment - The surroundings within which humans exist and that are made up of land, water and atmosphere of the earth, micro-organisms, plant and animal life: or any part or combination of the two and the interrelationships among them, the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Impact Assessment (EIA) - An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of a proposed development. The EIA includes an evaluation of alternatives; recommendations for appropriate management actions for minimising or avoiding negative impacts and for enhancing positive impacts; as well as proposed monitoring measures.

Environmental Management System (EMS) - Environmental Management Systems (EMS) provide guidance on how to manage the environmental impacts of activities, products and services. They detail the organisational structure, responsibilities, practices, procedures, processes and resources for environmental management. The ISO14001 EMS standard has been developed by the International Organisation for Standardisation.

Environmental Policy – A statement of intent and principles in relation to overall environmental performance, providing a framework for the setting of objectives and targets.

Habitat - A habitat is an ecological or environmental area that is inhabited by a particular species of animal, plant, or other type of organism. It is the natural environment in which an organism lives, or the physical environment that surrounds a species population.

Impact - A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time, space, magnitude and intensity.

Indigenous species - Flora and Fauna species that are naturally found in an area.

Infrastructure - The network of facilities and services that are needed for economic activities, e.g. roads, electricity, water, sewerage, etc.

Integrated Environmental Management- This is a philosophy used in the assessment of and management of the environment, during all actions, plans, activities, etc. that could affect the environment. Its aim is to ensure sustainability.

Mitigation - Measures designed to avoid, educe or remedy adverse impacts. Actions that limit, stop or reverse the magnitude and/or rate of long-term effect on the environment.

Natural environment - Encompasses all living and non-living things occurring naturally on Earth or some region thereof. It is an environment that encompasses the interaction of all living species. Climate, weather, and natural resources that affect human survival and economic activity.

Policy - A set of aims, guidelines and procedures to help you make decisions and manage an organisation or structure. Policies are based on people or an organisation's values and goals.

Process - Development usually happens through a process - a number of planned steps or stages.

Resources - Parts of our natural environment that we use and protect, e.g. land, forests, water, wildlife, and minerals.

LEGISLATIVE REQUIREMENTS FOR AN EMPr

The table below provides the Requirements for an Environmental Management Programme (EMPr) in terms of the 2014 EIA Regulations as amended, (Appendix 4) with reference to the relevant sections of this report or where these requirements are addressed.

Section	Content	Reference in report
An EMPr must comply with section 24N of NEMA and include-		
1(a)	Details of (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Chapter 2
1(b)	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Chapter 6
1(c)	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;	Section 1.1
1(d)	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including- (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	Chapter 7
1(e)	A description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	Chapter 7
1(f)	A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to – (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	Chapter 7
1(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Chapter 7
1(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Chapter 7
1(i)	An indication of the persons who will be responsible for the implementation of the impact management actions;	Chapter 7

1(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Chapter 7
1(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Chapter 7 and 8
1(l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Chapter 8
1(m)	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; and	Chapter 5
1(n)	Any specific information that may be required by the competent authority.	None Required

UNDERTAKING TO IMPLEMENT THE EMPr

Undertaking by the Principal Contractor

I …… acting on behalf of the **Contractor**, hereby indicate that I have read through the EMPr and understand the measures required to be implemented in terms of the EMPr. I hereby undertake to implement these measures and carry out my duties as specified herein.

Signed on …… at ……

…… ……..

Contractor's Environmental Representative

Witness (1)

……..

Witness (2)

Undertaking by the Environmental Control Officer

I …… the Environmental Control Officer appointed by DWS hereby indicate that I have read through the EMPr, and understand the measures required to be implemented in terms of the EMPr and hereby undertake to fulfil my duties as specified herein.

Signed on …… at ……

…… ……..

Contractor's Environmental Representative

Witness (1)

……..

Witness (2)

THE SIGNING OF THIS DOCUMENT IS CRUCIAL AS IT BINDS THE CONTRACTOR TO THE CONTENTS OF THE EMPR IMPLEMENTATION THEREOF

1. INTRODUCTION

This Environmental Management Programme (EMPr) serves to present the identified environmental impacts and mitigation for **the proposed project.**

1.1 Project background

The Department of Water and Sanitation (DWS, hereafter) is a state organ that exists to ensure equitable access to water for all South Africans as well as to protect, use, develop, conserve, manage and control water resources. In 2017, DWS undertook a feasibility study to assess five (5) potential dam sites for the Algoa Water Supply System (AWSS). The Lower Coerney site was eventually found to be the most feasible and most viable for the construction of the required balancing dam. Subsequently, GA Environment (Pty) Ltd was appointed by DWS, as independent Environmental Assessment Practitioners (EAP) to undertake the Scoping and Environmental Impact Assessment (EIA) and the Water Use License Application (WULA) process for the proposed construction of the Lower Coerney Balancing Dam as part of the AWSS. It must be noted that the Water Use License Application process has been discontinued following consultation with DWS Eastern Cape Region Licensing Officials and based on the DWS Circular for Exclusions from Water Use Authorisation processes in October 2022. According to this notice, DWS is excluded from applying for WULA as there are no legal requirements in terms of Chapter 4 of the National Water Act of 1998 to compel the Department of Water and Sanitation to also obtain a Water Use License for a development of approved Government Waterworks.

The objectives of the balancing dam are to:

- Limit risks of shortfall in supply to the Nelson Mandela Bay Metropolitan Municipality (NMBM) and the Lower Sundays River Government Water Scheme (LSRGWS);
- Remove potential operating system constraints for the sustainable delivery of bulk Orange River water supply to the LSRGWS and NMBM, for water requirements up to 2040; and
- Limit operational risks to acceptable levels.

The proposed Lower Coerney Balancing Dam site is located on Portion 7 of the Farm Scheepersvlakte No. 98 (C07600000000009800007), Farm 713 Uitenhage (C07600000000071300000) and the Remaining Extent of Farm 40 Farm Enon Mission 574 (C07600000000075800000) owned by Scheepersvlakte Farms CC, Venter Wildlife Trust and the Moravian Church in South Africa respectively. Landowner Consent forms for all directly affected properties were obtained and provided in **Appendix 3** of the Application Form. The study area is located in the town of Addo near Kirkwood, Sundays River Local Municipality in the Eastern Cape Province. The approximate coordinates of the site are 33°26'29.77"S and 25°37'23.68"E**.** The proposed location of the Coerney Dam is upstream of the Coerney Syphon outlet in a valley east of and adjacent to the existing Scheepersvlakte Dam as indicated in **Figure 1** and **Figure 2**.

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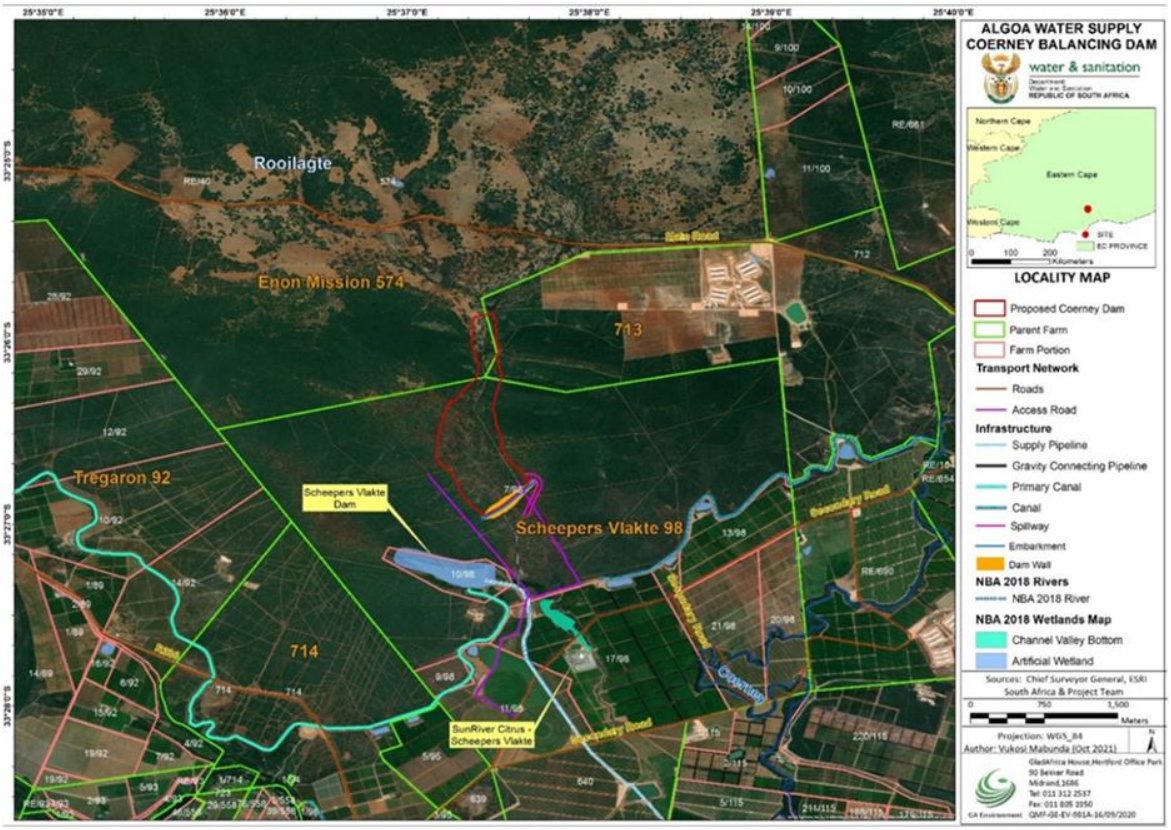

Figure 1: Locality Map of the Proposed Lower Coerney Balancing Dam

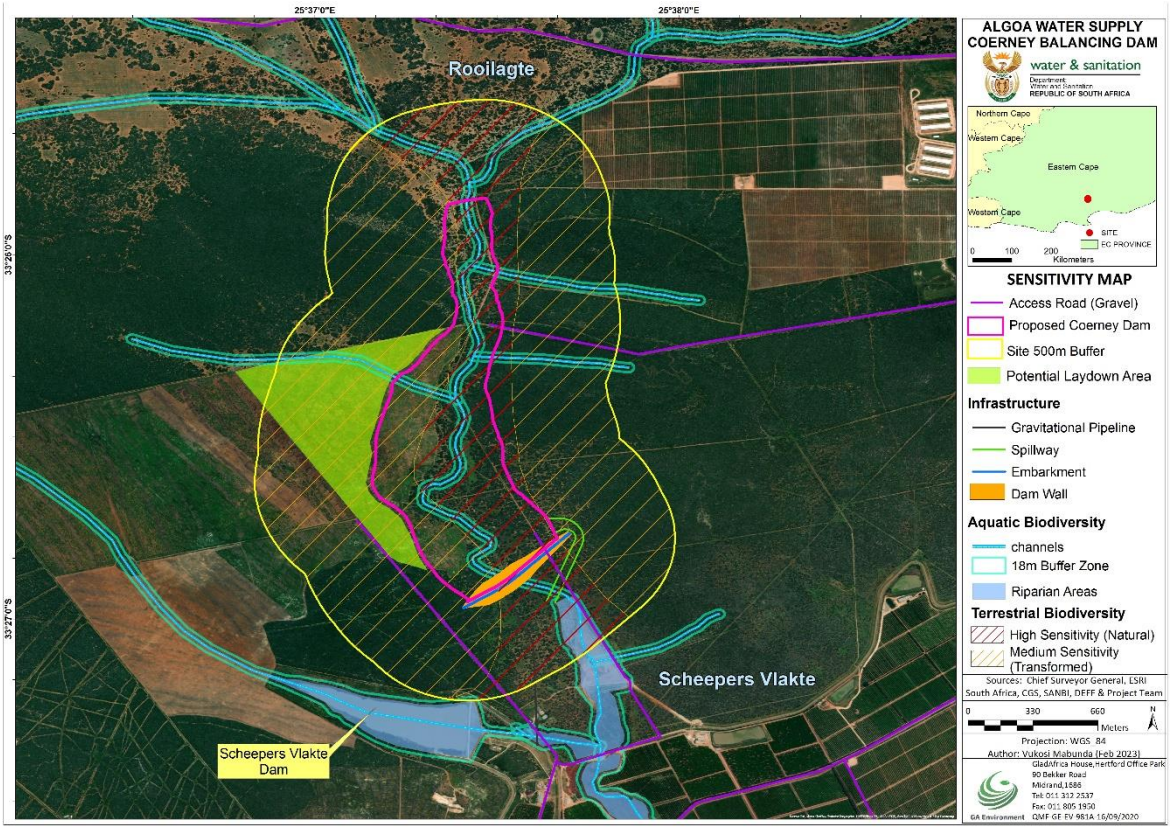

Figure 2: Site Layout Map

1.2 Description of the proposed activity

The existing Scheepersvlakte Dam is a balancing facility for water supply to the Lower Sundays River Water User Association (LSRWUA) and the Nelson Mandela Bay Metropolitan Municipality (NMBM) for emergency supply. The need for a new balancing dam on the Scheepersvlakte Farm is due to the inadequate smaller capacity of the existing Scheepersvlakte Dam to provide water supply to NMBM during an emergency. The main purpose of the proposed new balancing dam at the Coerney site is to eliminate the operational and balancing storage limitations imposed by Scheepersvlakte Dam.

DWS intends to construct a 77 ha homogeneous earth-fill embankment dam with a wall height of 20.5 m high and a capacity of 4.69 million m3 to provide an emergency water supply of 21-days to the Nelson Mandela Bay Metropolitan Municipality. The main advantage of the dam site is that it will enable the dam to be operated under gravity. The dam will be filled from the Kirkwood Primary Canal via a new pipeline and the dam will supply the Nooitgedagt Water Treatment Works (WTW) via a new connecting pipeline to the existing 1 400 mm Nooitgedagt pipeline. The proposed Coerney Dam will be filled, and topped up, over a longer filling period through gravity supply. The existing Scheepersvlakte Dam and proposed Coerney Dam, although filled from the same source, will be operated separately under normal operations. The proposed Coerney Dam will be used as balancing storage for NMBM and the Scheepersvlakte Dam will revert to its original function and will only be used as balancing storage for irrigation. See **Table 1** for a summary of key technical details.

Table 1: Technical background information

Aspect	Detail
Type of Dam:	Homogeneous Earthfill Embankment Dam.
Main advantage of dam site:	The dam will be filled and supply water under gravity (no need for water to be pumped).
Source of water:	Kirkwood Primary Canal via a new pipeline.
Wall height:	20.5m
Storage capacity (before excavation):	4.69 million m^3
Maximum water depth (before excavation):	16.2 m
Hazard rating:	High
Hazard dam type:	Category III Dam
Materials required and not available on site:	Sand, gravel, rocks and concrete aggregates (which all need to be imported).

1.3 Project Alternatives

Several options associated with the construction of the dam and for improving the assurance of water supply were considered. The options (alternatives) for the development of the Scheepersvlakte Balancing Dam and water supply to the Nooitgedagt Water Treatment Works (WTW) were identified and undertaken by DWS during the prefeasibility and feasibility assessments in 2019 (Aurecon, 2019; DWS, 2019). The prefeasibility and feasibility options considered are discussed in this chapter.

The key factors which determined the reliability of the supply to Nooitgedagt WTW were as follows:

- A limited balancing capacity in Scheepersvlakte Dam, which is operated at a capacity of 550 000 m^3 to avoid spillages, although the dam has a total capacity of 820 000 m^3.

- There is a risk of failure of the aging upstream canal, syphon and weir infrastructure, such as the May 2017 failure of the main canal. Additional future balancing capacity should be provided to supply 210 Mℓ /day for 21 days (4.1 million m^3).

The following options were identified for providing improved assurance of supply to the WTW by various means, including balancing storage:

1. Balancing storage on the right bank of the Sundays River near the Nooitgedagt Water Treatment Works (Nooitgedagt WTW) in combination with a raised Scheepersvlakte Balancing Dam wall.

2. Diverting water from the existing Korhaansdrift Weir via a right bank pipeline to Nooitgedagt WTW for additional delivery of the NMBM's water allocation.

3. Increased balancing capacity at the Korhaansdrift Weir and diverting water via a right bank pipeline to Nooitgedagt WTW for full delivery of the NMBM's water allocation.

4. Releasing water from the existing Korhaansdrift Weir and diverting it closer to the Nooitgedagt WTW via a new pump station for full delivery of the NMBM's water allocation.

5. Increased balancing capacity at the Korhaansdrift Weir, with water releases to a new pump station downstream in the Sundays River, close to the Nooitgedagt WTW.

6. Constructing a larger dam near the present Scheepersvlakte Balancing Dam site and integrating this dam with the existing gravity pipeline to the Nooitgedagt WTW.

7. Constructing a large balancing dam on the right bank near the Nooitgedagt WTW.

1.3.1 Activity alternative

a. <u>Improvements at Scheepersvlakte Dam</u>

The DWS study undertaken by Naidu Consulting identified the following improvements that should be made at Scheepersvlakte Dam:

- Install an isolating valve and a non-return valve on the 1420 mm Nooitgedagt pipeline to prevent backflow from the cross-connection to the Scheepersvlakte Syphon.
- Modify the dam's outlet works, to enable future maintenance and repairs to be undertaken without requiring 3-day shutdowns and draining of the dam.
- Construct a direct connection between the Nooitgedagt pipeline and the main canal, to replace the existing Syphon and separate the operation of the Nooitgedagt pipeline from the operation of the Upper Coerney Canal.

The first option above would probably require that Scheepersvlakte Dam is taken out of service for a few days and the second option would require a considerable time. The last option could probably be undertaken by taking the Scheepersvlakte Dam out of service for a relatively short period of time. After implementation, this option would enable the Nooitgedagt WTW to be supplied directly from the canal for up to 4.5 days per week, while Scheepersvlakte Dam is taken out of service, or for longer if the canal is not emptied each weekend during the period that maintenance work is undertaken on Scheepersvlakte Dam. The provision of a direct offtake from the canal would provide the additional

benefit that the deposition of silt in Scheepersvlakte Dam would probably be considerably reduced as the volume of sediment laden water that would flow through the reservoir would be reduced.

However, after careful analysis it was found that this option is not recommended. The main reason for the current operation of the canals for 4.5 days per week is because the canals have sufficient capacity to supply the full current allocation during this period and because of the additional costs and potential staffing problems that would arise if the canals were to be operated for 7 days per week. The filamentous algae which occur are reduced by drying out the canals for two days per week and only occasionally occur. These algae result in increased maintenance (cleaning) of the canal and could affect the operation of the Nooitgedagt WTW. In addition, it was suggested by DWS that if the balancing storage is sited near Scheepersvlakte Dam, then it would also be necessary to reduce the risk of failure of the pipeline from there to the Nooitgedagt WTW (1 400 mm x 9 300 m long steel pipeline). Duplication of the existing pipeline would probably rule out all options for balancing dams in the vicinity of Scheepersvlakte Dam because of the very high additional cost of approximately R240 million.

b. Raising of Scheepersvlakte Dam

If Scheepersvlakte Dam would be raised sufficiently to provide 21 days of balancing storage, then the dam wall would have to be raised by about 12 m to provide about 4.6 million m3 of balancing storage for an emergency supply of about 220 Mℓ /day (210 Mℓ /day plus 3% losses). Therefore, the full supply level would have to be raised from 104.6 m to about 117 m. The raising of Scheepersvlakte Dam is, however, not feasible as the site is not suitable for raising the dam and spillway by the required 12 m. If the site was suitable, the raised dam would require that most of the stored water would have to be pumped due to the lower level of the long weir in the canal that supplies Scheepersvlakte Dam. The crest level of this weir is at RL 105.8 m, which is 11 m below the raised full supply level.

c. Development of a new 21 day emergency supply balancing dam (preferred)

This option is based on the construction of a dam near Scheepersvlakte Dam or Nooitgedagt WTW. A balancing storage of 21 days average daily demand (ADD) is recommended to limit the risk of shortfall in supply to the NMBM. Thus, the requirement of the development of a new dam with the design water requirement for NMBM of 76.6 million m^3/a or 210Ml/day. The main advantage of the chosen dam site is that it would be operated under gravity (no pumping will be required). Other advantages is that the new dam will consist of new infrastructure which will have a longer operational period and minimal (cost reduction) maintenance requirements. This alternative is preferred due to ageing existing infrastructure making it unsuitable and unsafe for modifications to meet the higher demand and the new dam will provide water security for up to 21-days while also providing water for the citrus farms.

1.3.2 Location/ property alternatives

Three possible sites for a balancing dam near the Scheepersvlakte Dam were evaluated (**Figure 3**), namely:

1. Upper Scheepersvlakte Dam site;
2. **Lower Coerney Dam site (preferred)**; and

3. Upper Coerney Dam site.

Additional four possible sites for a balancing dam near the Nooitgedagt WTW were evaluated (**Figure 3**), namely:

1. Nooitgedagt North Option 1 site;
2. Nooitgedagt North Option 2 site;
3. Nooitgedagt North Option 3 site; and
4. Nooitgedagt South site.

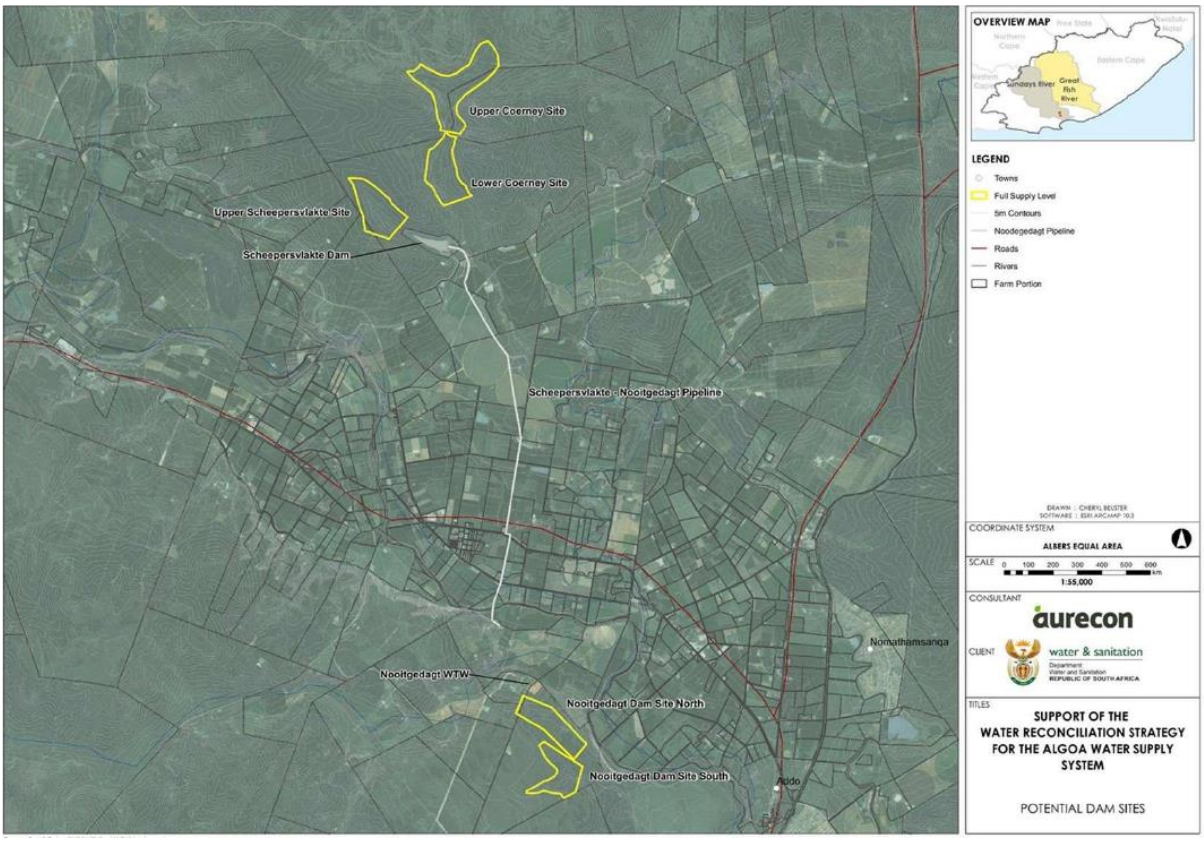

Figure 3: Options for Balancing Dams near Scheepersvlakte Dam and Nooitgedagt WTW (DWS, 2019)

The alternatives as described by DWS in the Options Analysis Report dated February 2019 are discussed as follows. An Environmental Constraints Analysis was undertaken to provide a desktop overview and analysis of the environmental sensitivity of the short-listed sites for a new balancing dam, highlighting potential issues and constraints and outlining the requisite environmental legal compliance requirements for each option. This provided high-level input regarding the environmental issues / constraints and legal requirements of the five short-listed sub-options. From a terrestrial ecology perspective, the Upper Scheepersvlakte and Coerney sites were considered slightly more environmentally sensitive when compared to the Nooitgedagt sites, mostly due to an overlap with an Endangered Ecosystem. From an aquatic ecology perspective, the Coerney sites have a greater aquatic sensitivity due to the drainage line within which they are located. No fatal flaws were identified from a heritage and palaeontology as well as land use perspective. From a purely environmental sensitivity perspective, the Nooitgedagt sites were slightly preferred to the Upper Scheepersvlakte and Coerney sites. The aforementioned do not however qualify as “fatal flaws”, but merely something to take note of when evaluating the overall feasibility of the sites.

1.3.2.1 Scheepersvlakte Dam Sites

a. Upper Scheepersvlakte Dam

The Upper Scheepersvlakte Dam would be sited immediately upstream of the existing Scheepersvlakte Dam on Scheepersvlakte 98 Portion Number 7, as shown in **Figure 3**. This property is currently owned by Scheepersvlakte Farms, which is currently developing the property for irrigated agriculture. The Scheepersvlakte 98 Citrus Development Trust plans to establish approximately 60 ha orchards in the area that would be occupied by the proposed dam wall and would be inundated by the reservoir basin.

The main features of the dam include:

- The full supply level of the proposed dam would be at 128 masl to provide a capacity of 4.6 million m^3. The lowest drawdown level would be at about 115 masl.
- The storage in the dam would only be utilized in an emergency and therefore over 50 years only about 4 000 m^3 of sediment from the catchment would be deposited in the dam.
- The reservoir footprint would be about 60 ha.
- The dam would have a catchment area of 3.5 km^2 and although the safety evaluation flood would be about 220 m^3/s, this could be accommodated by a relatively small 10 m wide side channel spillway, with 2.5 m of freeboard that would provide significant flood attenuation.
- As the existing nearby Scheepersvlakte Dam is an embankment dam it is likely that suitable earthfill materials would be available in the vicinity to construct a zoned earthfill embankment dam with 1 in 3 upstream slope and 1 in 2 downstream slope, with cobblecrete upstream slope protection.

The main advantages of the dam would be as follows:

- The dam would be situated very close to the existing Scheepersvlakte Dam and associated conveyance infrastructure.
- The catchment area of the dam is small (3.5 km^2) and therefore a smaller spillway and less freeboard will be required.

The disadvantages of the dam would be as follows:

- All the water stored in the dam would have to be pumped from the canal, which would be an additional operational cost.
- The dam would be situated on private property to be developed as orchards by Scheepersvlakte Farms.
- The developer may wish to share the use of the dam, which might complicate its operation.
- The pump station would be remote from the Nooitgedagt WTW and would have to be operated and maintained.
- The existing pipeline from Scheepersvlakte Dam to Nooitgedagt WTW may be vulnerable to damage by a major flood, although the risk would be significantly reduced by the proposed provision of a second Syphon crossing, as included in the estimate of the cost.

b. Lower Coerney Dam (Preferred)

The proposed Lower Coerney Dam (**Figure 3**) would be sited upstream of the Coerney Syphon on Scheepersvlakte 98 Portion Number 7 of Scheepersvlakte Farms Pty Ltd in the vicinity of the site

proposed by Scheepersvlakte Farms for a balancing dam. The main advantage of the scheme is that it would provide a gravity supply to the WTW via the existing 1 400 mm Nooitgedagt pipeline, and it would also be filled by gravity flow via the proposed pipeline from the canal. The main characteristics of the proposed dam are indicated in **Table 2**.

Table 2: Main characteristics of the proposed Lower Coerney Dam (DWS, 2019)

Characteristic	Lower Coerney Dam
Type of dam	Zoned earthfill embankment
NOC (m amsl)	103.8
FSL (m amsl)	98.8
Freeboard (m)	5.0
Crest width (m)	5.0
DS Slope (1V:H)	2.0
US Slope (1V:H)	3.0
Embankment fill volume (m^3)	355,993
Core trench volume (m^3)	46,798
Crest length (m)	623
Total gross dam capacity (m^3)	4,600,000
Surface area at FSL (ha)	59.7
Maximum wall height (m)	19.0
Catchment area (km^2)	34
Unrouted SEF (m^3/s)	890
Spillway configuration description	Concrete-lined, 36 m wide, side channel spillway located on the left abutment. (Note: spillway position dependent on geotechnical conditions) with downstream concrete outlet chamber, 4x4x3m, with two valves for the two pipelines.
Outlet works description	Dry well tower (19m high) with inside dimensions of 4x4m. Three offtake levels controlled by valves.
Access road length (km)	1.0

The main advantages of the scheme would be as follows:

- The dam would be situated close to Scheepersvlakte Dam and associated conveyance infrastructure.
- The scheme would be a gravity supply to fill the dam and to deliver water to Nooitgedagt WTW (no pumping required).
- The comparative capital cost as well as the cost of operation for this option is the lowest of the five options investigated.
- The irrigation water that passes through the dam would probably be sufficient to maintain acceptable salinity for urban consumption, but may need to be managed to ensure that the quality would be acceptable for citrus.
- No electricity costs would be incurred if water needs to be abstracted and replaced to maintain acceptable salinity levels.

The possible disadvantages of the scheme would be as follows:

- The dam would be situated at the outlet of a relatively large catchment area (34 km^2) and a major flood could cause damage downstream of the spillway as there is no evidence of rock at the site.
- The reserve storage and infrastructure would be remote from Nooitgedagt WTW and an additional Syphon under the Sundays River would be required to reduce the risk of wash away of the existing 1 400 mm Syphon.
- The potential joint use of the dam's water by the Municipality and the private developer would need careful planning.

c. Upper Coerney Site

The Upper Coerney dam site is situated about 1.5 km upstream of the Lower Coerney Dam site and approximately 2.3 km upstream of the Coerney Syphon. The dam and its reservoir basin would extend across two privately owned properties: Enon Mission Station 40-0, which is owned by Enon Mission, and Uitenhage Road 713-0, which is owned by the Venter Wildlife Trust. The main features of the dam are described below:

- There is no geotechnical information available concerning materials in the reservoir basin, and therefore for this very preliminary assessment it has been assumed that the dam wall would comprise a zoned earth embankment, as suggested for the costing of the Lower Coerney Dam.
- The full supply level of the proposed dam would be at about 109.1 masl and the lowest drawdown level at about 95 masl to provide a capacity of 4.6 million m^3 for 21 days emergency supply. Pumping would be required to fill the dam.
- The proposed dam would have a catchment area of 30 km^2. Assuming a sediment load of 15 m3/km^2/annum, then about 23 000 m^3 of sediment from the catchment area would be deposited over a 50-year period.
- The safety evaluation flood for the 30 km^2 catchment area of approximately 820 m^3/s, would be attenuated to about 700 m^3/s by the reservoir. As there does not appear to be any rock at the site, it has been assumed that a concrete lined side channel spillway with a 32 m crest width and 5 m of freeboard would be provided.

The main advantages of the scheme would be as follows:

- The dam would provide a gravity supply to deliver water in an emergency to Nooitgedagt WTW.
- The dam would be situated relatively close to the Scheepersvlakte Dam and associated conveyance infrastructure.

The possible disadvantages of the scheme would be as follows:

- The dam would be situated at the outlet of a relatively large catchment area (30 km^2) and a major flood could cause damage downstream of the spillway, as there is no evidence of rock at the site.
- Water would have to be pumped into the dam.
- The reserve storage and infrastructure would be remote from Nooitgedagt WTW and an additional Syphon under the Sundays River would be required to reduce the risk of failure of the system.
- The dam and reservoir basin would extend across two properties.

- This option has the highest comparative capital cost of the three options investigated in the vicinity of Scheepersvlakte Dam. The Upper Coerney Dam does not offer any real advantage over the other two options.

The Lower Coerney Dam site is preferred over the Upper Scheepersvlakte and Upper Coerney Dam site as placing the same dam at the upper Scheepersvlakte or Coerney sites would reduce the structural integrity of the dam and a major dam wall collapse would likely occur. In addition, the Upper Scheepersvlakte and Coerney sites would be financially costly to operate as it would require a pump for water supply rather than the gravitational pipeline.

1.3.2.2 Alternative Nooitgedagt Dam Sites

Four possible sites for a balancing dam near the Nooitgedagt WTW were identified and assessed. The main advantages of these sites would be as follows:

- The balancing dam would be located very close to the Nooitgedagt WTW and therefore could be easily managed by the operating staff at the Works.
- The supply would not be vulnerable to a failure of the Scheepersvlakte to Nooitgedagt pipeline.

Four possible sites for a balancing dam, to provide 21 days of storage, were assessed. All the sites would be situated on Erf 119 Portion 1, which is owned by Rolust Sondagsrivierplase CC, according to Windeed (but may currently be owned by Wicklow Trust). This property is currently utilized as a game reserve; however, the owners have indicated that they are planning to develop some of the area for irrigation (DWS, 2019). They will be requesting the LSRWUA to approve the relocation of the point of abstraction of their existing water allocation, from the 1 420 mm pipeline to the vicinity of the Nooitgedagt WTW. Wicklow Trust has also advised in their letter dated the 12th of October 2017 that the construction of a dam at the Nooitgedagt North Option 1 site would not be acceptable and that only the Nooitgedagt South site would be acceptable (DWS, 2019).

a. Nooitgedagt North Option 1

The location of the proposed Nooitgedagt North Option 1 dam is shown in **Figure 3**. The dam would be located close to three 11 kV/ 22 kV transmission lines and close to the main 400 kV transmission line, which supplies power to NMBM. The limited geotechnical inspection of the site indicated that suitable material would probably be available for the construction of a cut to fill dam. The dam would have virtually no catchment area, other than the reservoir basin, and therefore only a nominal overflow channel, which would discharge into the adjacent valley, would be provided. This dam was assumed to be like that of the proposed Upper Scheepersvlakte Dam.

The main advantages of the scheme would be as follows:

- The dam would provide a gravity supply to deliver water in an emergency to Nooitgedagt WTW.
- The dam would be situated very close to the Nooitgedagt WTW and the pump station would be situated at the WTW site, which would facilitate maintenance and operation.
- This scheme has a lower risk of failure than those in the vicinity of Scheepersvlakte Dam as water is not supplied via a long pipeline and Syphon.

- The dam would have virtually no catchment area and therefore only a small unlined spillway channel and limited freeboard would be required.

The possible disadvantages of the scheme would be as follows:

- The embankment volume to capacity ratio is relatively high and accounts for the relatively high cost, which is more than the most expensive option in the vicinity of Scheepersvlakte Dam. This cost could, however, potentially be slightly reduced.
- The 2 m of freeboard provided is conservative and other refinements may be possible.
- Water would have to be pumped into the dam.
- The property owner has advised that this proposed site for the dam is not acceptable due to possible seepage water affecting downstream orchards. Lining of the dam may therefore be required, depending on the soil permeability, which will further increase the capital cost.

b. Nooitgedagt North Option 2

The location of the proposed Nooitgedagt North Option 2 dam is shown in **Figure 3**. The dam would require the relocation of three 11 kV/ 22 kV transmission lines and probably also the main 400 kV transmission line, which supplies power to NMBM. The main features of the dam would be similar to those for the Nooitgedagt North Option 1 and Upper Scheepersvlakte Dam, as described in Section 6.2.a.

The advantages and disadvantages of Nooitgedagt North Option 2 would be similar to those for Nooitgedagt North Option 1, as described earlier, but the dam would also have the following additional disadvantages:

- The 11/22 kV transmission lines and possibly also the 400 kV transmission line would have to be relocated.
- The capital cost would be significantly higher than that for Nooitgedagt North Option 1.

c. Nooitgedagt North Option 3

The main features of the dam would be similar to those for Nooitgedagt North Option 1. The advantages and disadvantages of Nooitgedagt North Option 3 would be similar to those for Nooitgedagt North Option 1, but the dam would also have the following additional disadvantage:

- The capital cost would be significantly higher than that for Nooitgedagt North Option 1.

d. Nooitgedagt South

The site of the proposed Nooitgedagt South Dam is shown in **Figure 3**. The embankment dam would be located upstream of the 400 kV transmission line so that the line would not be impacted on by the dam. This site is not optimal for the dam, resulting in high construction cost. The main features of the dam would be similar to those for the Nooitgedagt North Option 1 and Upper Scheepersvlakte Dam, as described in Section 6.2.a.

The main advantages of the dam would be that water could gravitate into the dam, and it is the favored site for the landowner, the Wicklow Trust. The main disadvantages would be as follows:

- Water would have to be pumped to the Nooitgedagt WTW.

- The capital cost of the dam would be high. This in part arises from the siting of the dam so that construction would not take place below the 400 kV transmission line and the need for a relatively high dam wall, which would provide a relatively small reservoir basin.

The Nooitgedagt sites **are not** preferred over the Scheepersvlakte Site as the property which they would be situated is currently a game reserve, more environmentally sensitive and an important ecosystem for various species. In addition, within the Nooitgedagt sites, there are possible seepage water affecting downstream orchards which would require more funds to address and there are existing 11/22 kV transmission lines and possibly also the 400 kV transmission line which would have to be relocated for the dam to be developed.

1.3.3 Process alternatives

a. *Option 1: Balancing storage on the right bank of the Sundays River near Nooitgedagt WTW in combination with a raised Scheepersvlakte Balancing Dam wall*

This option consists of off-channel balancing storage consisting of a small dam in the valley to the north-west of the Nooitgedagt WTW in combination with an on-site storage facility, which could fit inside the present Nooitgedagt WTW site boundaries. The total storage available is limited due to the lack of available land on the Nooitgedagt WTW site (about 150 Mℓ storage in a cut-to-fill dam) and a possible 250 to 300 Mℓ in the valley surrounded by developed irrigation farmland. Raising of the Scheepersvlakte Balancing Dam by 1.0 to 1.5m could add some 160 Mℓ storage to achieve some 850 Mℓ storage. The maximum combined effective storage is estimated at 1000 to 1100 Mℓ, which may offer some 6 to 7 times the average daily demand (ADD) storage. This option thus cannot meet the required balancing storage.

b. *Option 2: Diverting water from the existing Korhaansdrift Weir via a right-bank pipeline to Nooitgedagt WTW*

The balancing capacity of the Korhaansdrift Weir is roughly estimated at 100 to 120 Mℓ, of which 80% would be utilized for this option. The proposed pipe route will initially start on the left bank (due to steep rocky slopes on the right bank) and then cross over to the right bank at 1.5 km downstream. The new pipeline will be 36 km long and will tie into the existing 1.5 m diameter pipeline from the Scheepersvlakte Balancing Dam to the Nooitgedagt WTW.

c. *Option 3: Increased balancing capacity at Korhaansdrift Weir and diverting the water via a right-bank pipeline to Nooitgedagt WTW*

The operation of this option is similar to Option 2, but additional balancing capacity will be created at Korhaansdrift Weir to accommodate the variability in the NMBM's water requirements and to minimize possible spillages under the LSRWUA long distance releases from Darlington Dam. This option requires that the Korhaansdrift Weir be raised by 4.5 m to create additional balancing capacity of 1 050 Mℓ. Given the age and history of the existing wall, raising the wall will require a new structure with the existing wall at best being used as a "shutter" to part of the new wall structure. The gravity pipeline will be 36 km long with a 1.5 m diameter.

d. Option 4: Releasing water from the existing Korhaansdrift Weir into the river and diverting closer to the Nooitgedagt WTW via a new pump station

This option is based on operating the existing Korhaansdrift Weir at present capacity, but to install a new outlet valve(s) in the present structure to allow for immediate releases on a short-term basis. At a distance, some 44 km downstream of Korhaansdrift Weir, a large "hippo pool" was identified in the Sundays River as a good point of abstraction for a proposed right bank raw water pump station. From the proposed pump station, a 1.4 m diameter pipeline will be tied into the existing 1.4 m diameter gravity pipeline from the Scheepersvlakte Balancing Dam.

The pump station will require an in-stream structure to maintain the present operating levels in the pool. Any permanent structure constructed above present "dry season" levels, will pose a flooding risk to adjacent irrigation land. The proposed structure would therefore be mass concrete or gabions, but not extend above the present water level. Total dissolved solids (TDS) levels at the proposed pump station could vary between 1 190 and 1 600 mg/ℓ.

e. Option 5: Increased balancing capacity at the Korhaansdrift Weir with releases to a new Pump Station downstream in the Sundays River

The operation of this option is similar to Option 4, but additional balancing capacity will be created at Korhaansdrift Weir to accommodate the variability in the water demands of NMBM and to minimize possible spillages under the LSRWUA long-distance releases from Darlington Dam. This option requires (as for Option 3) that the Korhaansdrift Weir be raised by 4.5 m to create additional balancing capacity of 1 050 Mℓ. Given the age and history of the existing wall, raising of the wall will require a new structure with the existing wall at best being used as a "shutter" to part of the new wall structure.

As per Option 4, a downstream pump station will be required to abstract raw water from the "hippo pool" with level protection in the form of a low weir structure. From the proposed pump station, a 1.4 m diameter pipeline will be tied into the existing 1.4 m diameter gravity pipeline from the Scheepersvlakte Balancing Dam. The deterioration of water quality due to irrigation/return seepage/flows between the Korhaansdrift Weir and the proposed pump station, and the high risk of water losses over the abstraction weir, are real concerns for this option as well.

f. Option 6: A larger dam near the present Scheepersvlakte Balancing Dam to be integrated with the existing gravity pipeline to Nooitgedagt WTW (preferred)

This option is based on the construction of a dam in the valley north-east of the existing Scheepersvlakte Balancing Dam, as shown in **Figure 4**. Water will be abstracted just upstream of the last long weir in the main canal, but downstream of the Coerney syphon offtake. The supply pipeline between this main canal abstraction point and the proposed dam will be a 1.4 m diameter x 880 m long steel pipe. The gravity supply, between the dam and the existing gravity pipeline to the Nooitgedagt WTW, will be a 1.4 m diameter x 730 m long steel pipeline. The site falls largely on land being planned for development by the Scheepersvlakte 98 Citrus Development Trust (Scheepersvlakte Farms (Pty) Ltd (SVPL)).

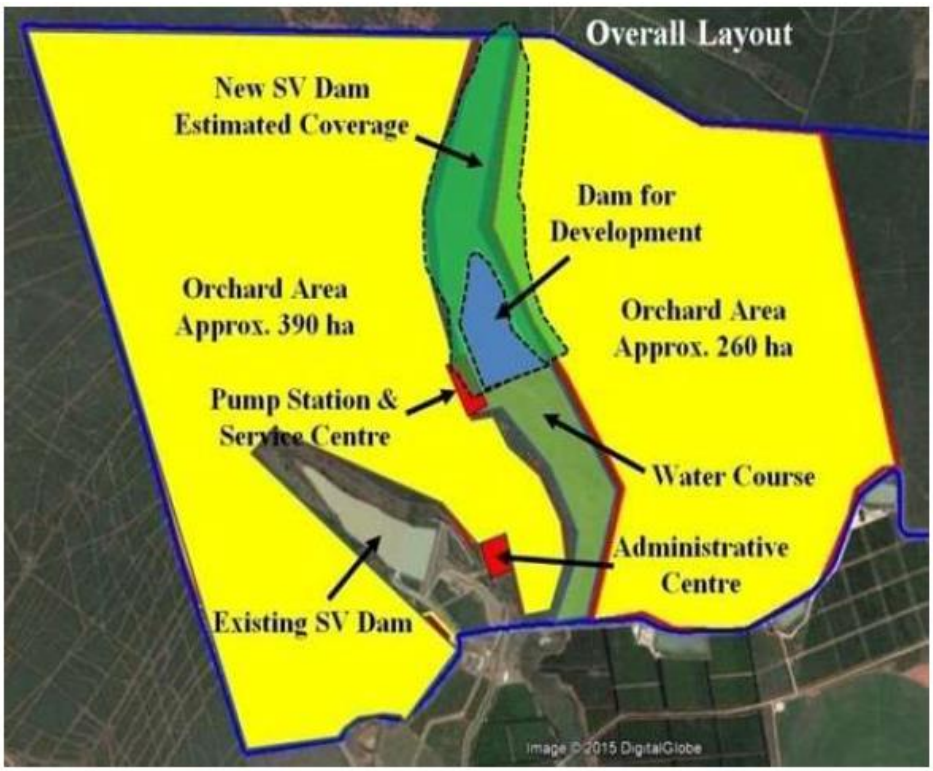

Figure 4: Scheepersvlakte 98 Citrus Development (DWS, 2019)

The Scheepersvlakte 98 Citrus Development Trust is currently constructing a small dam on the same site as that identified for the Coerney Balancing Dam. According to DWS (2019), a meeting was held with the Trustees and Engineers of the Trust in May 2016. The Trust agreed to co-operate with the DWS evaluation and possible future works, should this new dam option be pursued further. The Scheepersvlakte 98 Citrus Development has received a water use authorisation from the DWS for the abstraction of a maximum of 5 850 000 m^3/a, for the development of 650 ha of citrus. The Scheepersvlakte 98 Citrus Development Trust received their Environmental Impact Assessment for their development from the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEA) in August 2019.

g. Option 7: A large balancing dam on the right bank near the Nooitgedagt WTW

This option considered the possibility of providing additional storage near the Nooitgedagt WTW, which would have the following advantages:

- The storage would enable the works to continue to operate for a reasonable period while maintenance or repairs are done on the damaged components of the upstream sections of the supply system (all components are upstream).
- The proposed dam would supply the Nooitgedagt WTW by gravity, although it may be necessary to pump water into the dam.
- All future peak demands on the Nooitgedagt WTW could be supplied by gravity.

The existing 1.4 m diameter steel pipeline delivers water to a balancing tank located above the works at about related level (RL) 85 m. It may be possible to fill the dam by gravity when the Scheepersvlakte Balancing Dam is at or near full capacity. With the proposed full supply level (FSL) at RL 88 m and the

Scheepersvlakte Balancing Dam at lower levels, a booster pump station will be required near the northern boundary of the Nooitgedagt WTW site.

It is proposed that water should be supplied at one end of the proposed dam and abstracted from the other end to provide circulation and minimize the risk of algal growth. On the other hand, wind and wave action is likely to cause circulation within the water body and therefore it seems unlikely that there would be any significant benefit in separating the inlet and outlet. However, it would probably be desirable to provide a multi-level abstraction tower. A very small spillway would suffice. The electricity transmission line serving farms to the south-east of the Nooitgedagt WTW would have to be relocated for this option.

A Risk Matrix was compiled based on desktop conditions and site assessments to determine the feasibility of the above-mentioned options. **Table 3** is a Risk Matrix compiled for the seven options under consideration and is based on the discussions above.

Table 3: Risk Matrix for Preliminary Screening of Options (DWS, 2019)

Criteria Applied	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Risk to supply during Construction	Low	Medium	High	Medium	High	Low	Low
Risk to NMBM during Operation	High	High	Medium	High	Medium	Low	Low
Operational risks for LSRWUA	High	High	Medium	High	Medium	Low	Low
Capital and Operational costs	Low	High	High	Low	Low	Medium	Medium
Environmental risks costs	Low	Medium	Medium	Low	Low	Medium	Medium
Water quality deterioration in operation	Low	Low	Low	High	High	Low	Low

Based on the Risk Matrix, Options 1 to 5 have high risks for the continuity of water supply, either during construction or during operation. The direct and indirect costs associated with the risk of interruptions in water supply for both urban and agricultural water users, have ruled these five options out for more detailed investigations and evaluation. **Subsequently Options 1 to 5 are not preferred**. Options 6 and 7 have similar risk outcome, however **Option 6 is preferred over Option 7** as already indicated in this section that a dam within the Nooitgedagt sites would be situated within a game reserve, which is more environmentally sensitive and an important ecosystem for various species. In addition, Option 7 has more disadvantages and challenges including the possible seepage water affecting downstream orchards which would require more funds to address and there are existing 11/22 kV transmission lines and possibly also the 400 kV transmission line which would have to be relocated for the dam to be developed.

1.3.4 Demand alternatives

a. Option 1: A smaller balancing dam near the present Scheepersvlakte Balancing Dam

The proposed dam is a Homogeneous Earth fill Embankment Dam (gravity), with a storage capacity of approximately 4.69 million m^3, which will be supplied by the Kirkwood Primary Canal via a new pipeline. A smaller balancing dam would entail a development of a dam with a smaller capacity (less than 4.69 million m^3), which would have the following advantages:

- Reduced development footprint which requires lesser vegetation clearance;

- Minimal environmental impacts; and
- Reduced risk of dam integrity and structural failure or dam collapse due to reduced stress on the dam wall.

Regardless of the positive environmental aspects of this alternative, the smaller balancing dam option is not viable as this would entail a situation where the water shortages and required emergency water supply issues are not addressed and additional dams would still be required.

b. Option 2: A suitable balancing dam near the present Scheepersvlakte Balancing Dam (preferred)

This option comprises of the proposed suitable balancing dam with water capacity of approximately 4.69 million m^3 to will be supplied by the Kirkwood Primary Canal via a new pipeline. The dam will require approximately 74 ha of land to accommodate the desired water volume. The main advantages of this dam would be as follows:

- Although the dam footprint will be considerably big, the dam would be a gravity supply to fill the dam and to deliver water to Nooitgedagt WTW (no pumping required).
- The irrigation water that passes through the dam would probably be sufficient to maintain acceptable salinity for urban consumption, but may need to be managed to ensure that the quality would be acceptable for citrus; and
- The dam will cater for the citrus irrigation as well as provide emergency supply to NMBM for the required three weeks supply.

The possible disadvantages of the dam would be as follows:

- The larger dam has a high flood risk that could cause damage downstream of the spillway as there is no evidence of rock at the site; and
- The increased development footprint requires more vegetation clearance and has more environmental impacts;

This option is more viable and preferred as it is safer (less chance of dam wall failure) and it caters for the farmers while addressing the water shortages within the Nelson Mandela Bay Metropolitan Municipality and has provision for sustainability.

c. Option 3: A bigger balancing dam near the present Scheepersvlakte Balancing Dam

This option comprises of a bigger balancing dam with water capacity beyond 4.69 million m^3 to will be supplied by the Kirkwood Primary Canal via a new pipeline. The dam will require more than 74ha of land to accommodate the additional water volume. The main advantages of this dam would be as follows:

- Although the dam footprint will be considerably big, the dam would be a gravity supply to fill the dam and to deliver water to Nooitgedagt WTW (no pumping required).
- The irrigation water that passes through the dam would more than sufficient to maintain acceptable salinity for urban consumption, but would need to be managed to ensure that the quality would be acceptable for citrus; and
- The dam would cater for the citrus irrigation as well as provide emergency supply to NMBM for more than the required three weeks supply.

The possible disadvantages of the dam would be as follows:

- The larger dam would be a major high flood risk that could likely cause damage downstream of the spillway as there is no evidence of rock at the site; and
- The extended development footprint would require an extensive vegetation clearance and would result is severe environmental impacts.

Regardless of the positive capacity aspects of this alternative, the bigger balancing dam option is not viable as this would entail a situation where the dam and structural integrity would be significantly compromised and more likely to have a situation where the dam wall collapses.

1.3.5 Operational alternatives

The balancing dam would not be operated in the same way as normal water resource infrastructure as the water in the dam would only be abstracted in an emergency to supply the Nooitgedagt WTW. The dam would be filled over a certain filling period and would be topped up from time to time to make up evaporation and seepage losses, and possibly also operated to address water quality considerations. Because of this operation, the capital cost is more appropriate for comparing schemes rather than the unit reference value (URV). Refer to **Table 4** for the detailed prefeasibility comparison of the balancing dam options.

Table 4: Prefeasibility comparison of the balancing dam options (DWS, 2019)

	Potential Dam Sites				
EVALUATION FACTOR	**Upper Scheepersvlakte**	**Lower Scheepersvlakte**	**Upper Coerney**	**Nooitgedagt North – Option 1**	**Nooitgedagt South**
Capital Cost (R Million)	349	237	375	457	654
Capital Cost (cost of pumps reduced by 50%) (R Million)	282	231	309	403	600
Cost	2 – 2nd Lowest	1 - Lowest	3 – 3rd Lowest	4 - High	5 – Vey High
Pumping Required	**X**		**X**	**X**	**X**
Operational Complexity	**X**	**X**			
Strategic Location near WTW				**X**	**X**
Ecological considerations (Reserve)		**X** but likely easy to address	**X** but likely easy to address		
Considerations of floods					
Environmental & Social Impacts	Limited differentiation	Limited differentiation	Limited differentiation	Limited differentiation	Limited differentiation

Based on the capital cost comparison, operational costs, environmental sensitivities, and structural integrity amongst other aspects, the Nooitgedagt Dam sites were not recommended for feasibility assessments, because of their significantly higher costs and landowner objections. Although, the Nooitgedagt sites would provide a strategic advantage when compared with the Upper Scheepersvlakte and Coerney dam sites due to their proximity to the Nooitgedagt WTW, the Scheepersvlakte sites are more economical viable and have lesser environmental impacts as the Nooitgedagt sites are located within a game reserve and have existing transmission powerlines which would have to be relocated.

1.3.6 The No-Go Option

The no-development alternative would entail continuing with the *status quo*, i.e., a situation where the proposed Lower Coerney Balancing Dam will not be developed. This option is not preferred as this would entail a situation where the water shortages and required emergency water supply issues are not addressed and additional dams would still be required. In addition, several smaller dams would be required for irrigation purposes as the citrus farming community is currently being expanded. Therefore, the proposed Lower Coerney Balancing Dam addresses both scenarios.

1.4 Specialist Studies

In accordance with the requirements of Appendix 6 of the NEMA EIA Regulations, 2014 as amended, the recently published Government Notice 320 (dated 20 March 2020) and Government Notice 1150 (dated 30 October 2020) in terms of NEMA and the National web-based environmental screening tool, the following specialist studies indicated in **Table 5** were undertaken as part of the EIA process for the proposed development:

Table 5: Specialist studies and contact details

No	Specialist Study	Company Name	Contact Person and Details
1.	Terrestrial Biodiversity Impact Assessment	The Biodiversity Company	Andrew Husted andrew@thebiodiversitycompany.com
2.	Aquatic Biodiversity Impact Assessment	The Biodiversity Company	Andrew Husted andrew@thebiodiversitycompany.com
3.	Agricultural Impact Assessment	The Biodiversity Company	Andrew Husted andrew@thebiodiversitycompany.com
4.	Phase I Archaeological Impact Assessment	Eastern Cape Heritage Consultants CC	Kobus Reichert kobusreichert@yahoo.com
5.	Palaeontological Impact Assessment	Natura Viva cc	Dr. John E. Almond almond@zsd.co.za
6.	Geotechnical Investigation Report	Aurecon South Africa (Pty) Ltd	E van der Berg erik.vanderberg@aurecongroup.com tshwane@aurecongroup.com

These reports (as listed above) also contain additional recommendations and mitigation measures that should be considered during the construction and operational phases. The reports are attached to **Appendix F** of the Environmental Impact Assessment Report (EIR).

1.5 Specific Mitigation Measures and Specialist Studies

All recommendations made by the specialists and all mitigation measures proposed by the specialists in their assessments, as incorporated in the EMPr should be implemented and adhered to and all other conditions, monitoring and mitigation measures as provided in the EMPr should be adhered to. Some specific recommendations and mitigation measures highlighted in the EIR and are included in this EMPr.

1.6 General site conditions

An initial site visit undertaken on the 14th October 2021 and subsequent initial PP undertaken on the in November 2021. As observed during the site visit the proposed study area is north east of the existing Scheepersvlakte Dam and immediately north of the smaller Scheepersvlakte Dam (**Figure 5**). The site is located within citrus farming community and will blend in to the existing land-uses. The general conditions of the site and adjacent areas are as follows;

- The aerial view of the proposed development site indicating the cleared vegetation and remaining intact units is indicated in **Figure 6**.
- The proposed dam is located north west of the Scheepervlakte Dam and will have similar infrastructure (**Figure 7**).
- The primary water source for the dam will be through the Kirkwood Primary Canal south west of the site (**Figure 8**);
- The dam will have a gravitational pipeline which will join the Nooitgedagt Canal flowing to Nooitgedagt WTP (**Figure 9**);
- The dam will be filled via a siphon from the Kirkwood Primary Canal similar to the existing siphon (**Figure 10**);
- There Smaller Scheepersvlakte Dam under construction immediately south of the proposed dam site (**Figure 11**);
- The site is characterised by cleared vegetation and remaining intact vegetation units of the Western Endangered Albany Alluvial Vegetation and the least threatened Sundays Valley Thicket vegetation type on site (**Figures 12 & 13**);
- The site and adjacent properties comprises of the Endangered Albany Alluvial and the least threatened Sundays Valley Thicket vegetation units (**Figures 14 & 15**);
- There are existing access roads and services on site such as electricity (**Figure 16**); and
- There is a landfill and cemetery for the farming community approximately 1 km south of the site (**Figure 17**).

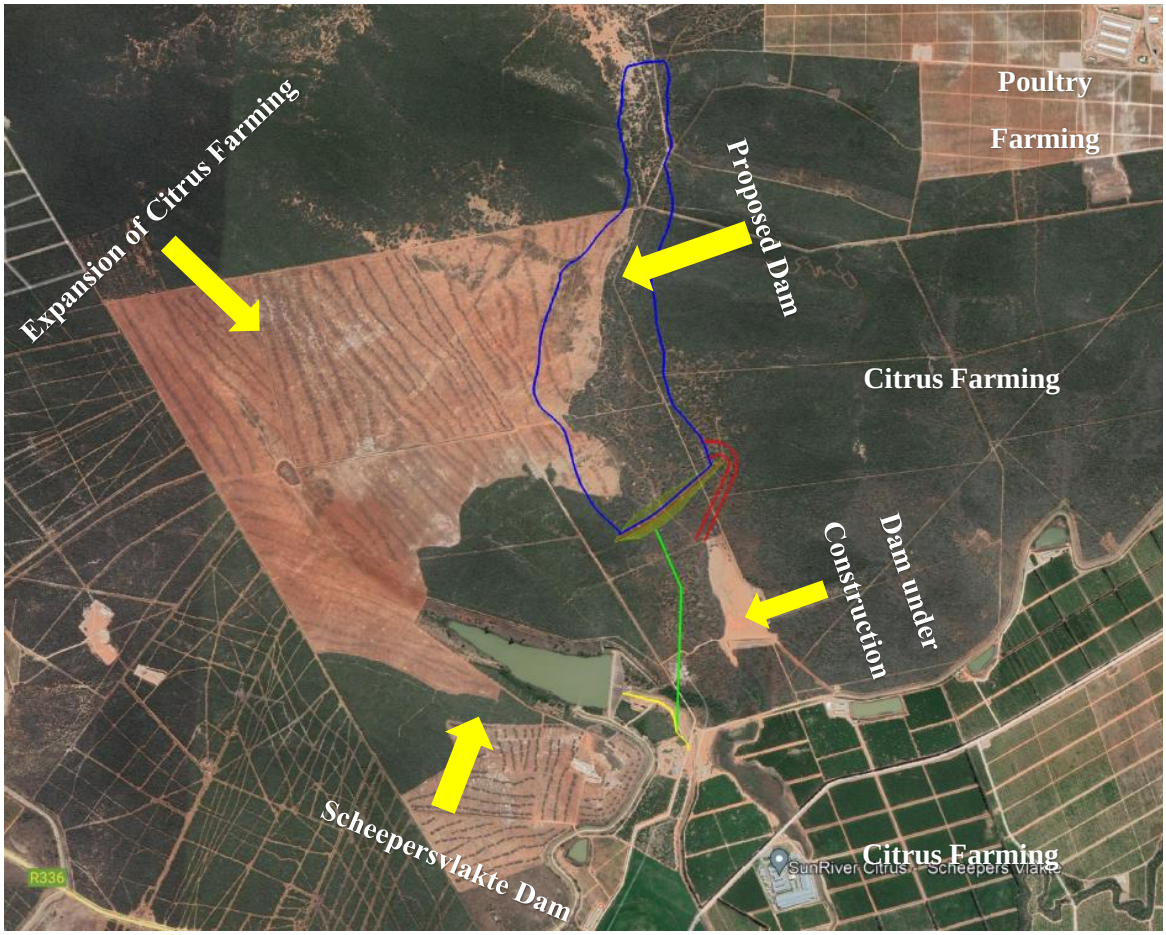

Figure 5: Land uses surrounding the site

Figure 6: Aerial view of the proposed development site

Figure 7: Existing Scheepersvlakte Dam

Figure 8: Kirkwood Primary Canal, the source of water for the dam

Figure 9: Nooitgedagt Canal flowing to Nooitgedagt WTP

Figure 10: Existing siphon off-taking from Kirkwood Primary Canal similar to the proposed siphon infrastructure

Figure 11: Smaller Scheepersvlakte Dam under construction immediately south of the proposed dam site

Figure 12: Clearance of vegetation on site for the smaller Scheepersvlakte Dam and expansion of citrus farming

Figure 13: The northern edge of the site indicating the clearance and adjacent intact vegetation

Figure 14: Endangered Albany Alluvial and the least threatened Sundays Valley Thicket vegetation on site

Figure 15: Adjacent intact vegetation units

Figure 16: Access roads and existing services on site

Figure 17: Landfill and cemetery approximately 1 km south of the site

1.7 Key site sensitivities

The proposed development area is situated within the endangered Albany Alluvial Vegetation and the least threatened Sundays Valley Thicket vegetation type (**Figure 18**). The Albany Alluvial Vegetation conservation status is classified as endangered and the protection level is regarded as 'Not Protected/Poorly Protected' Ecosystem. The Alluvial Vegetation habitat has high conservation importance and site ecological importance (SEI) while the Valley Thicket have medium and high conservation importance and SEI respectively. The distribution of the plant Species of Conservation Concern (SCC) within the assessment area may be regarded as spaced naturally and occurring abundantly throughout. There are at least four (4) protected floral species and twenty-one (21) fauna recorded on site. Portions of the current expected development would be considered to have a high negative impact as it would directly affect the habitat of threatened/protected plant species and expected listed faunal species that use these ecosystems.

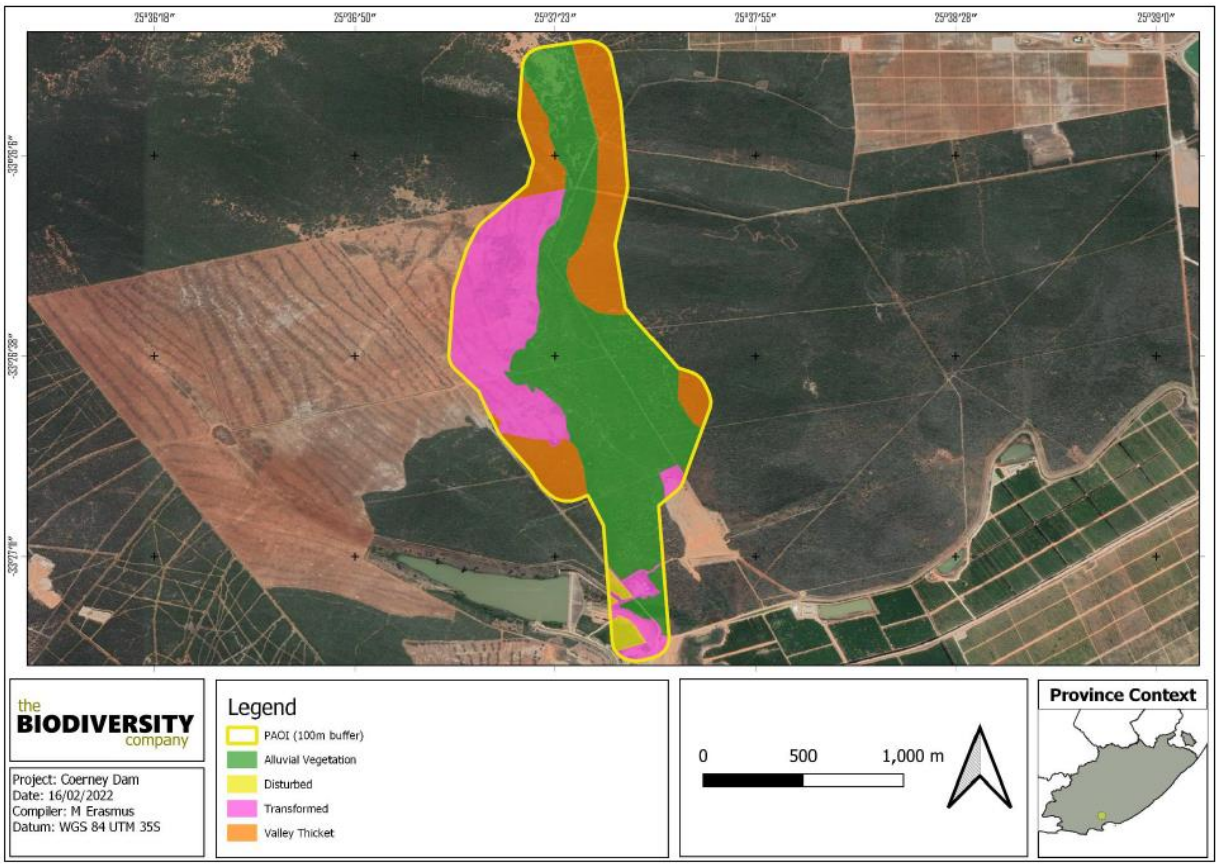

Figure 18: Terrestrial biodiversity sensitivity (Biodiversity Company, 2022)

With regards to Aquatic Biodiversity, the watercourses which may potentially be impacted from the construction of the Coerney Dam includes the N40D - 08561 Sub-Quaternary Reach (SQR) or Coerney River (**Figure 19**). The Present Ecological State (PES) of the Coerney River tributary across which the proposed dam will be constructed is considered largely modified (Class D). Furthermore, in situ water quality for the Coerney River system indicates modified water quality when compared to Target Water Quality Ranges. The aquatic biodiversity will be impacted through the clearing of vegetation from construction works within the aquatic and riparian habitats. It is anticipated that the recommended 18 m buffer zone for all activities except those directly within the riparian area will reduce the impacts.

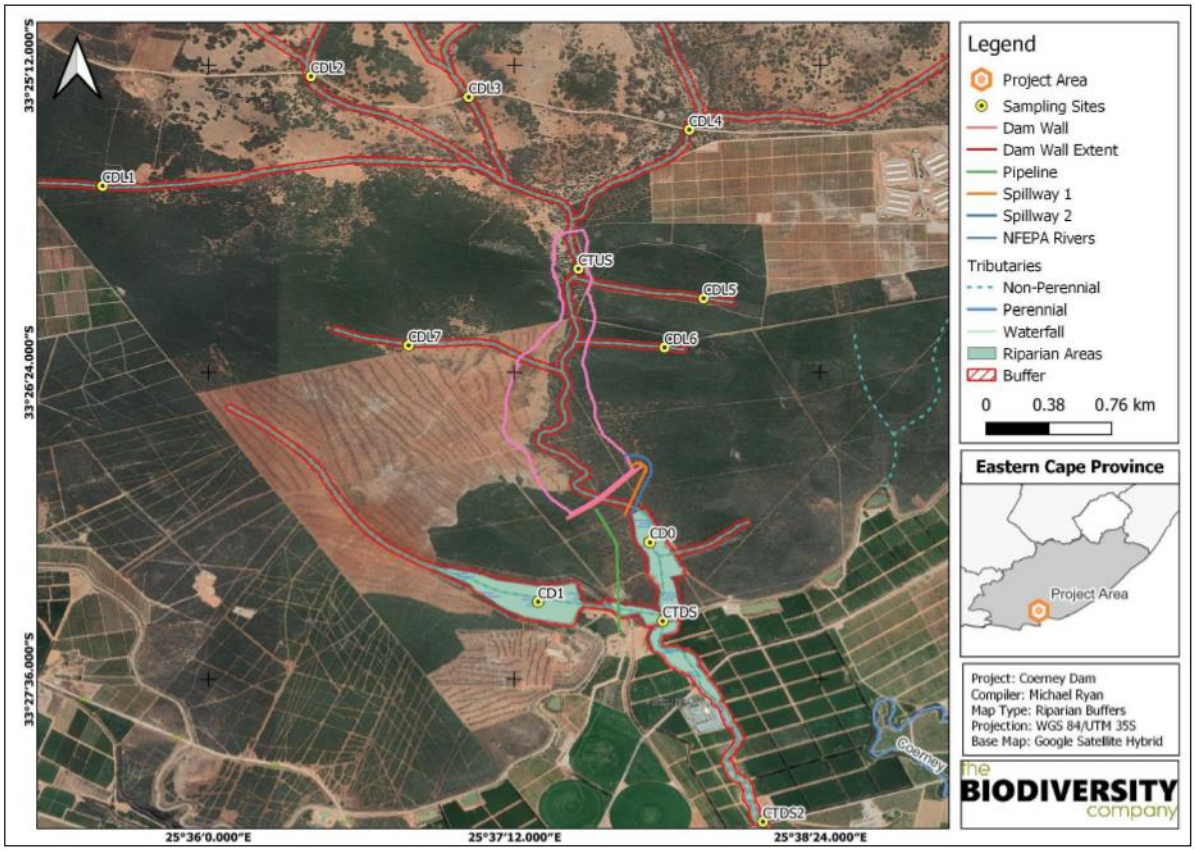

Figure 19: Site hydrological setting (Biodiversity Company, 2022)

From an agricultural perspective, the proposed project area is characterised by the Fc 362 and la 85 land types (**Figure 20**). The Fc 362 land types mainly have Mispah, Oakleaf, Valsrivier and Hutton soil forms according to the Soil classification working group, (2018), with the occurrence of other soils within the landscape. The la 85 land type is characterised with occurrence of Oakleaf, Hutton and Dundee soil forms associated to other soils in the terrain. The most sensitive soil forms that can be expected based on the Land Type Survey Staff, (1972 – 2006) soil forms within the project area is the Hutton and Oakleaf soil forms, with other associated soils also occurring.

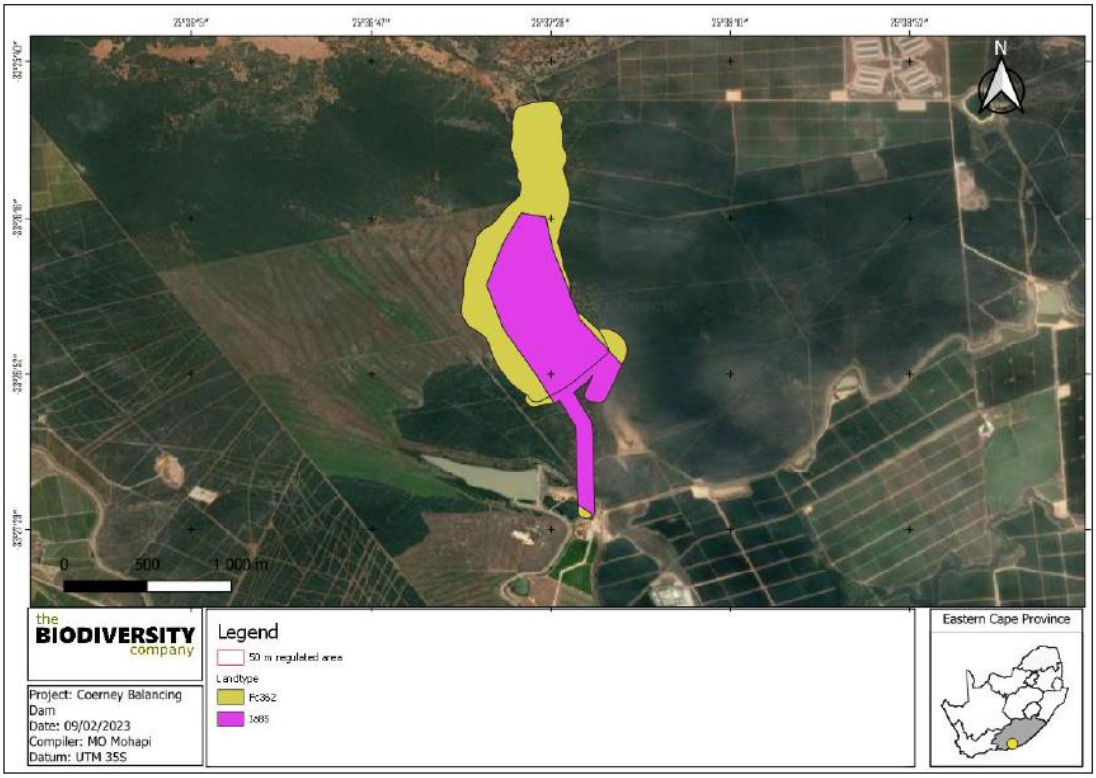

Figure 20: Soils and agricultural potential map (Biodiversity Company, 2022)

Based on the Archaeological Reports attached on **Appendix F** of the EIR, stone stools were the only archaeological material located and were mainly observed in areas where the river gravel is exposed and top soil has been disturbed (**Figure 21**). These stone tools are located in the reddish top soil and in the river gravels which cover the slopes overlooking the Sundays River, located ~2km to the south of the study area. Most of the Middle Stone Age stone tools were thick, small 'informal' flakes (with typical facetted striking platforms), cores and chunks with few of other typical Middle Stone Age tool types such as 'true' points and blades (Binneman, 2014).

Figure 21: Examples of the Early and Middle Stone Age stone tools in the dense Thicket vegetation (Binneman, 2014)

According to the DFFE National Web-Based Screening Tool Report, the project area is situated within a Very High palaeosensitivity. Palaeontological findings on site include early records of Cretaceous fossil remains from the Sundays River Formation of the Algoa Basin near Addo includes several reports of fossil *molluscs* (ammonites, bivalves, gastropods) as well as *tubiculous serpulid worms.* They include records of various molluscan taxa from The Look Out along the Sundays River just SW of the present study area (where a large petrified log is displayed) as well as a few sites to the northeast of Scheepersvlakte. It is noted that a previous field-based PIA study covering the Remainder of Portion 7, Farm Scheepers Vlakte 98 by Almond (2018), there were no report of any new fossil occurrences from the Uitenhage Group or Late Caenozoic superficial sediments. Furthermore, no fossiliferous Kirkwood Formation exposures were identified in the project area. Selected fossil and subfossil material recorded in the area is illustrated in **Figures 22 to 25** below (Natura Viva CC, 2022).

Figure 22: Subfossil shell of the large land snail "Achatina"

Figure 23: Poorly-preserved segment of a petrified fossil log

Figure 24: Coarsely banded petrified wood

Figure 25: Mould of a woody plant axis

Although the identified fossils are of low palaeosensitivity, the potential for impacts on rare, largely unpredictable fossil sites (e.g. mammalian bones, teeth, horncores, non-marine *molluscs*, *calcretised termitaria*) of High Palaeosensitivity associated with older alluvial deposits hidden in the subsurface cannot be entirely discounted.

1.8 Purpose and objectives the document

This EMPr is the main output of the Environmental Impact Assessment (EIA) process and has been compiled in accordance with the requirements of the National Environmental Management Act (No.

107 of 1998) (NEMA) legislation and Integrated Environmental Management (IEM) philosophy which aims to achieve a desirable balance between conservation and development (DEAT, 1992).

The purpose of this EMPr is to provide a framework within which the environmental risks and liabilities identified during the EIA process are managed for the duration of the project lifecycle. This document further provides mitigation measures to ensure legal compliance and environmental best practice during the construction of the proposed project.

The EMPr has the following key objectives:

- To ensure compliance of the with applicable environmental legislation;
- To communicate environmental expectations and requirements of the project;
- To ensure that the roles and responsibilities of the various parties involved in the implementation of the EMPr are clearly outlined;
- To reduce adverse environmental impacts as a result of the project activities; and
- To ensure continuous improvement in terms of the environmental performance of the project.

2. PREPARATION OF THIS EMPr

In accordance with the Regulation 13 of the EIA Regulations (GN R982 of 2014) as amended, the proponent is required to appoint an independent registered Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) process for any activities regulated in terms of the NEMA. As such, DWS appointed GA Environment (Pty) Ltd as an independent consulting firm to undertake the EIA process. Both GA Environment and associated specialist are not subsidiaries of the proponent or have vested interested in the proposed activity. This document has been compiled in line with the requirements *for an Environmental Management Programme (EMPr) in terms of the 2014 EIA Regulation 982 (Appendix 4) with reference to the relevant sections of this report or where these requirements are addressed.* The details of the project proponent and EAP are provided in **Table 6** below:

Table 6: Application details

Applicant's representative	Environmental Impact Practitioner	Competent Authority Representative
Name: Dr. Dayton Tagwi **Designation**: Programme Director **Tel:** Available on request (POPI Act) **e-Mail:** Available on request (POPI Act)	**Name: Mr.** Vukosi Mabunda **Designation**: Environmental Impact Assessment Practitioner **Address:** GladAfrica House, International Business Gateway, 6th Rd, Midridge Park, Midrand, 1685 **Tel:** 011 312 2537 **Fax:** 011 805 1950 **Email:** vukosim@gaenvironment.com or environment@gaenvironment.com	**Name:** Mr. Lunga Dlova **Designation**: 14/12/16/3/3/2/2222 Case Officer **Address:** Environment House 473 Steve Biko Road, Arcadia, Pretoria, 0001 **Tel:** 012 399 8524 **Email:** Dlova@dffe.gov.za

This EMPr was prepared by **Vukosi Mabunda,** a Registered Environmental Assessment Practitioner (EAP) employed by GA Environment. His CV is included in **Appendix H** of the EIR. Mr. Vukosi Mabunda

is a current Geographic Information Systems (GIS) Specialist and Environmental Assessment Practitioner with 5 years of working experience. Vukosi is a Registered Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA). He is one of the few dual registered professionals with SACNASP as a Professional Geospatial Scientist and Professional Environmental Scientist. Vukosi has a dual professional background in Geographic and Environmental Sciences with a Master of Science Degree in Geography.

3. KEY APPLICABLE LEGISLATION

The management and mitigation of the environmental impacts during construction is governed by environmental legislation. It is of utmost importance that this project is constructed in compliance with all relevant environmental legislation whether National, Provincial and/or Local. Subsequently, this EMPr has been compiled as per the requirements of *Appendix 4* of the NEMA EIA Regulations 2014, as amended and in terms of Section 24N of the NEMA.

It is understood that any development during its various phases is a dynamic activity within a dynamic environment. The common list of legislative references contained herein is by no means exhaustive but is applicable to the general principles of this document:

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996);
- National Environmental Management Act, 1998 (Act No. 107 of 1998);
- National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act 10 of 2004);
- National Environmental Management; Waste Act, No 59 of 2008;
- National Water Act, 1998 (Act No. 36 of 1998);
- The Water Services Act 108 of 1997;
- National Heritage Resources Act, 1999 (Act No. 25 of 1999);
- National Environmental Management Laws Amendment Bill (Act No. 2 of 2022)
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
- Expropriation Act 63 of 1975;
- Protection of Personal Information Act, 2013 (Act 4 of 2013);
- Promotion of Access to Information Act, 2000 (Act No. 2 of 2000);
- Draft Eastern Cape Environmental Management Bill (2019); and
- Eastern Cape Biodiversity Conservation Plan (2018).

In addition to the above, other provincial and municipal legislation by relevant to the proposed development must also be adhered to.

4. ROLES AND RESPONSIBILITIES

In order to ensure the sound development and effective implementation of the EMPr, it is necessary to identify and define the responsibilities and authority of the various personnel and organisations that will be involved in the project. The following key roles must be provided for during the implementation of the EMPr:

- Authorities;
- Developer/ Proponent;

- Consulting Engineers (CE);
- Engineer's Representative (ER);
- Environmental Officers (EO);
- Environmental Site Representative (ESR);
- Environmental Control Officer (ECO);
- Project Manager (PM);
- Contractors (C); and
- Environmental Assessment Practitioner (EAP).

The functions and responsibilities of these role players are outlined in **Table 7**.

Table 7: Functions and Responsibilities of the Project Team

FUNCTION	RESPONSIBILITY
DEVELOPER/PROPONENT *Department of Water and Sanitation*	DWS will be the project proponent for all components of the work related to the project. DWS is therefore accountable for ensuring compliance with the EMPr and all legal requirements related to the project. The proponent is also responsible for the appointment and management of the rest of the project team.
PRINCIPAL CONTRACTOR *To be appointed by DWS*	The Principal Contractor is responsible for the implementation and compliance with the requirements of the EMPr and conditions of the EA's (where applicable), contract and relevant environmental legislation. The Contractor must ensure that all sub-contractors have a copy of and are fully aware of the content and requirements of this EMPr, through inductions and training. The Contractor is also required, where specified, to provide Method Statements setting out how the management actions contained in this EMPr of the EA will be implemented.
CONSULTING ENGINEER *To be appointed by DWS*	The Consulting Engineer (CE) is contracted by the developer to design and specify the project engineering aspects. Generally, the engineer runs the works contract and oversee the overall implementation of the project as well as the compliance of the EMPr and incorporate any environmental consideration recommended in this EMPr into the design. The CE may also fulfil the role of PM on the proponent's behalf (see PM).
PROJECT MANAGER *To be appointed by DWS*	The Project Manager (PM) has overall responsibility for managing the project, Contractors, and Consultants and for ensuring that the environmental management requirements are met. All decisions regarding environmental procedures must be approved by the PM. The PM has the authority to stop any construction activity in contravention of the EMPr in accordance with an agreed warning procedure.

FUNCTION	RESPONSIBILITY
ENVIRONMENTAL CONTROL OFFICER *To be appointed by DWS*	The Environmental Control Officer (ECO) is an independent person responsible for monitoring and implementation of the EMPr and environmental licences/authorisation (where applicable). This will be through frequent environmental audits, however the frequency at which the ECO will be required to conduct audits will depend on the conditions of the Environmental Authorisation (where applicable) or the nature of the development/ sensitivity of the environment. *Other responsibilities of the ECO may include the following, depending on the nature of the appointment:* • Authority to stop any works until the matter is resolved if, in his/her opinion, there is or may be a serious threat to or impact on the environment; caused directly by the Contractor's actions or activities during the construction phase. • Submit environmental audit reports to the relevant project team and Competent Authority to keep abreast of compliance on site. Report any environmental incidents/ accidents on site and follow appropriate corrective actions. • Liaise with the relevant authorities and the project team, as and when required. The ECO must communicate and inform the developer and CE of any changes to environmental conditions as required by relevant authoritative bodies. • Ensure that the registration and updating of all relevant EMPr documentation is carried out. Review all environmental related method statements. • Undertake to conduct an induction and an environmental awareness training for the key staff on site. • Advise the Contractor on preventative measures as well as corrective action measures to eliminate the cause of the non-conformance incidents.
ENVIRONMENTAL SITE REPRESENTATIVE *To be appointed by Principal Contractor*	The Environmental Site Representative (ESR) is employed by the Contractor as his / her environmental representative to monitor, review and verify compliance with the EMPr and other Environmental Authorisations on a day-to-day basis on site. The site representative needs to work closely with the ECO to manage the environmental impacts on site. They will also be responsible for maintaining all records in relation to the EMPr requirements on site. *NOTE: It is possible that the Health and Safety representative on site can also fulfil this role*
ENVIRONMENTAL OFFICER *Developer's Environmental Representative*	The Environmental Officer (EO) is employed by the Developer, i.e. DWS, to fulfil the following responsibilities, *inter alia*: • Aiding the Contractor to comply with all the project environmental requirements, objectives and targets; • Facilitating environmental activities and environmental awareness training of all personnel on site, and

FUNCTION	RESPONSIBILITY
	• Implementing the internal or Developer's Environmental Management Systems (EMS). This individual also works closely with the ESR and ECO.
Competent Authority *Department of Forestry, Fisheries and the Environment (DFFE)*	The Competent Authority (CA) will be responsible for approving the EMPr and issuing of the Environmental Authorisation (if applicable). Once the project has been approved, the competent authorities will be accountable for ensuring that the Developer complies with the conditions of the Environmental Authorisation and requirements stipulated in this EMPr and other environmental legislations. This will be achieved by reviewing audit reports submitted by the Environmental Control Officer. and conducting regular site visits should the need for this arise. *Other authorities may also be involved in the reviewing and approval process of this EMPr.*
ENVIRONMENTAL ASSESSMENT PRACTITIONER *GA Environment (Appointed by DWS)*	The definition of an Environmental Assessment Practitioner (EAP) in Section 1 of NEMA is "*the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management plans or any other appropriate environmental instruments introduced through regulations*". The Environmental Assessment Practitioner is generally responsible for undertaking environmental processes necessary to authorise the project activities proposed. The Developer can also appoint the Environmental Assessment Practitioner to act an Environmental Control Officer during the implementation or construction phase of the project.

5. OPERATIONAL CONTROLS

The operations that are associated with the identified environmental aspects must be consistent with the objectives and conditions of the EMPr. The typical operational controls that must be put in place for a construction site are as follows:

5.1 Environmental-related method statements

Environmental-related method statements are written submissions to the Engineer by the Contractor, in collaboration with environmental personnel involved in the project. The method statements set out the plant, materials, labour and method that the Contractor proposes using to carry out an activity (identified by the Engineer) to address specific requirements and ultimately this EMPr.

All method statements, including those which may be required as ad-hoc or emergency construction method statements, must be submitted for approval prior to the commencement of any activity. Any changes to the method of works must be reflected by amendments to the original approved method

statement and re-approved on the understanding that such changes are environmentally acceptable and in line with the requirements of this EMPr.

Typical environmental method statements that may be required for a construction development at the discretion of the ECO include:

- Removal of indigenous vegetation;
- Removal of alien vegetation;
- Water Resources Management;
- Dust Control;
- Concrete mixing and management;
- Management of Fire;
- Handling and storage of oils and chemicals;
- Management of accidental spills;
- Management of contaminated materials;
- Solid waste management;
- Management and storage of reusable materials;
- Site refuelling of construction vehicles and plant on site; and
- Structural demolition (bridges and culverts).

5.2 Emergency preparedness

In the event of emergency, the following elements must present and easily accessible on site for the management of such emergency:

5.2.1 Emergency contact details

The Contractor must ensure that the numbers of the following persons are displayed at a prominent place on site at all times:

- The local Police Stations;
- The nearest ambulance/clinic/hospital;
- Resident Engineer, project Manager and Representative of the Contractor; and
- Representative of the Developer.

These details must be updated as when necessary.

5.2.2 Spill kits and first aid

The Contractor must ensure that spill kits, first-aid and associated equipment are present onsite and easily accessible for the potential occurrence of hazardous and/or material spills. The staff should be trained in the use thereof.

5.3 Environmental training and awareness

Prior to commencement of site establishment and construction activities, all the teams involved in work on the project are to be briefed on their obligations towards environmental controls and methodologies in terms of this EMPr. The importance of the environmental awareness training is to also ensure all workers understand the risks involved as well as how to adequately implement

mitigation measures. The education/awareness programme should be aimed at all levels of management and construction workers within the Contractor's team. All new employees arriving on site shall undergo environmental awareness programme.

It is recommended that the environmental awareness training be undertaken by the ESR and the programme must include:

- Induction of all personnel in a language and method most suitable; and
- Signing of an attendance register and declaration of ensuring environmental protection. Proof of the induction must be kept.

Indicative topics that may be included/ covered in the environmental induction:

- What is the environment and why must it be protected?
- What are the environmental sensitivities of the area in which activities are being undertaken?
- How construction activities can adversely impact of the environment;
- What are the mitigation measures for adverse impacts?
- What is the social responsibility of all site employees during construction?
- How should environmental incidents be recorded?

Awareness posters and pamphlets must also be provided to create environmental awareness throughout the site. Refresher environmental awareness training must be conducted and when the need arises.

5.3.1 Toolbox talks

The Environmental Site Representative must also ensure daily/weekly toolbox talks include alerting the workforce to particular environmental concerns associated with the tasks for that day or the area / habitat in which they are working, etc.

It is also recommended that the toolbox talks are conducted in an interactive way as to ensure the employees understand the content and purpose of the EMPr requirements. The Contractor shall keep records of the environmental subjects discussed in the toolbox talk sessions. Signed registers documenting all employees' attendance must also be kept on record.

5.4 Site documentation

The following is a list of some examples of documentation that should be kept on site and made available to the ECO and/or any other relevant parties on request:

- This EMPr;
- The Project's Environmental Authorisation obtained from DFFE;
- Search and Rescue Plan;
- Tree removal permits/licenses Permits;
- Site daily diary;
- Site instruction book;
- A complaints register;
- Incident register;
- Copies of environmental audit reports;

- Proof of environmental training undertaken by the Contractor and the ECO;
- Waste records;
- Minutes of project meetings;
- Agreements;
- Non-compliance and corrective action reports; and
- Method statements signed by the Contractor, the ECO and Engineer.

5.5 Communication procedures

- *Site instructions:* The site instruction journal entries will be used for the recording of instructions as they relate to implementation of the EMPr, and/or any work orders given by the Engineer.
- *Site Meetings*: A clear channel of communication and coordination between the Developer and the Contractor is very crucial in any construction project. One way of ensuring this is through regular site meetings. The purpose of the meetings will be to discuss general progress of construction. Some of the environmental aspects to be discussed in the meeting shall include:
    - *Efforts to lower the environmental, social and health risks involved;*
    - *Discuss and resolve non-conformance to environmental legislation / policies or the EMPr; and*
    - *Report on environmental performance of the construction works.*

5.6 Other general guidelines

The following measures provide guideline solutions to frequently anticipated issues on most development activities.

- The prevention of any site degradation due to non-compliance, administrative or financial problems, and inactivity during the construction phase, illegal activities, delays caused by archaeological finds etc. are ultimately the responsibility of the applicant / developer as per Section 28 of NEMA, 1998 (as amended) which discusses 'Duty of Care and remediation of environmental change'.
- The study area must be clearly defined and surveyed according to the proposed activities. All workforce members and other construction personnel are not to go beyond the defined footprint.
- The Contractors must adhere to agreed and approved access points and no-go areas.
- Damage to private or public property such as fences, gates and other infrastructure may occur at any time. All damages are to be repaired as soon as practically possible.
- Landowners of the site and adjacent properties must be informed of the starting and completion dates of the construction activities.
- The Contractor must adhere to all conditions of contract including this EMPr.
- All private and public manmade structures near the project site must be protected against damage at all times and any damage must be rectified by no later than 7 days after occurrence.
- Proper documentation and record keeping of all complaints and actions taken must be kept at the site office.

- Regular site inspections and good control over the site activities should be undertaken.
- A positive attitude towards environmental management by all site personnel must be motivated through regular and effective awareness and training sessions.
- Social issues in terms of safety for human life, on employees should be encouraged. All construction areas and activities should be cordoned off.

6. PROJECT PHASES AND ASSOCIATED ACTIVITIES

6.1 Pre-construction phase

The 'pre-construction phase' refers to the period leading up to and prior to the commencement of the construction activities and is included to ensure pro-active environmental management measures with the goal of identifying avoidable environmental damage at the onset and sustain optimal environmental performance throughout the construction phase. Most impacts will occur during the construction phase and must be mitigated through the contingency plans identified in the pre-construction phase.

6.2 Construction phase

The 'construction' section refers to all construction activities associated with the demolition, construction of the road and replacement of the bridges and culverts. This phase will include the clearance of vegetation for the proposed development and support infrastructure.

6.3 Rehabilitation phase

A proper rehabilitation procedure must be followed, immediately after construction activities and prior to demobilisation. The objective of rehabilitating the site would be to re-instate the affected areas to a similar or better condition to the current environment. This phase will include the rehabilitation of areas disturbed by construction works and removal and disposal of all construction equipment and rubble.

7. ENVIRONMENTAL CONTROLS AND MANAGEMENT PROGRAMME IMPLEMENTATION

The point of departure for this EMPr is to ensure a pro-active rather than re-active approach to environmental performance by addressing potential problems before they occur. This will limit corrective measures needed during the construction activities.

This section describes the potential environmental impacts which may result from the identified aspects, the objectives of mitigating these impacts as well as the targets used to measure the level of environmental compliance.

The tables below present the objectives to be achieved and the management actions that need to be implemented in order to mitigate the negative impacts and enhance the benefits of the project. Associated responsibilities, criteria / targets and timeframes are specified.

The tables for the construction activities consists of seven parts which are included as key requirements of EMPr as defined in the NEMA EIA Regulations, 2014 as amended. These sections are described below as follows:

- **Phase of development –** This section will identify either pre-construction (planning) or actual construction activities during the Operation phase.
- **Impact / issue -** This section will identify the issue being addressed, e.g. Materials, site demarcation, heritage, etc.
- **Mitigation measure -** This column will include all the necessary mitigation measures for each impact / issue'.
- **Management objectives -** This column will indicate what the management objectives to be achieved for each mitigation measure.
- **Measurable targets -** This column will indicate what evidence is to be used as an indication to whether or not the 'Management objectives' have been implemented and hence achieved.
- **Frequency of action -** Provides time guidelines for the 'Responsible party' by which he / she is to action or manage the required mitigation.
- **Responsible party –** Provides the details of the responsible team member which should account on the activities highlighted in column 1 to 4.

This EMPr must be read in conjunction with the following rehabilitation plans and procedures compiled for the proposed project. These plans have been attached as appendices to the Environmental Impact Report.

- **Appendix G2**: Rehabilitation Plan
- **Appendix G3:** Alien Invasive Management Plan
- **Appendix G4**: Erosion and Soil Management Plan

7.1 General planning and administrative considerations (A)

PHASE OF DEVELOPMENT: PRE-CONSTRUCTION

POTENTIAL IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
A1 ENVIRONMENTAL AUTHORISATIONS AND DOCUMENTATION					
a. Construction commencing without all required environmental permits and authorisations	i. A copy of the Environmental Authorisation and this EMPr and other management plans as well as other developer environmental obligations shall be kept on site during the construction phase. ii. Search and Rescue Plan and Tree Permits/Licenses for the protected species which will be impacted must be kept on site. iii. Copies of all other project permits must be acquired and kept on site. iv. A walkdown of the development footprint within the endangered Albany Alluvial and the Sundays Valley Thicket habitats and other areas of increased ecological sensitivity be undertaken by an ecologist within the appropriate season prior to commencement of construction. Should any of the identified SCC fall within the proposed construction footprint but will not necessarily be impacted on, these SCC shall be clearly marked and the areas barricaded as a no-go zone. Should any of these SCC fall within the construction area, the relevant permits/license must be obtained before they can be removed.	• Contingencies for minimising negative impacts anticipated to occur during the planning stages of the project. • Obtain all required environmental authorisations/ permits prior to construction activities.	• No fines due to unauthorised activities or absence of authorisations. • Compliance with Authorisations and Permits conditions	Once-off	• Developer • EO • Contractor • ESR • ECO
A2 ENVIRONMENTAL SITE DOCUMENTATION AND RECORDS					
a. Inadequate environmental documentation or records on site	i. The following documents must be prepared and kept on site • Copy of this EMPr along with a signed declaration of understanding of the contents of the EMPr by the Contractor and ECO; • Site daily diary / instruction book / incident reports;	• Contingencies for minimising negative impacts anticipated to occur during the planning stages of the project.	• Environmental file that is up to date, with all the relevant environmental documentation.	Ongoing	• Contractor • ESR • ECO

PHASE OF DEVELOPMENT: PRE-CONSTRUCTION

POTENTIAL IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	• Copies of Environmental Audit Reports; • Waste records; • A Complaints register; • Proof of Environmental training undertaken by the ECO; • Proof of Environmental training undertaken by the Contractor; • Schedules for environmental audits; • Non-compliance and corrective action reports compiled by the Contractor; • Search and Rescue Plan and Tree permits/license ; and • Method statements signed by the Contractor and approved by the Eco and the Engineer.	• Document and file all environmental related information about the project.			
A3 ENVIRONMENTAL REPRESENTATIVE ON SITE					
a. Inadequate implementation and monitoring of environmental requirements on site	i. An independent ECO must be appointed to monitor and to provide environmental advisory services on site. ii. Appoint a suitably qualified ESR to manage daily environmental issues on site.	• No construction activities must commence without an ESR on site. • Official appointment of ESR on site.	• Monthly environmental audits. • Weekly/daily environmental inspection checklists.	Ongoing	• Contractor • ESR • ECO • EO
A4 SITE ESTABLISHMENT					
a. Unnecessary environmental degradation and removal of natural vegetation	i. A walk down of the development footprint within the endangered Albany Alluvial and Sundays River Thicket habitats and other areas of increased ecological sensitivity be undertaken by an ecologist within the appropriate season prior to commencement of construction. Should any of the identified SCC fall within the proposed construction footprint (road reserve) but will not necessarily be impacted	• Ensure no unnecessary degradation of the environment adjacent to authorised project footprint	• No vegetation cleared or disturbed outside the working footprint	Once off	• Contractor • ESR • ECO

PHASE OF DEVELOPMENT: PRE-CONSTRUCTION

POTENTIAL IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	on, these SCC shall be clearly marked and the areas barricaded as a no-go zone; ii. Floral Species of Conservation Concern (SCC) and protected trees encountered within the study area should ideally be conserved in situ. Where the encroachment of the proposed dam encroaches upon these floral species is unavoidable, it is recommended that these plants be relocated under the supervision of a qualified botanist to suitable adjacent habitat. iii. Fauna Species of Conservation Concern (SCC) and protected fauna encountered within the study area should ideally be temporary relocated under the supervision of a qualified botanist to suitable adjacent habitat. iv. The buffer zone of 18 m along the delineated riparian area must be established as a no-go area for all farming activities/clearing as well as associated aspects of the development which aren't directly related to the watercourse. v. Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further; vi. A qualified ecologist must mark protected trees in the area to ensure that none of the trees that are not covered by the destruction permit is harmed. vii. All activities must be restricted too within the low/medium sensitivity areas. No unnecessary loss of high sensitivity areas should be permitted. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon (including fencing off the defined project area). viii. All infrastructure, with specific mention of contractor laydown areas/ site camps, and other temporary				

PHASE OF DEVELOPMENT: PRE-CONSTRUCTION

POTENTIAL IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	infrastructure, are to be placed outside of the aforementioned sensitive habitat. ix. Locate laydown areas and construction camps outside of no-go areas, preferably within historically disturbed or transformed areas of vegetation. It is recommended that the Contractor considers the potential construction camps indicated in **Section 10.4** of the EIR. x. A detailed method statement for proposed upgrade activities within watercourses must be compiled prior to construction. xi. Design a stormwater management plan prior to the commencement of construction related activities which details how stormwater runoff from cleared, compacted surfaces will be controlled in order to prevent the erosion and sedimentation of watercourses. xii. Only clear vegetation immediately prior to the commencement of construction related activities in order to reduce the duration of exposure of bare soil. xiii. In planning the project, connectivity between surrounding natural areas on either side of section 8 of national road R101 should be considered, and it must be ensured that such spatial connectivity is not entirely lost, and by allowing as large areas of unfragmented natural habitat as possible to remain. xiv. The contractors must provide and maintain a Site layout indicating the proposed location of all key infrastructure which are: • Ablution facilities • Eating areas • Smoking area • Waste storage areas • Working areas				

PHASE OF DEVELOPMENT: PRE-CONSTRUCTION

POTENTIAL IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	• Cement storage and concrete mixing areas (where applicable) • Stockpile areas for topsoil and cleared vegetation • Parking area xv. The following infrastructure should not be permitted on site: • Vehicle washing areas • Hazardous material storage areas with the exception of cement storage areas where applicable • Cooking Areas xvi. Working footprint and area to be cleared should be limited to the access road, vehicle turning point and working area. xvii. Prior to the commencement of project activities, the site layout must be agreed upon by DWS, the ECO and the Engineer. The locations of key infrastructure such as toilets, eating and smoking areas, bins, stockpile areas, etc.				
A5 EXISTING SERVICES AND INFRASTRUCTURE					
a. Damage to existing infrastructure **b. Disruption in the provision of services in the vicinity of working area**	i. Permission from landowners must be obtained before site establishment. ii. The location of all services including underground services must be identified and confirmed by the Surveyor during the Design phase of the project and the services be included in the Design drawings. iii. The Contractor must ensure that design layouts of all existing services are readily available and considered prior to the commencement of construction activities. iv. The Contractor shall ensure that all existing services are not damaged or disrupted by any activities prior to construction. v. During the set up phase of the project, the Contractor needs to make contact with those people that are interested or affected by the development (IAPs).	• Avoiding impact on surrounding services such as access roads, canals, siphons, sewer line and water lines • All services providers with services in the vicinity of the site must be notified prior to construction	• No impacts of services and infrastructure within the vicinity of the site	Ongoing	• Contractor • Developer • RE • ESR • ECO

PHASE OF DEVELOPMENT: PRE-CONSTRUCTION

POTENTIAL IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	vi. The Contractor shall be responsible for the repair and reinstatement of any existing infrastructure that is damaged or services which are interrupted. vii. Where applicable all existing services shall be protected by the Contractor. viii. The required wayleaves shall be obtained from the applicable service providers prior to the commencement of construction activities. ix. The relevant municipal and provincial departments shall be informed of all construction activities prior to commencement. x. Prior to commencement of site establishment activities, DWS and the Contractor should ensure that formal written agreements are in place with the affected landowners with regards to dealing with damage to property caused as a result of construction activities (where applicable). xi. Any damage caused to adjacent properties or infrastructure, as a result of construction activities, should be fixed by the Contractor to the satisfaction of the landowner. All repairs or reinstatement will be to the Contractor's cost and shall receive top priority over all other activities. xii. Any planned service interruptions should be communicated to relevant service providers and affected parties prior to the interruptions. Fourteen (14) days are recommended for the notification of possible affected parties. xiii. Where infrastructure is damaged, the landowner and relevant service provider must be notified within 24 hours.				

PHASE OF DEVELOPMENT: PRE-CONSTRUCTION

POTENTIAL IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
A6 ENVIRONMENTAL AWARENESS TRAINING AND INDUCTION					
a. Inadequate training and awareness about environmental protection	i. The ECO/EO must undertake an initial environmental induction during the site establishment for all key site staff. ii. Environmental induction/ training shall be repeated by the ESR and extended in the weekly Toolbox Talks. This should also include awareness programmes (i.e. emergency and use of spill kits etc). iii. Proof of all environmental training and awareness undertaken must be kept on site, both training material used and attendance registers. iv. ECO shall review and approve training and awareness material content before material is presented to the Labourers on site. v. It is the Contractor's responsibility to provide ongoing environmental training to ensure that all staff have sufficient understanding to pass this information onto the construction staff. vi. Use of environmental awareness posters on site where necessary, especially for the protection of the certain plant species around the working area. vii. The Contractor must ensure that all subcontractors are informed of the importance of the adherence to the EMPr and their labourers are also inducted.	• Raise awareness about the importance of environmental protection including EMPr and authorisation condition	• Records of environmental training and awareness programmes • Reduce and manage potential Environmental impacts	Weekly	• Contractor • ECO • ESR • EO

7.2 Construction phase (B)

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
B1 WASTE MANAGEMENT					
a. Pollution and environmental degradation **b. Decrease in the aesthetic quality of the environment**	i. The Contractor must provide and maintain a method statement for "waste storage and disposal". The method statement must provide information on the type of waste, the location of the storage and disposal method as well as disposal intervals. ii. Adequate refuse bins must be provided. iii. Bins must be emptied at least once a week or as and when the need arises. iv. Overspill of the bin should not occur, and neither should waste be allowed to lie on the ground near the bin or anywhere else on site. v. Proof of safe disposal must be obtained from the service provider and kept in the environmental file. vi. Waste must be disposed by a Registered Waste Service provider i.e. Kirkwood & Paterson Landfill Sites. vii. A waste disposal management plan for the removal of vegetation must be compiled. viii. The contractor must provide labourers with plastic bags or other containers to allow for the storage of litter during the clean-up of the construction site on a daily basis. These areas must then be inspected by the contractor or his / her ESR to ensure compliance with this requirement. **Ablution facilities:** i. Adequate chemical toilets for the staff on site must be provided. ii. Under no circumstances should pit toilets be constructed on site.	• Minimise unwarranted environmental damage outside the footprint • Maintain a clean and healthy working environment • Control potential influx of vermin and flies and rats • Minimise potential of diseases onsite and influence the health of the employees	• No signs of pollution • No complaints received from the landowners / I&AP's	Daily	• Contractor • ESR • ECO • EO

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	iii. Under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities. iv. The location of all toilets must be approved by the ECO and must not be located on areas that are already disturbed on site. v. Chemical toilets must be emptied / serviced on a regular basis to prevent them overflowing. vi. Waste from chemical toilets must be disposed of in a license disposal facility. Proof of this must be obtained from the service provider and made available during the environmental audits. **Eating Areas:** i. The Contractor must, in conjunction with the ECO, designate restricted eating areas for eating during normal working hours. ii. Under no circumstance should informal food traders be allowed on site. iii. Open fires must not be permitted anywhere on site. iv. The feeding, or leaving of food, for stray or other animals in the area is strictly prohibited.				
B5 DUST AND AIR QUALITY MANAGEMENT					
a. Dust generation from construction activities	i. The Contractor must provide and maintain a method statement for "dust control". The method statement must provide information on the proposed source of water to be utilised and the details of any licenses or permits required. ii. The construction site must be watered during dry and windy conditions to control dust fallout. Preferably grey	• Reduce dust fall out at construction site • Minimise loss of valuable soil material	• No visible signs of dust around the site • No complaints from I&APs regarding dust • No incidences reported to ECO	Daily	• Contractor • ESR • ECO • EO

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	water or other dust suppressant substances must be used. iii. Dust production must be controlled by regular watering of access roads and roads and working areas, should the need arise. iv. Construction vehicles must adhere to low speeds to avoid the generation of dust on the construction site v. All vehicles transporting material that can be blown off (e.g. soil, rubble, etc.) must be covered with a tarpaulin, and adhere to speed limits on public roads vi. Excessive dust conditions must be reported to the ECO. vii. A continuous dust monitoring process needs to be undertaken during construction. viii. Speed restriction of no more than 40km/h must be implemented for all construction vehicles within the construction site ix. All construction vehicles must be maintained to avoid adverse impacts on air quality as a result of a lack of maintenance		• No visible evidence of dust contamination on the surrounding environment • Method statements adhered to		
B6 NOISE MANAGEMENT					
a. Nuisance factor to surrounding landowners, communities and fauna	i. All construction vehicles must be in a good working order to reduce possible noise pollution. ii. Contractors must endeavour to limit unnecessary noise, especially loud talking, shouting or whistling, radios, sirens or hooters, motor revving, etc. iii. The Contractor must inform all I&APs in writing 24 hours prior to any planned activities that will be unusually noisy or any other activities that could reasonably have an impact on the neighbouring residents. iv. The working hours stipulated in the Construction permit, where applicable, must be adhered to. Where this is not	• Effectively manage noisy activities emanating from construction activities.	• No complaints from site staff and landowners about noise from site.	Daily	• Contractor • ESR • ECO • EO

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	applicable, the following working hours must be adhered to: Monday to Friday from sunrise to sunset and where applicable on a Saturday which must be agreed upon between DWS and the Contractor unless otherwise stated in the environmental authorization. v. For blasting purposes (if required): • All adjacent residents must be notified of the intention to undertake the initial blasting at least seven (7) working days in advance. • The contractor shall implement a blast management plan. • The Contractor shall employ industry standard methods to control the impact of blasting and limit the risk of damage to structures by reducing blast vibrations induced in the rock mass, eliminating fly rock and limiting air-blast and noise to acceptable levels. • Method Statements for blasting shall be approved by the ECO.				
B7 CEMENT STORAGE AND CONCRETE HANDLING					
a. Contamination of the soil and runoff from concrete mixing	i. Mixing of concrete must only be permitted on site in designated and disturbed areas approved by the ECO. ii. Under no circumstances should concrete be mixed directly on the ground but on an adequate liner. iii. Cement bags must be stored in a designated and secure area on site. Empty cement bags must be placed in litter bins. iv. All concrete spillages must be cleaned immediately.	• Maintain noise levels below "disturbing" as defined in the National Noise Regulations • Minimise the nuisance factor of the development	• No complaints from surrounding landowners or I&AP's	Daily	• Contractor • ESR • ECO • EO
B8 STOCKPILE AND SOIL MANAGEMENT					

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
a. Sedimentation and erosion **b. Soil loss** **c. Stormwater Management**	i. Stockpiles of any material only be placed within demarcated areas which will not create nuisances to adjacent landowners. The Contractor should consider the potential stockpiling areas highlighted in **Section 10.4** of the EIR. ii. Stockpiles must not be located within 18 m from the edge of the watercourse or riparian area. iii. Loose and uncompacted soil stockpiles piles must be covered to prevent wind and water erosion during seasons when wind or rainfall is prevalent. iv. Stormwater runoff from any stockpile sites and other related areas must be contained as far as possible. v. Stormwater must be discharged via many smaller outlets rather than few larger ones to spread out flows. vi. Infiltration of all stormwater runoff generated by the proposed development should be maximised as far as practically possible. vii. The central collection and concentration of stormwater must be minimised as far as practically possible. viii. Stockpiles are to be stabilised if signs of erosion are visible. ix. Soils excavated from watercourses must be stored separately to terrestrial soils. x. Topsoil stockpile must be separated to allow for reuse of the soil for rehabilitation. xi. Topsoil stockpiles must be clearly demarcated as no-go areas. Where possible, topsoil must be conserved for rehabilitation purposes. xii. Loose topsoil stockpiles should not be higher than 3 meters to avoid compaction, while the slopes of the stockpiles should not be steeper than 1 vertical to 1.5 meters horizontally	• Minimise scaring of the soil surface and land features • Minimise disturbance and loss of soil • Minimise contamination of stormwater run-off	• No visible erosion scars once construction is completed	Daily	• Contractor • ESR • ECO • EO

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	xiii. Topsoil stockpiles must be monitored for invasive vegetation growth. Contractors must remediate as and when required in consultation with the ECO. xiv. To reduce the loss of soil by erosion, the contractor must ensure that disturbance on site is kept to a minimum and in areas agreed upon with the ECO. xv. The contractor is responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed. **Stormwater Management:** i. Special care must be taken to avoid spillage from entering the ground or contaminating surface water. Any spillage must be attended to immediately and affected areas are to be promptly reinstated to the satisfaction of the Engineer and ECO. ii. The spillway must be fitted with infrastructure such as gabions or flow dissipation to remedy point source erosion at the end of the spillway. The spillway must be regularly monitored and maintained/vegetated. iii. Stormwater must be managed such that the stormwater from the site does not erode the surrounding area iv. Stormwater runoff from any stockpile sites and other related areas must be contained as far as possible. Erosion/sediment control measures must be placed around the stockpiles to limit sediment runoff from stockpiles v. Stormwater must be discharged via many smaller outlets rather than few larger ones to spread out flows vi. The use of point source discharge outlets must be avoided or minimised in favour of infiltration systems vii. The central collection and concentration of stormwater must be minimised as far as practically possible.				

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
B9 HANDLING OF HAZARDOUS GOODS AND SUBSTANCES					
a. Potential spillage of hazardous substance into the environment	i. Should there be storage of hydrocarbons on site, the Contractor must provide method statements for the "handling & storage of oils and chemicals" (where these will be kept on site) and "accidental spills management" ii. All chemicals kept on site must be clearly labelled and stored with MSDS to prevent leakage or incidental spills iii. Leaking equipment must be repaired immediately or be removed from site to facilitate repair iv. Drip trays must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended. The drip trays must be large enough to catch any hydrocarbons that may leak from the vehicle while standing. v. Where possible and practical all maintenance of vehicles and equipment must not be done on site vi. Spill kits must be obtained from reputable service providers and restocked once any material within the kit has been depleted vii. Contaminated material or spilled hazardous substances must be removed by service provider or by the Contractor to a licenced facility. Proof of all removal (i.e. waste manifest) must be kept by the Contractor. viii. Labourer must be trained on how to use the spill kits ix. A record must be kept of all spills and the corrective action taken. x. Records of monitoring and measurement of hazardous substances must be kept.	• Prevention of pollution of the environment • Ensure hazardous substances are transported, used and disposed in a responsible manner	• No pollution of the environment • No litigation due to transgression of pollution control acts • Method statements as set out by the contractor adhered to.	Daily	• Contractor • ESR • ECO
B10 FIRE MANAGEMENT					

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
a. Accidental fires	i. The Contractor must provide smoking areas for construction workers. ii. Fire extinguishers and an outdoor ashtray or similar suitable container must be provided in all smoking areas. iii. Under no circumstances should fires be lit on site. iv. Serviced fire extinguishers must be kept at the smoking area. At least one serviced fire extinguisher should be available on site at all times. v. All site personnel in senior positions and who will be on site on a full-time basis must be trained on the usage of fire extinguishers. vi. The Contractor to ensure that no person smokes in any place in which a flammable liquid is used or stored. vii. The contractor must further affix a suitable and conspicuous no smoking sign notice at all entrances to areas prone to fire. viii. No flammable material, including cotton waste, paper, cleaning rags or similar material should be stored with flammable liquids. ix. Fire breaks should be clearly demarcated to prevent proliferation of fire during possible incident.	• Minimise risk of veld fires and loss of natural habitat • Maintain safety on site and the community in general	• No veld fires started by the contractor's workforce • No claims from landowners for damages due to veld fires • Method statement adhered to	Daily	• ECO • ESR • Contractor • EO
B11 FAUNA MANAGEMENT					
a. Loss of fauna due to habitat destruction **b. Loss of fauna migration connectivity**	**Faunal Specialist Mitigation Measures:** i. A protected tree search and rescue plan must be undertaken prior the construction phase. ii. A qualified environmental control officer must be on site when construction begins. The area must be walked though prior to construction to ensure no faunal species remain in the habitat and get killed. Should animals not move out of the area on their own relevant specialists	• Minimise disturbance to animals and their habitats	• No complaints from any I&AP • No evidence of killing or poaching of animals on site	Daily	• Contractor • ESR • ECO • EO • Faunal Specialist (where applicable)

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
c. Disturbance of wetland, riparian and instream habitat. **d. Intentional and unintentional killing of animals on site**	must be contacted to advice on how the species can be relocated. iii. Any holes/excavations need to be sealed to ensure that no fauna species can fall in. iv. Prevent excessive disturbance of watercourses during construction activities as far as possible. v. Construction activities within the watercourses must be limited to the drier months as far as possible. vi. Portions of the watercourses and associated buffer areas (18 m from the riparian area) that are located outside of the demarcated construction footprint must be designated as no-go areas. vii. Construction impacts associated with the proposed project must be contained within the footprint of the demarcated areas as indicated on the final approved project layout plan. viii. Prior to construction, the final layout and development footprint area must be demarcated on site to ensure that construction impacts are contained within this area. If necessary, these areas may be fenced or, alternatively, nearby sensitive areas are to be fenced to prevent access. ix. The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna. Construction are also not allowed to take place at night. x. Movement of faunal species through the study area must be catered for during construction. xi. Existing access roads must be used to avoid further habitat loss. xii. Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible				

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	disturbances to amphibian species and nocturnal mammals. xiii. Flooding of impoundment should be conducted over as long a time as possible, preferably to allow fauna to retreat to higher ground. xiv. In order to minimize the number of fauna species affected by the rising waters it is important to clear as much of the existing vegetation possible prior to filling of the dam, as this will cause the majority of fauna to evacuate the area. xv. Areas used during the construction phase and not during the operational phase should be rehabilitated. **General Mitigation Measures:** i. Ensure that all construction personnel are provided with appropriate training in ecological awareness, as appropriate to their work activities. ii. Make use of existing access roads as much as possible to reduce the vegetation clearance. iii. Off-road driving must be prohibited. iv. No intentional killing or poaching of any animals may be allowed on site and it must be a condition of employment that any employee caught poaching must be disciplined accordingly. v. Where a snake is encountered on site and must be removed, a snake catcher must be called in to safely relocate the snake. vi. All construction activities must be limited to daylight hours. vii. Construction activity is restricted to the immediate footprint of the infrastructure.				
B12 FLORA MANAGEMENT					

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
a. Loss of Floral Habitat and Species Diversity **b. Loss of floral SCC** **c. Loss of protected trees** **d. Introduction of alien invasive plants** **e. Erosion and soil compaction**	**Flora Specialist mitigation measures:** i. Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. ii. All activities must be restricted too within the low/medium sensitivity areas. No unnecessary loss of high sensitivity areas should be permitted. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon (including fencing off the defined project area). iii. All construction/operational and access must make use of the existing roads to avoid further floral habitat loss. iv. Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species. v. A qualified ecologist must mark protected trees in the area to ensure that none of the trees that are not covered by the National Forests **Act**, 1998 are harmed. vi. The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on flora. Construction are also not allowed to take place at night. vii. The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. viii. Where possible, vegetation within the working servitude but outside of the direct construction footprint should be cut to ground level rather than completely removed. This	• Minimal disturbance to vegetation where such vegetation does not interfere with construction • Minimise scarring of the soil surface and land features • Removal of alien plant species to encourage indigenous plant growth	• No litigation due to removal of vegetation without necessary permission • No visible erosion scars once construction is completed • The footprint has not exceeded the agreed boundaries	Daily	• Contractor • ESR • ECO • EO • Ecological Specialist (where applicable)

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	will assist with soil stabilisation and with the rehabilitation of cleared areas. ix. Vegetation which is considered suitable for rehabilitation activities after construction (such as indigenous grasses and other herbaceous species) should be carefully removed from the direct construction footprint and stored at an appropriate facility for use in later rehabilitation activities. x. Removal of vegetation must only be done when essential for the construction of the proposed development. Do not allow any disturbance to the adjoining natural vegetation cover or soils. All disturbed areas must be prepared and then revegetated to the satisfaction of the ECO. xi. Construction vehicles should be restricted to travelling only on designated and existing roadways, to limit the ecological footprint of the proposed development activities; xii. No littering or dumping of waste and construction material within natural areas outside of the development footprint area may be allowed. All excess material must be removed from the construction areas once construction has been completed. xiii. Floral Species of Conservation Concern (SCC) and protected species encountered within the study area should ideally be conserved in situ. Where the encroachment of the proposed dam encroaches upon these floral species is unavoidable, it is recommended that these plants be relocated under the supervision of a qualified botanist to suitable adjacent habitat. xiv. Should other floral SCC be noted within the development footprint, the relevant authorities (DEDEA and DFFE should be consulted based on the conservation status of				

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	such species, and it must be determined whether relocation is possible. Relocation of such species should only be undertaken upon approval by the relevant authorities. xv. Implement an Alien Plant Control Plan which specifies long-term monitoring schedules. Additional mitigation measures include: i. The development footprint area must be kept as small as possible. This can be achieved through adequate planning and demarcation of infrastructure areas and areas required for construction activities. ii. Construction workers must not remove flora or collect seed from any plants outside the areas on which vegetation clearing has not been planned. iii. Under no circumstances should chemicals be used in the removal of plant species. iv. Only indigenous plants must be used in the rehabilitation of disturbed areas. v. All construction vehicles and equipment as well as construction material should be free of plant material vi. Prevention of erosion, and where necessary rehabilitation of eroded areas. vii. Rehabilitation of disturbed vegetation as soon as undertaken as soon as construction has ended in the area that has been disturbed. viii. No collection of plant material should be allowed by operational personnel. ix. The use of pesticides for management of alien invasive species must be approved by the ECO. Only selected pesticides should be used.				

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
B13 MANAGEMENT OF HERITAGE RESOURCES AND ARTEFACTS					
a. Damage or loss of valuable heritage resources	i. Known sites should be clearly marked in order that they can be avoided during construction activities. ii. Although all the stone tools are of low cultural significance and no further action is required, these must ideally not be displaced if encountered. iii. The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped, and a qualified archaeologist must be contacted for an assessment of the find. iv. All If any human remains or any other concentrations of archaeological heritage material are exposed during construction, all work must cease, and it must be reported immediately to the archaeologist at the Albany Museum and the Eastern Cape Provincial Heritage Resources Authority. Sufficient time should be allowed to investigate and to remove such material. The applicant and appointed ECO must ensure in terms of section 38(6) of the Act, the responsible heritage resources authority, SAHRA as well as the South African Police Service (SAPS) must be notified. <u>Additional mitigation measures include:</u> i. The ECO must train the Contractor to recognise any heritage features. Should there be a sign of such objects, construction must halt in that area immediately and a suitably qualified heritage specialist must be called to investigate through the ECO. ii. Artefacts may not be removed under any circumstances	• Avoid damage to heritage resources • Report all finds of human remains or other heritage resources • Implement chance find procedures in case where possible heritage finds area made	• Limited or no damage to heritage resources	Daily	• Contractor • ESR • ECO • EO • Heritage Specialist (If required)

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
B14 MANAGEMENT OF PALAEONTOLOGICAL RESOURCES					
a. Destruction of Fossil Heritage	i. Although the identified fossils are of low palaeosensitivity, the potential for impacts on rare, largely unpredictable fossil sites (e.g. mammalian bones, teeth, horncores, non-marine *molluscs*, *calcretised termitaria*) of High Palaeosensitivity associated with older alluvial deposits hidden in the subsurface cannot be entirely discounted. Construction activities such as excavations and grading could expose or damage the features of heritage and cultural value beneath the surface. ii. If any fossiliferous deposits are exposed by surface clearance or excavations during the construction phase of the development, the Chance Fossils Finds Protocol outlined in Appendix 3 of the Palaeontological Impact Assessment Report must be implemented. <u>General mitigation measures include:</u> i. The ECO must survey for fossils before and or after clearing, blasting, drilling or excavating; ii. Special care must be taken during the digging, drilling, blasting and excavating of foundations, trenches, channels and footings and removal of overburden as a site visit may have missed a fossiliferous outcrop; iii. Should Fossils be unearthed the Contractor shall notify the palaeontologist, SAHRA and SAPS; iv. The area must be fenced-off with a minimum of 30 m barrier and the construction workers must be informed that this is a no-go area until the specialist determines the official buffer requirements.	• Report all finds of fossils to the ECO; • Implement chance find procedures in cases where possible fossils may occur	• Limited or no damage to fossil heritage	Daily	• Contractor • ESR • ECO • EO • Heritage Specialist (If required)

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
B15 MANAGEMENT OF NO-GO / SENSITIVE AREAS					
b. Environmental impacts outside working areas	i. All construction activities must be demarcated at the start of construction and maintained accordingly during the construction phase ii. The Contractor must communicate the importance of specific working methods in sensitive areas close to the site, e.g. identified SSC species and activities within the watercourses must be kept strictly to the infrastructure required within the dam layout. There shall be no facilities such as construction camp, ablution facilities, crushing area or eating areas within the watercourses or 18m riparian buffer zone. iii. Mark and/ or demarcate all sensitive sites.	• Minimise unnecessary impacts outside the working footprint	• Containment of footprint • No impacts on sensitive areas • No complaints from adjacent landowners	Daily	• Contractor • ESR • ECO • EO • RE
B16 MANAGEMENT OF SOCIO ECONOMIC IMPACTS					
a. Enhance the Positive Economic Impacts during the Construction Phase **b. Reduce the Potential Negative Impacts on Traffic and Road Infrastructure** **c. Reduce Nuisance Impacts (Noise, Dust, Littering)**	i. A social facilitator can be appointed to ensure the smooth running of the project as well as sustainability. ii. As far as possible and based on the Developers' required skills for the construction of the proposed infrastructure, locals must be employed in line with DWS's 14-point plan that stipulates the principles concerning project liaison, sub-contracting and labour sourcing that shall be implemented iii. Access roads and entrances to the site should be carefully planned to limit any intrusion impacts, noise and dust pollution, as well as to limit any risks of accidents. iv. Construction vehicles should adhere to the speed levels.	• To ensure that communities in the vicinity of the facility are involved in the project and are able to improve their economic conditions through the acquisition of employment	• The local community benefits from the employment opportunities created during the construction phase	Ongoing	• Developer • Contractor • ESR • ECO • EO

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
Related to Construction Activities **d. Reduce Negative Impacts on Community Safety** **e. Reduce Potential Negative Impacts on Local Infrastructure** **f. Reduce impact on Social Cohesion and Sense of Place**	v. Construction vehicles and those transporting materials and goods should be inspected to ensure that these are in good working order and not overloaded. vi. Source material and goods locally as far as possible to limit transportation of these over long distances vii. Adjacent land owners must be informed timeously, at least 14 days of any planned service stoppages in their areas. viii. Construction workers should be confined to the construction area as far as possible and should be easily identified. ix. Construction activities should keep to normal working hours e.g. sunrise to sunset x. Noise should be kept to the minimum. xi. The construction area should be fenced to avoid unauthorised entry by animals or children. xii. Dust suppression methods should be implemented as and when required.				
B17 WATER RESOURCES MANAGEMENT					
a. Changes in water quality due to foreign materials and increased nutrients **b. Changes in water flow regime**	i. The Contractor must provide and maintain a method statement for water resource management including the source of water and the potential discharge into watercourses. ii. Design a stormwater management plan prior to the commencement of construction related activities which details how stormwater runoff from cleared, compacted surfaces will be controlled in order to prevent the erosion and sedimentation of watercourses.	• To ensure that water resources are not impacted negatively.	The focus of mitigation measures should be to reduce the significance of potential impacts associated with the residential development and thereby to: • Prevent the unnecessary	Daily	• Contractor • ESR • ECO • EO

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	iii. Energy dissipators should be included in the design of the dam. iv. The spillways must be fitted with infrastructure such as gabions or flow dissipation to remedy point source erosion at the end of the spillway. v. A conservative buffer zone of 18 m for the construction phases of the project must be implemented. vi. Construction affecting watercourses must be restricted to the dryer winter months. vii. Silt traps and fences must be placed in the preferential flow paths to prevent sedimentation of the watercourse and the proposed dam, these should be monitored and serviced regularly. viii. A temporary fence or demarcation must be erected around No-Go Areas outside the proposed works area prior to any construction taking place as part of the contractor planning phase when compiling work method statements to prevent access to the adjacent portions of the watercourse. ix. Effective stormwater management should be a priority during the construction phase. This should be monitored as part of the EMP. High energy stormwater input into the watercourses should be prevented at all cost. Changes to natural flow of water (surface water as well as water flowing within the soil profile) should be taken into account. x. Topsoil should be excavated and stockpiled separately from the subsoils to be used during the rehabilitation. Drip trays shall be provided in construction areas for stationary plant and for "parked" plant; Drip trays, sumps and bunds must be emptied regularly, especially before		destruction of, and fragmentation, of the watercourses (including the riparian area); and • Prevent the loss water resources and associated ecosystem services.		

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	a known rain event and after a rain event, and the contents disposed of at a licensed disposal facility. xi. All vehicles and equipment shall be kept in good working order and serviced regularly; Leaking equipment shall be repaired immediately or removed from the Site. xii. Should cement be mixed on site, mixing will take place within a demarcated fenced off concrete batching area at the Contractors Camp. Cement must be mixed on an impervious surface				
B18 TRAFFIC MANAGEMENT					
a. Disruption of access routes and daily movement patterns	i. There must be an erection of signage warning motorists about the presence of construction vehicles. ii. Construction activities must be limited to daytime hours. iii. Construction vehicles travelling on public roads must adhere to speed limits. iv. Construction vehicles must not dispose of soil or other material on roads. Where this occurs, the material must immediately be removed before the end of the working day.	• To ensure that public roads around the site are safe and the flow of traffic is not disrupted	• No incidents of reported vehicle/ pedestrian accidents • Adequate signage and alternative routes for traffic to flow	Daily	• Contractor • ECO • EO • ESR
B19 MANAGEMENT OF HEALTH AND SAFETY IMPACTS					
a. Impacts associated with loss of human lives and risk of injuries	*Detailed Health and Safety issues will be addressed in reports compiled by the Health and Safety Officer* i. Contractor must appoint an independent Health and Safety Officer for the construction phase of the project ii. Suitable Personal Protective Equipment (PPE) must be worn at all times by all employees on site during the construction and maintenance phases of the project	• To ensure safety of employees, site visitors as well as surrounding landowners • Minimise the potential for impacts associated with loss of human lives and risk of injuries	• No complaints from surrounding landowners and communities	Daily	• Contractor • Health and Safety personnel • ESR

PHASE OF DEVELOPMENT: CONSTRUCTION

IMPACTS	MITIGATION MEASURES	MANAGEMENT OBJECTIVES	MEASURABLE OUTCOME TARGETS	FREQUENCY OF ACTION	RESPONSIBLE PARTY
	iii. With the exception of the project team members, no persons should be allowed to enter the construction site area iv. The site and crew are to be managed in strict accordance with the OHS Act v. The contractor must ensure that all emergency procedures are in place prior to commencing work. Emergency procedures must include (but not be limited to) fire, spills, contamination of soil, accidents to employees and limiting casual access to the construction site for workers, use of hazardous substances and materials, etc. vi. The Contractor must ensure that lists of all emergency telephone numbers / contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site vii. The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, including police and ambulance services must be available at prominent locations around the construction site viii. A Health and Safety Officer as well as an independent firm must be appointed to audit the site's compliance with the OHS Act during construction	• Reduce the likelihood of the occurrence of traffic accidents as result of the presence of construction vehicles			

Where applicable, the mitigation measures for the construction phase will be carried forward to other phases. In addition, the following specific measures presented in the table below will also apply.

7.3 Demobilising and rehabilitation phase (C)

ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	FREQUENCY OF ACTION	OBJECTIVES	RESPONSIBLE PARTY
1. Proliferation of exotic vegetation and weeds in disturbed areas	All exotic flora and weeds to be eradicated in an environmentally friendly manner.	Monthly for the first year after rehabilitation.	To ensure that indigenous plants are well established	Developer & EO
2. Damage to plants established as part of rehabilitation	• All areas under rehabilitation must be cordoned off as no-go areas. If necessary, these areas should be fenced off. • The survival rate of plant species established as part of rehabilitation must be monitored and replanted where necessary.	Weekly for the first two months after establishment and after that, monthly for the first year after construction	To ensure that indigenous plants are well established	Developer & EO
3. Soil erosion	All areas that have been eroded by construction activities must be rehabilitated accordingly.	Monthly for the first year after construction. Frequency must be increased during the rainy season	To ensure there are no visible erosion scars	Developer & EO
4. Riparian areas rehabilitation	Rehabilitate any areas of watercourses located outside of the direct construction footprint which have been disturbed as a result of construction related activities.	Monthly for the first year after rehabilitation.	To ensure the riparian areas are afforded the opportunity to recover.	Developer & EO

8. REPORTING, MONITORING AND REVIEWING

To ensure continuous improvement in terms of the environmental performance of the project, the site must be audited and monitored against the EMPr requirements. The EMPr must also reviewed to ensure its applicability. This is detailed in subsequent sections.

8.1 Reporting on EMPr compliance

In order to ensure sufficient levels of compliance with the EMPr, regular environmental monitoring has to be undertaken and the results of the monitoring be reported on regular basis. In order to control the reporting on the EMPr Compliance, it is imperative that the following be borne in mind:

- Typical report description;
- Document control procedures;
- System for documenting environmental training; and
- Frequency of reports.

Each of these are briefly discussed below:

8.1.1Typical report description

A typical report used to indicate the level of environmental compliance on the project must adhere to **Appendix 7** of NEMA EIA Regulations, 2014, as amended, which must include the following

(a) details of the—

(i) independent person who prepared the environmental audit report; and

(ii) expertise of the independent person that compiled the environmental audit report;

(b) a declaration that the independent auditor is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the environmental audit report was prepared;

(d) a description of the methodology adopted in preparing the environmental audit report;

(e) an indication of the ability of the EMPr, and where applicable, to—

(i) sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis;

(ii) sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and

(iii) ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;

(f) a description of any assumptions made, and any uncertainties or gaps in knowledge;

(g) a description of any consultation process that was undertaken during the course of carrying out the environmental audit report;

(h) a summary and copies of any comments that were received during any consultation process; and

(i) any other information requested by the competent authority.

In addition to the above, the **Environmental Audit Report** must include the following

- Project Background Information;
- Terms of Reference of various project team members;
- Scope of audit and the audit period;
- Objectives of the Environmental Audit;
- Methods used for undertaking of Compliance Audits;
- Roles and Responsibilities of different parties involved in ensuring the compliance of the EMPr;
- Summary of main findings;
- Checklist used for checking compliance;
- Photographs of observations of audit; and
- Any other documents deemed important to support the audit findings.

8.1.2 Document control procedures

To ensure the Environmental Auditing Reports are of good quality, these must undergo an internal review prior to submission to relevant parties. An indication of the document history indicating as a minimum the revision number and date as well as the names and signatures of the compiler, reviewer and approver must be provided.

8.1.3 System for documenting environmental training

The Developer, Project Manager, Contractors and subcontractors must develop a system for documenting environmental monitoring, training and reporting. This system must as a minimum include the following:

- Plans on relevant parties to train and the frequency of training to ensure that all parties; working on the site/providing services are aware of the necessity to adhere to the EMPr;
- An indication of items to be discussed in typical training sessions; and
- Typical documents/material to be used for training and proof of the undertaking of training.

8.1.4 Frequency of audit reports

The reports compiled to record the findings of the audit must be provided at frequencies required by the Department of Forestry, Fisheries and Environment (DFFE), where stated, or by DWS.

8.2 Monitoring of the EMPr

In order to ensure that the EMPr is being correctly implemented and remains relevant to site activities, the following must be undertaken:

8.2.1 Environmental auditing

Internal Audits as well as External Audits (where required by the DFFE - Competent Authority) of the EMPr must be undertaken at the periods and according to procedures outlined below unless otherwise stated in the Authorisation conditions:

- *Internal Audits* - these must be undertaken at periods and according to procedures prescribed by the Developer/Project Manager (if applicable). Records associated with this auditing must be kept. The Contractor shall undertake their own Internal Audits and must communicate their procedure to the ECO. All Internal Audits must also be aligned to the DWS's audit process in terms of internal environmental policy requirements. Where required, the DFFE will also be provided with copies of all audit reports.

- *External Audits* – if required by the DFFE, these must be undertaken by a suitably qualified and experienced Environmental Control Officer (ECO). Similar to the Internal Audits, these must entail the checking of Environmental Compliance based on the EMPr and the Environmental Authorisations as well as any other requirements including environmental best practice. All External Audits must also be aligned to the DWS audit process in terms of internal environmental policy requirements. In order to undertake the external audits, the ECO must adopt the following methods and approaches as a minimum:
    - Review of background information to acquaint the ECO with various aspects of the project;
    - Document review;
    - Observations during site walkabout. Photographs must be undertaken during the walkabout;
    - Interviews and Questioning (open-ended questions will be asked); and
    - Completion of checklists to report and discuss the findings of each of the areas within the construction site.

Audit reports will be compiled and submitted to the relevant parties within the project. These must include the DWS as the Project Developer, the Project Manager and the Contractor.

8.2.2 Corrective actions

The Contractor must compile an Environmental Action Plan to ensure that the non-compliances are addressed and ensure that the issues are addressed within a certain target date set by the ECO. The Contractor must ensure that corrective actions arising as a result of non-compliances are undertaken and recorded accordingly. These records must be kept for review by the ECO and/or any other party with authority to undertake this exercise.

8.3 Review of the EMPr

The EMPr must be reviewed by and with the Project Team, should the need arise. The discussion of this item must preferably be led by the ECO. The frequency of the review of the EMPr must be decided between the ECO and DWS. All records of this review must be kept by the ECO on behalf of the Project Manager and DWS.

Any amendments to the EMPr must be communicated to the Project Team by the ECO. Proof of the communication must be kept.

8.3.1 Amendment of the EMPr (where required)

The NEMA EIA Regulations, December 2014, as amended regulate the procedures and criteria for the submission and consideration of the EMPr including its content. It must be noted that the EMPr is a living document that can be amended should the need for this arise. The amendment must however be undertaken according to the EIA Regulations that will be relevant at the time of the required amendment. It must be noted that the NEMA EIA Regulations 2014 (Sections 34-37) (which were applicable during the compilation of this EMPr) introduce a defined process with regard the amendment of the EMPr as outlined below:

- **First amendment** applies to the amendment of the EMPr as a result of audit findings.
- **Second amendment** pertains to an amendment of a specific impact management action of an EMPr.
- **Third amendment** gives opportunity to the holder of the EA to amend the EMPr, and also requires the involvement of the Competent Authority (CA) and the undertaking of Public Participation (PP).

It is important that the Developer and the Contractor follow these defined processes during the implementation phase as deviating from this process is regarded as a non- conformance.

In terms of the NEMA EIA Regulations 34, Government Notice No 982, of Government Gazette No 40772, Developers must ensure compliance with the conditions of the EMPr by undertaking an Environmental Audit in a structured and systematic manner. This audit must provide for recommendations regarding the need to amend the EMPr, and where applicable the Closure Plan. It is a requirement of the environmental compliance audit process that risks to the environment are identified and these possible risks should be taken into account during the planning and construction phase of the development. These risks are presented in this EMPr. The implementation of this EMPr, through the appointed Contractor, remains the responsibility of the Developer, i.e. DWS.

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