water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

PROPOSED DEVELOPMENT OF FOXWOOD DAM & ASSOCIATED INFRASTRUCTURE

CLOSURE PLAN

DRAFT

November 2015

[DEA Reference - 14/12/16/3/3/1/2/817]

TITLE AND APPROVAL PAGE

Project Name:	***Proposed Development of Foxwood Dam & Associated Infrastructure***
Report Title:	***Draft Closure Plan***
Authors:	***D. Henning, N Naidoo***
Authority reference no.:	***DEA Reference - 14/12/16/3/3/1/2/817***
DWS report reference no.:	***To be confirmed***
Status of report:	***Draft***
Date of issue:	***November 2015***

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Prepared by Nemai Consulting
for DWS

NEMAI CONSULTING

AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
November 2015	Draft for Authorities and Public Review	0	

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LIST OF ACRONYMS & ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEDEAT	Department Economic Development, Environmental Affairs and Tourism
DEAT	Department of Environmental Affairs and Tourism
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EC	Eastern Cape
ECDRPW	Eastern Cape Department of Roads and Public Works
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
FSL	Full Supply Level
GIS	Geographical Information System
GN	Government Notice
ha	Hectare
HIV	Human Immunodeficiency Virus
I&AP	Interested and Affected Party
km	Kilometre
m	Metre
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NDP	National Development Plan
NWA	National Water Act (Act No. 36 of 1998)
NWRS2	National Water Resource Strategy 2
SANS	South African National Standard

1 PURPOSE OF THIS DOCUMENT

The Department of Water and Sanitation (DWS) is investigating the feasibility of developing a multi-purpose dam on the Koonap River outside of Adelaide in the Eastern Cape (EC). The proposed site is known as the Foxwood Dam site.

The proposed project consists of the following:

- Major storage dam (Foxwood Dam);
- Bulk water supply pipeline and pump station;
- Gauging weir;
- Access roads (construction and operational phases);
- Quarry and borrow areas;
- Eskom supply to the dam and gauging weir;
- Relocate existing infrastructure (including water supply canal, R344, MR00639, Telkom telephone line and Eskom power line);
- Construction camp; and
- Permanent offices and accommodation for dam operator.

This document serves as the **Closure Plan**, as contemplated in Regulation 19 of Government Notice (GN) No. R. 982 (4 December 2015), for the proposed development of Foxwood Dam. It was developed in support of the Environmental Impact Assessment (EIA) for the project

2 DOCUMENT ROADMAP

As a minimum, the Closure Plan aims to satisfy the requirements stipulated in Appendix 5 of GN No. R. 982 (4 December 2014). **Table 1** presents the document's composition in terms of the aforementioned regulatory requirements.

Table 1: Closure Plan Roadmap in relation to GN No. R. 982

Chapter	Title	Correlation with GN No. R. 982
1	Purpose of this Document	–
2	Document Roadmap	–
3	Project Background and Motivation	–
4	Environmental Assessment Practitioner	(a) Details of – (i) The EAP who prepared the closure plan; and (ii) The expertise of that EAP.
5	Overview of Project	–
6	Environmental Governance Framework	–
7	Overview of Borrow Pits and Quarry	(j) Where applicable, details of any financial provisions for the rehabilitation, closure and on-going post decommissioning management of negative environmental impacts.
		(i) Details of all public participation processes conducted in terms of regulation 41 of the Regulations, including- (i) Copies of any representations and comments received from registered interested and affected parties; (ii) A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; (iii) The minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants; (iv) Where applicable, an indication of the amendments made to the plan as a result of public participation processes conducted in terms of regulation 41 of these Regulations.
8	Overview of Closure Plan	(b) Closure objectives.
		(g) Time periods within which the measures contemplated in the closure plan must be implemented.
9	Sensitive Environmental Features	–
10	Monitoring	(c) Proposed mechanisms for monitoring compliance with and performance assessment against the closure plan and reporting thereon.
11	Environmental Training & Awareness Creation	–
12	Closure Plan Review	–
13	Implementation Programme	(d) Measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity and associated closure to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including a handover report, where applicable.

Chapter	Title	Correlation with GN No. R. 982
		(e) Information on any proposed avoidance, management and mitigation measures that will be taken to address the environmental impacts resulting from the undertaking of the closure activity.
		(f) A description of the manner in which it intends to- (i) Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation during closure; (ii) Remedy the cause of pollution or degradation and migration of pollutants during closure; (iii) Comply with any prescribed environmental management standards or practices; and (iv) Comply with any applicable provisions of the Act regarding closure.
		(h) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of closure.

3 PROJECT BACKGROUND AND MOTIVATION

3.1 DWS Project Life-cycle

The standard DWS project life-cycle consists of the phases presented in **Figure 1**.

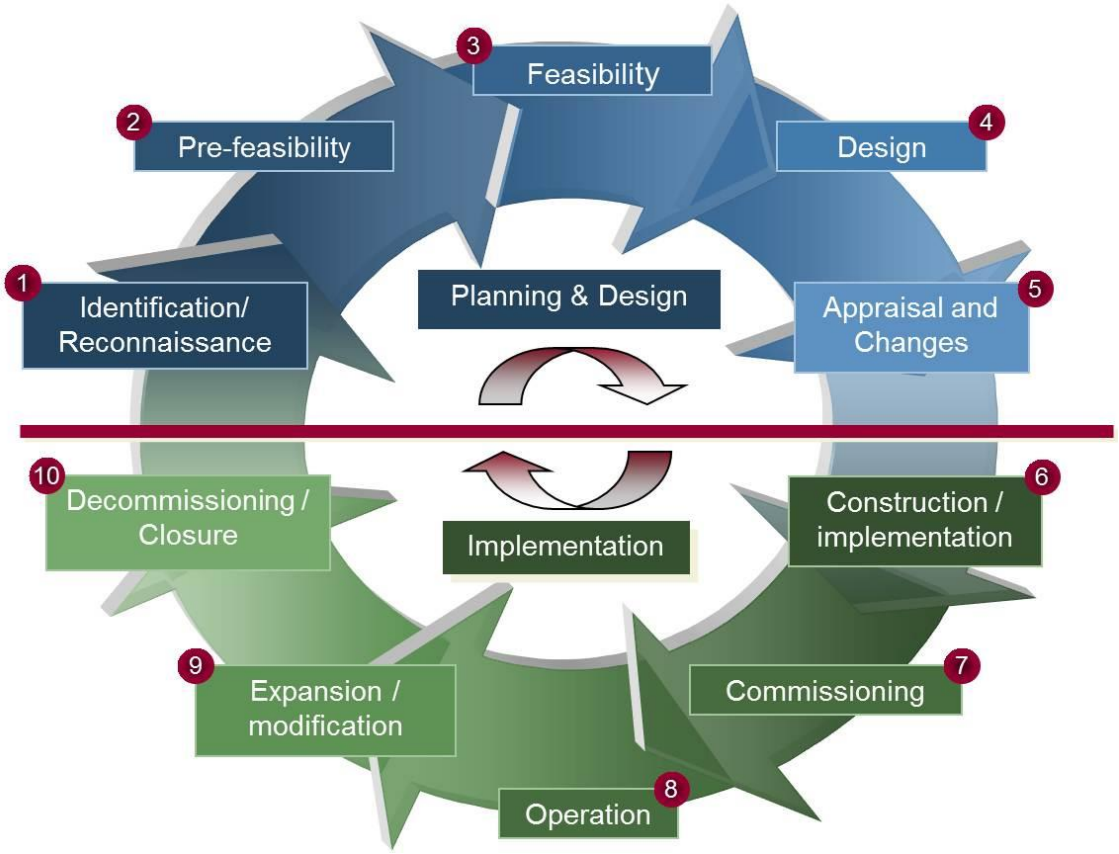

Figure 1: Generic DWS Project Life Cycle for Water Resource Management

The DWS is investigating the feasibility of developing the proposed Foxwood Dam as a multi-purpose dam on the Koonap River outside of Adelaide in EC. A Technical Feasibility Study was completed by Arup (Pty) Ltd at sufficient detail to refine the scheme configuration and costs and to investigate all aspects of the proposed option(s) in sufficient depth to enable the decision-maker to make an informed and accountable decision. The overall Feasibility Study, which includes the EIA, makes a final recommendation on the preferred option which is submitted with motivation to management for approval and funding.

3.2 Background and Motivation

Adelaide (and surrounding towns) has suffered water shortages in the past. Investigations into the potential development of the water resource within the Koonap River Valley date back to the 1960's. In the 90's Foxwood Dam was re-considered to augment domestic supplies as well as for

some development of commercial irrigation. The scheme was not developed due to farmers not accepting the resultant cost of water.

The Nxuba Local Municipality (LM) raised the issue of water shortages at the 2009 EC Water Indaba. In response, DWS proposed a comprehensive Feasibility Study for Foxwood Dam alongside other options, which included:

- Improvement of water-use efficiency (Water Conservation and Demand Management);
- Enlargement of the off-channel storage scheme;
- Exploration and exploitation of groundwater resources; and
- Enlargement of the Fish River to Adelaide pipeline.

The motivation for the project stems from the strategic initiative to mobilize the water resources in the area as a stimulus for socio-economic development in this rural, economically depressed region. This initiative would support the objectives of the National Development Plan (NDP) and is consistent with the National Water Resource Strategy 2 (NWRS2).

Development of the Foxwood Dam would, in the first instance, provide additional, high assurance water supplies for domestic use; this would significantly improve the resilience of the limited supplies now available from the Koonap River without the benefit of storage, and would make water available to meet any increasing needs for domestic, municipal and industrial use.

The effective development of a major storage dam at the Foxwood site would regulate the variable runoff in the Koonap River to the extent that, after full provision is made for maintaining the Reserve to ensure the health and integrity of the resource itself, a significant quantity of water would be made available for irrigation development at an appropriate level of assurance. It is this resource that would be mobilized, together with land and human resources in the region, to provide a stimulus for socio-economic development. This vision is assessed in the context of agricultural development, land reform and rural development policies within the framework of the NDP.

3.3 Project Location

The project area is situated in central part of the EC, in the Amatole District Municipality (DM) and Nxuba LM (refer to maps contained in **Figure 2**). From a southern direction the proposed dam wall site (coordinates 32˚40’30”S, 26˚16’0”E) is accessed via the R344 (off the R63).

The town of Adelaide and the Bezuidenhoutville Township are located to the south-east of the dam. Adelaide lies 37 km west of Fort Beaufort, on the R63 between Bedford and Fort Beaufort, and is situated in the foothills of the Winterberg Mountain range. Adelaide serves as an administrative and decision-making centre in the region. It is predominantly a farming town, in a beef, mutton, wool and citrus farming district.

The project infrastructure is mostly located on privately-owned properties that are primarily used for agricultural practices, except for the land in the south-eastern part of the project footprint which is owned by the municipality.

The properties that are directly affected by the proposed development are shown in **Figure 3** and listed in **Table 2**.

Table 2: Directly affected properties

SG Code	Farm Name & No.	Erf / Ptn
C02500000000008700002	Olifants Drift 87	2
C02500000000008700000	Olifants Drift 87	
C02500010000000100000	Adelaide	1
C02500000000011100000	111	
C02500010000056900000	Adelaide	569
C01000000000012900000	Leeuw Hoek 129	
C01000000000008600000	Rooidam 86	
C01000000000012600002	Mancasana Drift (Petronella) 126	2
C01000000000012600000	Mancasana Drift (Petronella) 126	
C01000000000012600001	Mancasana Drift (Petronella) 126	1
C01000000000012600003	Mancasana Drift (Petronella) 126	3
C02500000000008600005	Elands Drift 86	5
C02500000000008600003	Elands Drift 86	3
C02500000000008600007	Elands Drift 86	7
C02500000000008600004	Elands Drift 86	4
C02500000000008600006	Elands Drift 86	6
C02500000000008600001	Elands Drift 86	1
C02500000000008600002	Elands Drift 86	2
C01000000000011600000	Fathers Poort 116	
C01000000000011500000	Doornkloof Mouth 115	

Figure 2: Regional Map (***Note – not all sub-components shown***)

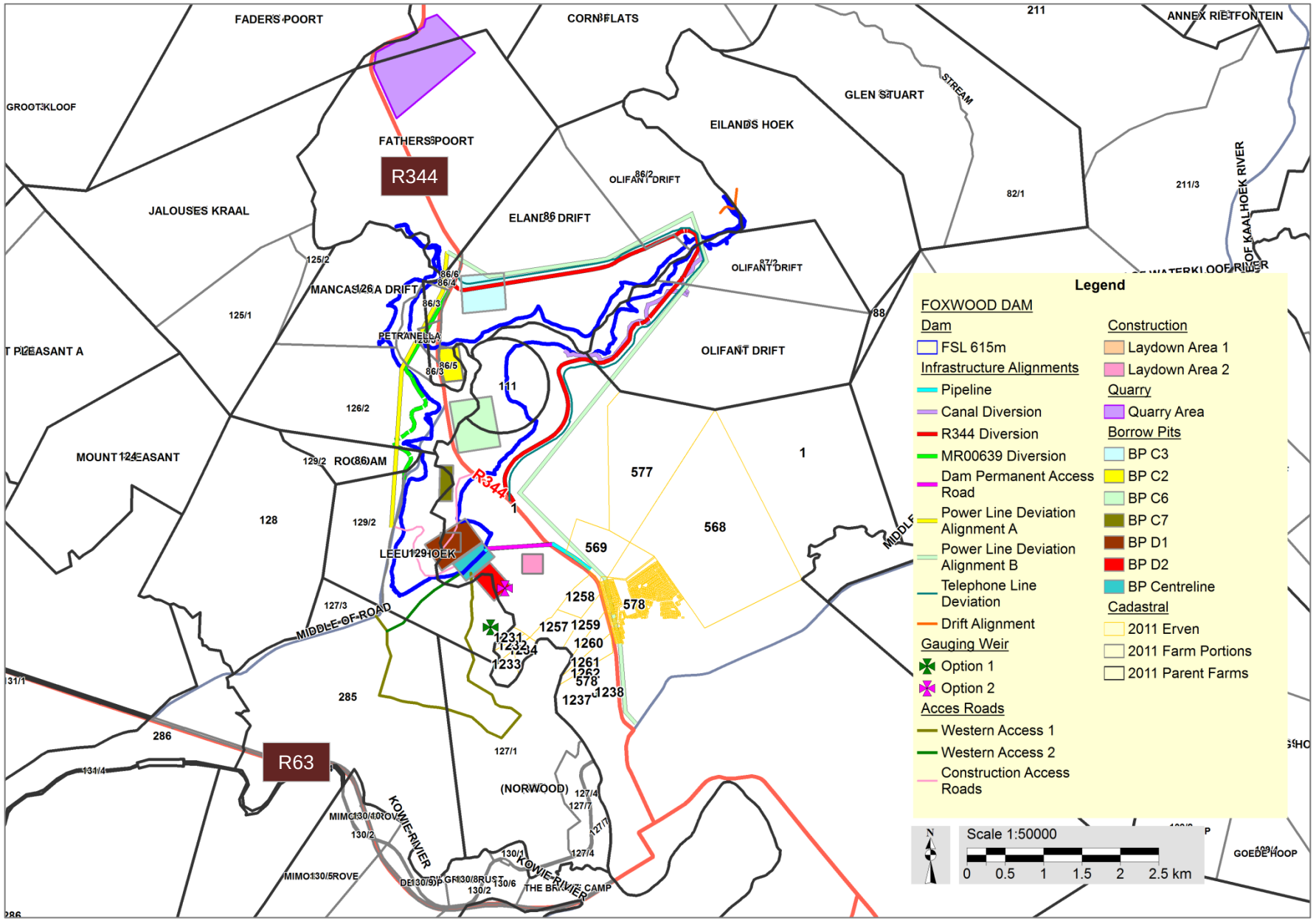

Figure 3: Cadastral Map

4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by DWS as the independent EAP to undertake the environmental assessment for the proposed development of Foxwood Dam.

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

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

Table 3: EMPr Core Team Members

Name	Qualifications	Experience
Mr D. Henning	MSc (Aquatic Science)	15 years' experience. Prepared EMPs and acted as the Environmental Control Officer (ECO) on various projects, including: • 80km bulk water pipeline from Randfontein to Rustenburg; • Construction of the Spring Grove Dam, as part of the Mooi-Mgeni Transfer Scheme Phase 2; • Fish barrier on the Mooi River upstream of Spring Grove Dam; • Ncwabeni Off-Channel Storage and associated infrastructure; and • Mokolo Crocodile West Water Augmentation Project (water transfer scheme).
Mr C. Chidley	• B.Sc Eng (Civil); • BA (Economics, Philosophy) • MBA	22 years' experience. Prepared EMPs and acted as the ECO on various projects, including:: • Raising of Hazelmere Dam; • Upgrade of the Sunderland Ridge Waste Water Treatment Works and bulk sewer line situated on the Hennops River; • Empangeni Bulk Outfall Sewer, 40km pipeline.

5 OVERVIEW OF PROJECT

The project components are listed in **Table 4** and shown in **Figures 3 - 4**.

Table 4: Project Components

Project Components	Associated Infrastructure
Major storage dam (Foxwood Dam)	1. Dam wall 2. Embankment 3. Dam outlet works (including dam intake tower, tunnel and outlet valve house) 4. Access roads (construction and operation) 5. Quarry and earthfill borrow areas 6. Electrical supply 7. Construction camp (temporary) 8. Operator's offices and accommodation (permanent)
Bulk water supply pipeline	1. Pump station 2. Pipeline and associated structures (chambers, Cathodic Protection measures, AC mitigation measures, pipeline markers)
Gauging Weir	1. Weir and associated instrumentation 2. Access roads (construction and operation) 3. Electrical supply 4. Satellite construction camp
Relocation of Infrastructure	1. Relocate water supply canal 2. Relocate R344 3. Relocate MR00639 4. Relocate Telkom telephone line 5. Relocate Eskom power line 6. Relocate drift (low level crossing)

6 ENVIRONMENTAL GOVERNANCE FRAMEWORK

6.1 Legal Provisions

The overall environmental legal framework for the development of Foxwood Dam and the associated infrastructure is contained in the EIA Report. This section only focuses on key pieces of environmental legislation that specifically deal with the closure of the borrow pits and quarry.

6.1.1 National Environmental Management Act

According to Section 2(3) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), "*development must be socially, environmentally and economically sustainable*", which means the integration of these three factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

The proposed Foxwood Dam (including the borrow pits and quarry) requires authorisation in terms of NEMA and the EIA was undertaken in accordance the EIA Regulations (2014) that consist of the following:

- EIA procedure - GN No. R 982 (4 December 2014);
- Listing Notice 1 - GN No. R 983 (4 December 2014);
- Listing Notice 2 - GN No. R 984 (4 December 2014); and
- Listing Notice 3 - GN No. R 985 (4 December 2014).

As a minimum, the Closure Plan aims to satisfy the requirements stipulated in Appendix 5 of GN No. R. 982 (4 December 2014).

6.1.2 Mineral and Petroleum Resources Development Act

The purpose of the Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002) is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources and to provide for matters related thereto. This act defines mining as "any operation or activity for the purposes of winning any mineral on, in or under the earth, water or any residue deposit, whether by underground or open working or otherwise and includes any operation or activity incidental thereto".

Borrow areas and a quarry have been identified to source construction material for the project. Under Section 106(1) of the MPRDA, and in accordance with GN No. R. 762 of 25 June 2004, DWS is exempt from the provisions of Sections 16, 20, 22 and 27 "*in respect of any activity to remove any mineral for road construction, building of dams or other purpose which may be identified in such notice*". In terms of Section 106(2) of the MPRDA, DWS still needs to submit Environmental Management Programmes for all borrow areas and quarries for approval by the Department of Mineral Resources (DMR).

The Mineral and Petroleum Resources Development Amendment Act (Act No. 49 of 2008), Section 106(2) was amended as follows: "*Despite subsection (1), the organ of state so exempted must submit relevant environmental reports required in terms of Chapter 5 of the National Environmental Management Act, 1998, to obtain an environmental authorisation*."

The new EIA Regulations of 2014 include a number of provisions in terms of the transition of the environmental regulation of mining from the MPRDA to NEMA and the introduction of the One Environmental System. Amongst others, this is facilitated by the inclusion of mining activities under the 2014 Listing Notices. Approval will be sought from DMR for the relevant activities associated with the borrow areas and quarry (i.e. GN No. R. 983 Activities 21 and 22; GN No. R. 984 Activities 17, 18, 19 and 21) (refer to activities identified in **Table 3**).

6.1.3 National Environmental Management: Waste Act

Amongst others, the purpose of the National Environmental Management: Waste Act (NEM:WA) (Act No. 59 of 2008) includes the following:

1. To reform the law regulating waste management in the country by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development;
2. To provide for institutional arrangements and planning matters;
3. To provide for specific waste management measures;
4. To provide for the licensing and control of waste management activities;
5. To provide for the remediation of contaminated land; and
6. To provide for compliance and enforcement.

No authorisation will be required in terms of the National Environmental Management: Waste Act (NEM:WA) (Act No. 59 of 2008), as the project will not include any listed waste management activities in terms of GN No. R. 921 of 29 November 2013. The following should be noted with regards to waste management during the construction phase:

- Excess material would be spoilt within the dam basin;
- Temporary waste storage facilities will remain below the thresholds contained in the listed activities under Schedule 1 of NEM:WA;
- The EMPrs make suitable provisions for waste management, including the storage, handling and disposal of waste; and
- The storage of general or hazardous waste in a waste storage facility will comply with the norms and standards in GN No. R. 926 of 29 November 2013.

6.1.4 National Water Act

The purpose of the National Water Act (NWA) (Act No. 36 of 1998) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial and gender discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for growing demand for water use; protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and droughts.

The quarry encroaches on tributaries of the Mankazana River. Borrow pits D2 encroach on the Koonap River. The final configuration of the borrow pits will only be confirmed following detailed geotechnical investigations in the project's design phase. Where possible, watercourses (and their regulated areas) will be avoided in determining the ultimate footprints of the mining areas.

6.2 Guidelines

The following guidelines were considered during the preparation of the Closure Plan:

- Western Cape Provincial Administration - Operational Manual, Chapter 7: Closure of Depleted Borrow Pits (WCPA, 2006).

6.3 Project Specifications

The Closure Plan focuses more on performance criteria for environmental compliance associated with the closure of the relevant borrow pits and quarry, whereas the detail on how the project is to meet these performance criteria is provided in the project specification in the form of minimum standards and measures to be implemented by the Contractor. The Contractor shall provide detailed method statements on how the performance criteria will be met, through the application of the specification. These methods are to be reviewed and approved by the Project Manager to ensure that they are adequate.

The Method Statement for the closure of the relevant borrow pits and quarry must be project- and site specific and should explain in detail the following:

1. The manner in which closure is to be undertaken;
2. The estimated schedule for closure (timing);
3. The area affected by closure activities (location);
4. The materials and plant / equipment needed for the closure activities;

5. The necessary mitigation measures that need to be implemented to adequately safeguard the environment, construction workers and the public (where applicable) during the execution of the closure activities;
6. Training of employees involved with closure activities;
7. Roles and responsibilities; and
8. Monitoring and reporting requirements;

7 OVERVIEW OF BORROW PITS AND QUARRY

7.1 General

The borrow pits and quarry identified as part of the geotechnical investigations during the Technical Feasibility Study to source construction material are shown in **Figure 4**.

Note that the final footprints of the borrow pits and quarry will only be confirmed following detailed geotechnical investigations during the project's design phase.

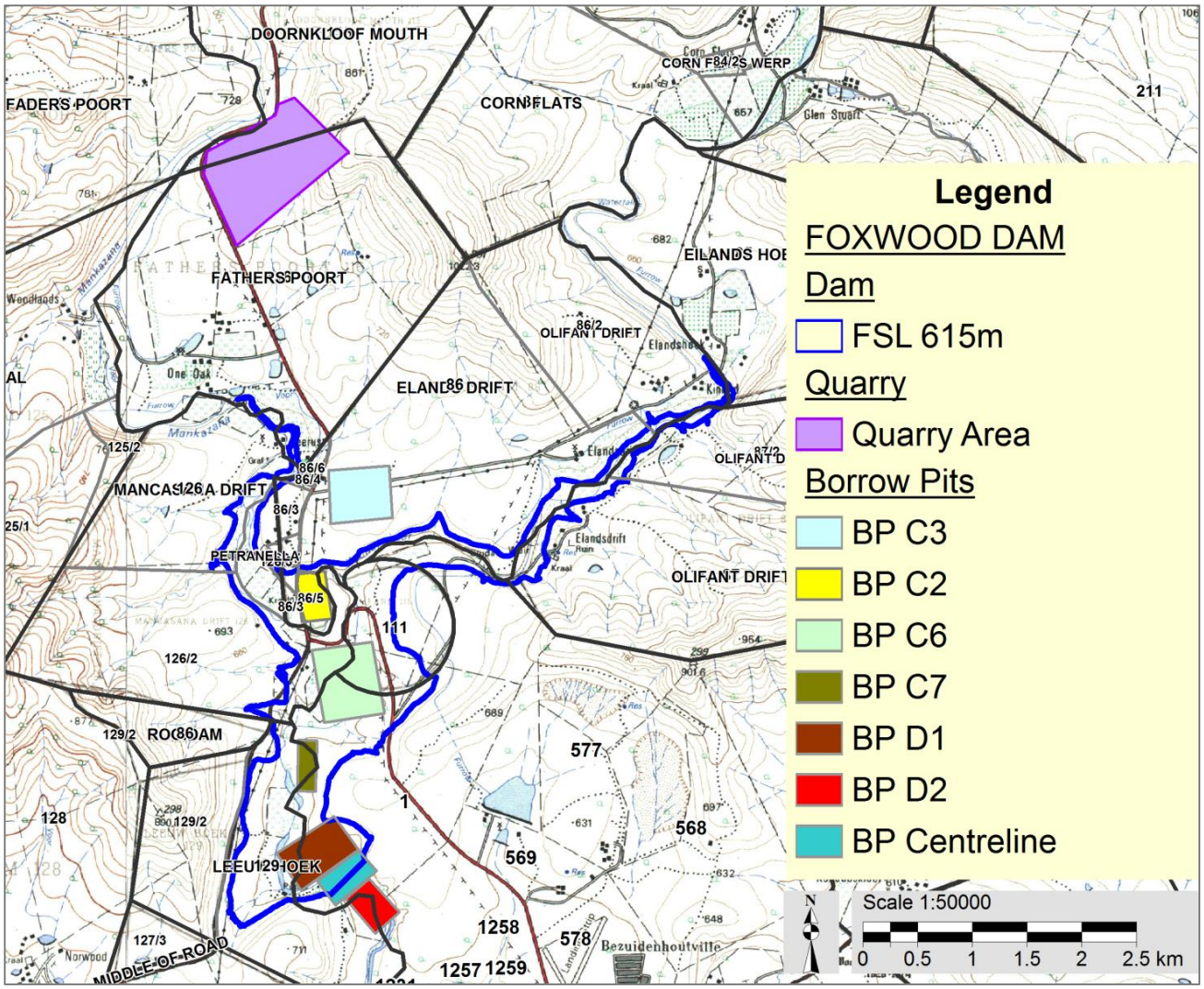

Figure 4: Borrow pits and quarry site

7.2 Locations of Borrow Pits and Quarry

Details of the proposed borrow pits and quarry are provided in **Table 5**.

Table 5: Details of Borrow Pits and Quarry

	Name	Coordinates	Property Description	Area
Borrow Pits	C3	NW: 32°38'31.15"S, 26°16'09.65"E NE: 32°38'29.80"S, 26°16'30.93"E SW: 32°38'46.87"S, 26°16'10.46"E SE: 32°38'45.10"S, 26°16'30.12"E	Ptn 1 of Elands Drift 86	27 Ha
	C2	NW: 32°39'01.93"S, 26°15'58.27"E NE: 32°39'01.02"S, 26°16'08.43"E SW: 32°39'16.10"S, 26°16'00.34"E SE: 32°39'15.15"S, 26°16'10.91"E	Ptn 1 of Elands Drift 86 Ptn 5 of Elands Drift 86 Ptn 7 of Elands Drift 86 Ptn 3 of Elands Drift 86	12 Ha
	C6	NW: 32°39'24.56"S, 26°16'03.92"E NE: 32°39'22.02"S, 26°16'24.81"E SW: 32°39'46.06"S, 26°16'08.27"E SE: 32°39'43.23"S, 26°16'29.41"E	Erf 1 of Adelaide 111 Ptn 2 of Mancasana Drift 126	37 Ha
	C7	NW: 32°39'51.12"S, 26°15'59.08"E NE: 32°39'51.33"S, 26°16'05.77"E SW: 32°40'06.28"S, 26°15'58.67"E SE: 32°40'06.50"S, 26°16'05.12"E	Erf 1 of Adelaide Leeuw Hoek 129	8 Ha
	D1	NW: 32°40'24.74"S, 26°15'51.43"E NE: 32°40'13.72"S, 26°16'11.62"E SW: 32°40'35.81"S, 26°16'00.02"E SE: 32°40'23.73"S, 26°16'20.12"E	Erf 1 of Adelaide Leeuw Hoek 129	25 Ha
	Centreline	NW: 32°40'32.98"S, 26°16'05.72"E NE: 32°40'24.02"S, 26°16'20.27"E SW: 32°40'40.11"S, 26°16'12.12"E SE: 32°40'30.02"S, 26°16'26.46"E	Erf 1 of Adelaide	12 Ha
	D2	NW: 32°40'38.21"S, 26°16'15.72"E NE: 32°40'32.30"S, 26°16'24.02"E SW: 32°40'48.52"S, 26°16'26.06"E SE: 32°40'42.18"S, 26°16'34.51"E	Erf 1 of Adelaide Leeuw Hoek 129	12 Ha
Quarry		NW: 32°36'56.38"S, 26°15'27.07"E NE: 32°36'40.64"S, 26°15'57.67"E SW: 32°37'24.41"S, 26°15'37.46"E SE: 32°36'56.58"S, 26°16'16.69"E	Fathers Poort 116 Faders Poort 114	90 Ha

7.3 Volumes of Material

The construction materials are broken down into three categories: clay core, shell and rockfill material. **Table 6** indicates the estimated reserve potential of each borrow pit, respectively, based on the geotechnical investigations conducted during the Technical Feasibility Study.

Table 6: Rough Estimated Quantities Available at Site (DWS, 2014)

Borrow Pit	Clay Core (m^3)	Shell (m^3)	Rockfill (m^3)
D1	275 000	465 000	N/A
Centreline	113 000	264 000	N/A
D2	101 000	303 000	N/A
C7	N/A	144 000	N/A
C6	N/A	1,100,000	N/A
C2	82 000	175 000	N/A
C3	256 000	544 000	N/A
Spillway	N/A	N/A	1,200,000
Total	**827,000**	**3,000,000**	**1,200,000**

7.4 Mining Characteristics

Characteristics of the proposed mining are provided in **Table 7**.

Table 7: Mining Characteristics

Criteria	Details
Mineral to be mined:	• Sand • Clay • Dolerite
Mining method:	Opencast
Approximate volume of material to be mined:	Refer to **Table x**
Depth of mining activity:	To be confirmed following detailed geotechnical investigations in the design phase of the project
Mining Period / Schedule:	• Mining operations - 2 years • Rehabilitation - 1 year

7.5 Overview of Mining

The primary activities related to the mining of suitable construction material from the borrow pits and quarry include the following:

- Complete detailed geotechnical investigations;
- Complete negotiations with affected landowners;
- Contractor to confirm the mining process and to develop a mining method statement;

- Contractor to develop Mining Plan, which includes the layout of mining activities and features such as fencing, access arrangements, aggregate stockpiles, topsoil stockpiles, container stores, crushing and screening area, office and support facilities, haul roads, overburden placement, etc.;
- Understand site drainage and manage stormwater (e.g. construct sediment holding basins and divert up-slope water around the mining area);
- Construction of access and haul roads;
- Prevent unauthorized access to site;
- Site preparation, including clearing and grubbing;
- Remove and safe storage (temporary stockpiles) of topsoil and remaining overburden material for post-mining rehabilitation;
- Manage borrow pits and quarry, including side slopes and floor of mined area;
- Implement drainage measures to prevent damming of water;
- Manage impacts related pollution sources (noise, air and water);
- Process the borrowed material (crushing and screening) for use in earthworks;
- Load the borrow material into tipper trucks and haul material to dam wall and embankment, as well as other areas where the material is required;
- Inert and spoil material to be used to fill borrow area in basin (as necessary);
- Post-mining –
  - Grading of site;
  - Removal of all facilities associated with mining activities; and
  - Stabilise, reinstate and rehabilitate borrow areas and quarry that are located outside of dam basin.

The mining equipment to be used includes the following:

- Excavators
- Bull-dozers, front-end loaders, backactors;
- Tipper trucks;
- Graders
- Water trucks; and
- Lowbed truck (transporting machines on and off site).

Provision is made in the Pre-Construction and Construction EMPrs to manage impacts associated with the mining-related activities during these respective phases of the project lifecycle. .

7.6 Financial Provisions

Based on a Memorandum of Understanding in 2007 between the then Department of Water Affairs (DWAF) and Department of Minerals and Energy (DME), it was agreed between these parties that for the construction and maintenance of Government water works undertaken by the

DWAF's own Construction Unit, DWAF shall be deemed to comply with the requirements of financial provision. Provided that the estimated costs for the management, rehabilitation and closure of such quarries and borrowed areas or works are provided for within the approved budget for such Government water works.

7.7 Public Participation

The details of the Public Participation process, as conducted in accordance with Regulation 41 of GN No. R. 982 (4 December 2014), are contained in the EIA Report. This includes the following information:

- Notification;
- Meetings (including minutes);
- Opportunities for comments with regards to the project and review of EIA documentation;
- Comments and Responses Report;
- Copies of any representations and comments received from registered Interested and Affected Parties (I&APs).

Further engagement with I&APs will be necessary as part of the closure activities in terms of the following:

- Establishing closure objectives;
- Identifying concerns; amd
- Registering and addressing complaints.

8 OVERVIEW OF CLOSURE PLAN

8.1 Scope of Closure Plan

A Closure Plan typically forms part of documentation associated with mining activities and indicates the closure objectives together with the accompanying remedial/rehabilitation measures required to achieve these objectives.

The Closure Plan specifically deals with borrow pits C3 (**Figure 5**) and D2 (**Figure 6**), as well as the quarry (**Figure 7**), as they will be situated outside of the dam basin. The remaining borrow areas will be located within the basin, and will be inundated and will thus not pose residual environmental risks. The area affected by the borrow pit at the dam's centreline will permanently be altered by the dam wall.

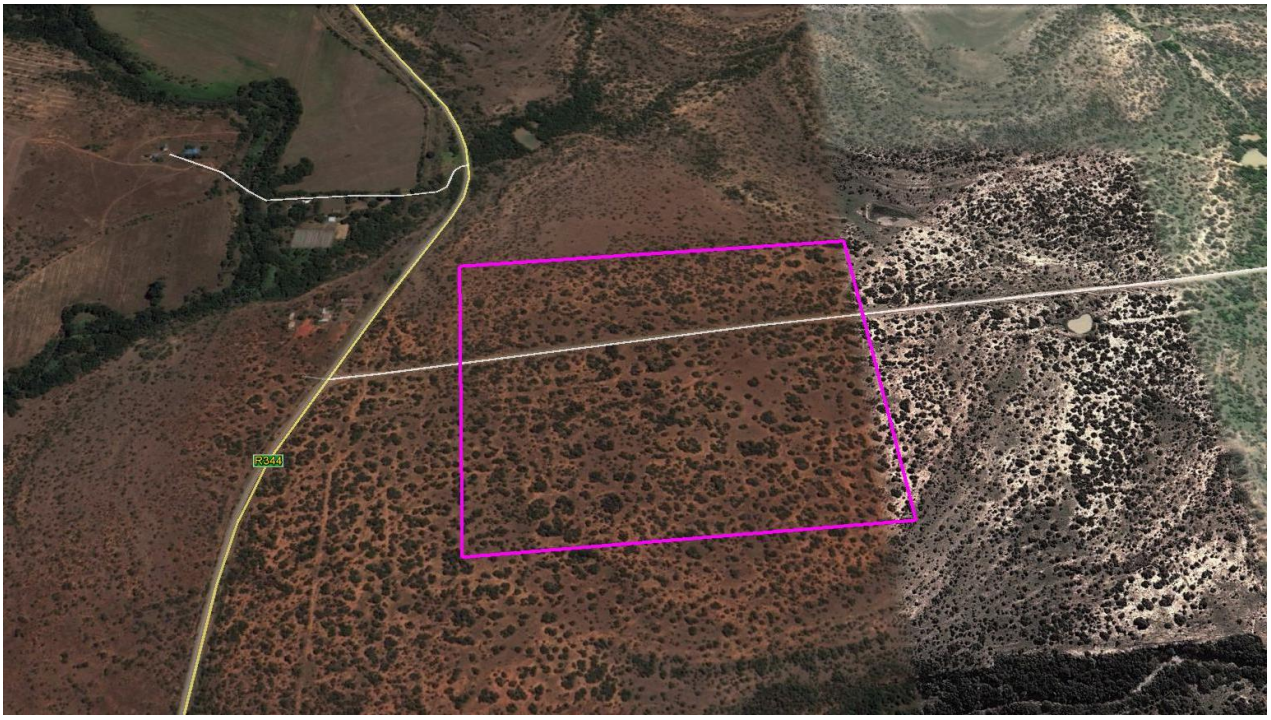

Figure 5: Northern view of Borrow Pit C3

Figure 6: Northern view of Borrow Pit D2

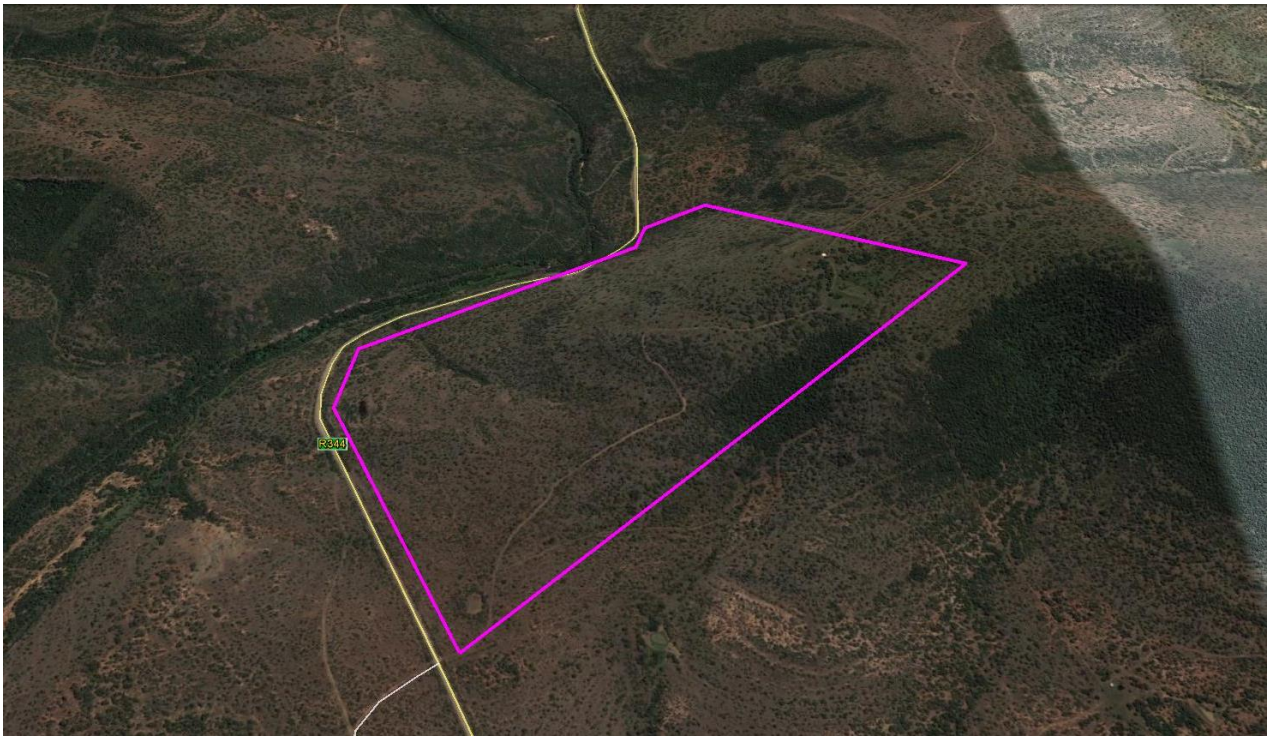

Figure 7: Northern view of Quarry

8.2 Closure Objectives

Closure objectives guide environmental management efforts during the cessation of mining activities and the subsequent closure of the mined area.

The closure objectives for borrow pit C3 and D2, as well as the quarry, which are all located outside of the dam basin, include the following:

1. Adequate reinstatement and rehabilitation of construction areas;
2. Conduct concurrent or progressive rehabilitation of areas affected by construction activities that are situated outside of the dam footprint;
3. Return mined area back to state that existed prior to mining; and
4. Ensure that all residual risks associated with the mined area are suitably mitigated.

Specific objectives and targets are also set in the categories of mitigation measures that are included in **Section 7**.

8.3 Closure Timeframes

The closure of the mined areas will be programmed to occur as soon as practically possible following the cessation of mining activities. The period between cessation of activities associated the mining of materials and the onset of rehabilitation will not exceed 1 month.

Where practically possible, rehabilitation will be conducted in parallel with extraction activities. Progressive rehabilitation is thus supported, where depleted sections of the borrow pits and quarry will be reclaimed while extraction is ongoing in other sections of the same mining areas.

9 SENSITIVE ENVIRONMENTAL FEATURES

Cognisance must be taken of the following sensitive environmental features that should be afforded additional care and protection during closure activities:

- Steep slopes are encountered in the following areas –
  - Quarry site (steep gradient towards the R344 and Mankazana River);
  - Eastern part of borrow pit D2;
- All watercourses, including the Koonap and Mankazana Rivers and their tributaries (including drainage lines), are regarded as sensitive and require suitable protection from the closure activities. A drainage line traverses the quarry site. The eastern part of borrow pit D2 encroaches on the Koonap River. During the design phase when the detailed geotechnical investigations are undertaken, the layout of the mining areas should strive to avoid all watercourses.
- All existing infrastructure and structures are regarded as sensitive and need to be safeguarded from construction activities until they have been relocated and the redundant sections removed (as relevant).
- Protected fauna and flora species occur in the area, which need to be protected against the project's potential adverse impacts. All construction activities to comply with the National Environmental Management: Biodiversity Act (No. 10 of 2004), National Forests Act (No. 84 of 1998) and Provincial Nature Conservation Ordinance of 1974. Sensitive species to be identified as part of the pre-construction survey. If relocation is not required, then these species need to be adequately protected from construction activities.
- All traffic and pedestrians on the public roads are regarded as sensitive and measures need to be implemented to safeguard these road users. Special measures are required to protect road users along the R344 alongside the quarry site.
- A number of grave sites and structures older than 60 years were identified within the project area. The final locations of all heritage and cultural features will be confirmed as part of the Phase 2 Heritage Impact Assessment, Archaeological Impact Assessment and Paleontological Impact Assessment. These features may not be disturbed without following legal protocol.
- Prevent construction-related nuisance to the Presbyterian Church Adelaide Primary School, which is situated on Portion 4 of the Farm Elands Drift 86 along the R344.
- Existing communication channels need to be duly respected and adhered to when engaging with the community.
- Private land may not be accessed unless consent has been granted by the landowner, or until the land acquisition process has been concluded, or a construction servitude has been registered.
- Livestock and unauthorised access to the construction domain needs to be prevented. Excavations to be adequately safeguarded.

10 MONITORING

Monitoring is required to ensure that the receiving environment at the relevant borrow pits and quarry is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of closure activities.

10.1 Baseline Monitoring

Baseline monitoring will be undertaken to determine the pre-construction state of the receiving environment at the relevant borrow pits and quarry, and it is discussed further in the Pre-Construction EMPr. Records of pre-construction survey to be kept for rehabilitation purposes.

10.2 Environmental Monitoring

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

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

1. Air Quality –
    - Dust fallout;
    - Particulate matter (PM_{10});
2. Noise; and
3. Water quality.

The following requirements need to be incorporated into the environmental monitoring programme:

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

Note that the specifications will include more detailed requirements in terms of environmental monitoring for closure activities.

10.3 Compliance Monitoring and Auditing

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

The ECO will undertake weekly inspections of the site and at least 6 monthly full compliance auditing against the EMPr and Environmental Authorisation. The aforementioned reports will be submitted to the Project Manager, EMC and DEA for their records.

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

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

the activity on an ongoing basis and to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and

b. The level of compliance with the provisions of Environmental Authorisation, EMPr and the Closure Plan.

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

- Method Statements;
- Site instructions;
- Emergency preparedness and response procedures;
- Record of environmental incidents;
- Non-conformance register;
- Training records;
- Site inspection reports;
- Monitoring reports;
- Auditing reports; and
- Public complaints register.

11 ENVIRONMENTAL TRAINING & AWARENESS CREATION

Training aims to create an understanding of environmental management obligations and prescriptive measures governing the execution of the closure activities.

Awareness creation strives to foster a general attentiveness amongst the construction workforce to sensitive environmental features and an understanding of implementing environmental best practices. The various means of creating environmental awareness for the closure of the mined areas may include:

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

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

12 CLOSURE PLAN REVIEW

The Closure Plan will be reviewed and revised when necessary to ensure continued environmental improvement. Changes to the Closure Plan shall be required where the existing management measures:

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

The amendment of the Closure Plan will be undertaken in terms of Regulation 34 – 37 of GN No. R 982 (4 December 2014), as applicable.

13 IMPLEMENTATION PROGRAMME

The framework for the subsequent management measures related to closure activities consists of the following:

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

13.1 Administrative Requirements

Management Objective:

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

Target:

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

Management Actions:

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

Responsibilities:

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

Monitoring Requirements:

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

13.2 Risk Assessment

Management Objective:

- Manage risks associated with closure activities.

Target:

- All risks to be identified and addressed through suitable mitigation measures.

Management Actions:

- Risk assessment to be conducted prior to closure of mined areas to establish potential environmental impacts and to identify suitable mitigation measures.
- Review provisions in approved Closure Plan and amend as necessary, in accordance with the EIA Regulations (4 December 2014).

Responsibilities:

- Proponent – approval for amendment of Closure Plan (if necessary).
- Project Manager and ECO – checking and approval of risk assessment.
- Contractor – conduct risk assessment.

Monitoring Requirements:

- Documented risk assessment.
- Approved Method Statement.
- Amended Closure Plan with approval (if necessary).

13.3 Environmental Awareness Creation

Management Objective:

Ensure that the Contractor, construction workers and site personnel that will be involved with closure activities are aware of the relevant provisions of the Closure Plan, EMPr, sensitive environmental features and agreements made with the affected landowners and community members.

Target:

1. All construction workers and employees that will be involved with closure activities to have completed appropriate environmental training.
2. A record of environmental training undertaken to be kept on site.

Management Actions:

- The Contractor must arrange that all of his employees that will be involved with closure activities go through the project specific environmental awareness training courses before the commencement of closure activities.
- The environmental training is compulsory for all employees that will be involved with closure activities and it will be structured in accordance with their relevant rank, level and responsibility, as well as the Environmental Specification as they apply to the works and site.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

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

13.4 On-going Consultation with Affected Parties

Management Objective:

- Establish and maintain a record of all complaints and claims pertaining to mining and closure activities and ensure that these are timeously and effectively verified and responded to.
- Adhere to agreements made with individual landowners and community members regarding mining and closure activities.

Target:

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

Management Actions:

- Establish lines of communications with landowners and community members.
- Establish processes and procedures to effectively verify and address complaints and claims received.
- Complaints or liaisons with landowners and community members with regard to environmental aspects, compensation or disturbance to activities or animals, must be recorded, reported to the correct person and a record of the response is to be entered in the complaints register.
- Provide relevant contact details to landowners and community members for queries / raising of issues or complaints.
- Provide all information, especially technical findings, in a language that is understandable to the general public.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.

13.5 Management of Access & Traffic

Management Objective:

- Ensure that all construction vehicles use only dedicated access routes to mined areas.
- Ensure proper access control.
- Prevent unlawful access to mined areas.
- Adhere to agreements made with individual landowners and community members regarding access.
- Ensure the safety of all road users.

Target:

1. No reports of construction vehicles using other unauthorised routes.
2. No direct harm to livestock and wild animals due to inadequate access control.
3. No unwarranted complained regarding access.

Management Actions:

- Undertake negotiations and confirm arrangements with the private landowners regarding access arrangements.
- Determine and document the road conditions of the access roads, as relevant.
- Temporary access roads to be suitably rehabilitated.
- Speed limit of 40km/h on public and other roads within the project area to be adhered to.
- Ensure appropriate traffic safety measures are implemented to make provision for blind rises and sharp bends on the R344 (near quarry).
- Permission required from the Project Manager for the movement of any vehicles and/or personnel outside of designated working areas.
- Access roads to be maintained in a suitable condition.
- Clearly mark pedestrian-safe access routes.
- Suitable erosion protective measures to be implemented for access roads.
- Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented.
- Clearly demarcate all access roads.
- Proper access control to be maintained to prevent livestock from accessing mined areas.
- All fences erected for construction should be inspected on a daily basis to detect whether any damage has occurred. Damaged fences / barricading to be repaired immediately.
- Consult with property owners, local authorities and communities to ensure that all affected parties are informed of the timing and extent of any disruptions.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

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

13.6 Management of Waste

Management Objective:

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

Target:

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

Management Actions:

- Waste management activities must comply with the National Environmental Management: Waste Act (No. 59 of 2008).
- The storage of general or hazardous waste in a waste storage facility must comply with the norms and standards in GN No. R. 926 of 29 November 2013.
- Where possible, waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes).
- Establish and monitor recycling targets.
- Provide waste skips at the mining areas. These skips should be sufficient in number, the skip storage area should be kept clean, skips should be emptied and replaced before overflowing or spillage occurs.
- Ensure suitable housekeeping. .
- The Contractor will ensure that no burying, dumping or burning of waste materials, vegetation, litter or refuse occurs. All waste will be disposed of at suitable licensed disposal sites, based on the waste type (general versus hazardous).
- Ensure that solid waste is transported so as to avoid waste spills en-route.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

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

13.7 Management of Pollution Generation Potential

Management Objective:

- Ensure that all possible causes of pollution that may be associated with closure activities are mitigated as far as possible to minimise impacts to the surrounding environment.

Target:

1. No complaints regarding pollution.
2. No measurable signs of pollution.
3. Dust fallout -
    a. Fenceline sites = Industrial Band (600 to 1200 mg/m^2/day);
    b. Community sites = Residential Band (< 600 mg/m^2/day);
    c. Comply with ASTM D1739; *SANS 1929, SANS 69.*
4. Particulate matter (PM_{10}) -
    a. 24 hr = 120 µg/m^3 (more than four times a year);
    b. Annual = 50 µg/m^3;
    c. Comply with the National Ambient Air Quality Standards.
5. Noise -
    a. L_{Aeq} (equivalent continuous sound level) during daytime hours (07:00 to 22:00) = 45 dBA;
    b. L_{Aeq} during night-time hours (22:00 to 07:00) = 35 dBA;
    c. Comply with SANS 10103:2008.
6. Water quality – construction activities may not cause an adverse impact that results in more than a 10% change in baseline values.
7. All water discharges to comply with legal requirements associated with the National Water Act (Act No. 36 of 1998), including GN No. 399.

Management Actions:

- **<u>Noise</u> -**
    - The remote nature of the construction domain needs to be factored in to the mitigation of noise-related aspects.
    - The provisions of SANS 10103:2008 will apply to all areas at the perimeter of the site, within audible distance of residents.
    - Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners and community members.

- Construction activities generating output levels of 85 dB or more will be confined to the hours during normal working hours.
- The Contractor will take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools.

- **Dust -**
  - Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of construction activities to sensitive receptors.
  - Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area, access roads, borrow pits, site yard, etc.
  - Speed limits to be strictly adhered to.
  - The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties).
- **Erosion -**
  - Protect areas that are susceptible to erosion through suitable measures (e.g. watering, planting, retaining structures, commercial anti-erosion compounds).
  - Any erosion channels caused by construction activities to be suitably stabilised and rehabilitated.
  - All efforts to prohibit ponding on surface and ensure stormwater runoff is channelled from the site must be made. The method used will be appropriate to the expected stormwater flows and the topography and geology of the site.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.
- Contractor to conduct environmental monitoring for air quality (dust and PM_{10}), noise and water quality.

Monitoring Requirements:

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

- Air, noise and water quality monitoring.

13.8 Management of Emergency Procedures

Management Objective:

- Minimise environmental impacts associated with emergency procedures.

Target:

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

Management Actions:

- **Fire** -
  - Comply with the National Veld and Forest Fire Act (No. 101 of 1998).
  - Work closely with the local fire protection association. Determine requirements and add to list of emergency telephone numbers. Keep a fire danger index displayed on site and comply with requirements. Fire breaks are to be agreed with neighbours and the local fire protection association.
  - Proper emergency response procedure to be in place for dealing with fires.
  - Burning of waste is not permitted.
  - All fire control mechanisms (fire fighting equipment) will be routinely inspected by a qualified investigator for efficacy thereof and be approved by local fire services.
  - All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to alert to the presence of a fire.
  - No fires are allowed on site, unless in dedicated areas approved by the Project Manager.
  - Firebreaks to be made for mining areas, as required.
  - Dedicated smoking areas to be provided. Sigarette butts may not be disposed of onsite.
- **Accidental Leaks and Spillages** -
  - Proper emergency response procedure to be in place for dealing with spills and leaks.
  - Ensure that the necessary materials and equipment for dealing with spills and leaks are available on site, where practicable.
  - Remediation of the spill areas will be undertaken to the satisfaction of the Project Manager.
  - In the event of a hydrocarbon spill, the source of the spillage will be isolated and contained. The area will be cordoned off and secured. The Contractor will ensure that

there is always a supply of an appropriate absorbent material readily available to absorb, breakdown and where possible, encapsulate a minor hydrocarbon spillage.

- All staff on site will be made aware of actions to be taken in case of a spillage.
- Provide contact details of person to be notified in a case of spillages – signage to be displayed at strategic points within the mining areas (e.g. workshop, fuel storage area, hazardous material containers).

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

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

13.9 Management of Health and Safety

Management Objective:

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

Target:

1. Approved Health and Safety Plan.
2. No incidents.
3. Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993), Construction Regulations (2003) and other relevant regulations.

Management Actions:

- Contractor to submit a Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval prior to the commencement of work. These requirements are aligned with the Construction Regulations (2003).
- Fencing and barriers will be in place in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993).
- Comply with the provisions of the Fencing Act (Act No. 31 of 1963).

- Applicable notice boards and hazard warning notices will be put in place and secured. Night hazards will be indicated suitably (e.g. reflectors, lighting, traffic signage).
- Emergency contact details will be prominently displayed.
- Two-Way Radio Systems should be used where cell phone coverage is poor.
- All construction personal must be clearly identifiable. All employees must also be issued with employee cards for identification purposes.
- All workers will be supplied with the required Personal Protective Equipment as per the Occupational Health and Safety Act (Act No. 85 of 1993).
- Maintain access control to prevent access of the public to the mining areas, as far as practicable.
- Use approved communication channels to inform the community of Occupational Health and Safety measures to prevent incidents involving community members.

Responsibilities:

- Project Manager and ECO - checking.
- Dedicated Occupational Health and Safety system to be implemented by Contractor's Safety Officer. To be monitored and audited by the Client's Safety Agent, in terms of the Construction Regulations (2003).
- Contractor to implement management actions.

Monitoring Requirements:

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

13.10 Management of Reinstatement and Rehabilitation

Management Objective:

- Adequate reinstatement and rehabilitation of mined areas outside of dam basin.
- Conduct concurrent or progressive rehabilitation.
- Final shape and form of the mined areas to blend with the surrounding landscape.
- Render the site clean and safe.

Target:

1. No remaining infrastructure associated with mining activities.
2. No pollution sources to remain.
3. Reinstatement of mined area to pre-construction state / desired state established in consultation with the landowner.

4. At least 80% of the surface area of the rehabilitated land should be free of surface run-off water in a year of normal precipitation.

Management Actions:

- **Removal of structures and infrastructure**
  - After the cessation of mining activities the mined areas outside of the dam basin must be rehabilitated by appropriate landscaping, levelling, topsoil dressing, land preparation, alien plant eradication and vegetation establishment.
  - Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, and fixtures.
  - Demolish and remove infrastructure erected at the site as part of the mining activities.
  - All services to be dismantled and re-moved from site.
  - All foreign materials to be removed from site.
  - Ensure that all access roads utilised during construction which are outside of the dam basin and not earmarked for use during the operational phase, are returned to a usable state and/or a state no worse than prior to construction.
- **Inert waste and rubble**
  - Clear the mined areas of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates. After the material has been removed, the site shall be re-instated and rehabilitated.
  - Load and haul excess spoil and inert rubble to fill in borrow pits/dongas or to dump sites indicated/approved by the Project Manager.
  - Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site.
- **Hazardous waste and pollution control**
  - Remove from site all pollution containment structures.
  - Soil contaminated with oil, grease, fuel or other hydrocarbon to be treated as hazardous waste and suitably disposed of.
  - Remove from site all temporary sanitary infrastructure and waste water disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.
  - Comply with relevant provisions under the EMPr for *Management of Storage and Handling of H*azardous *Material*, *Management of Water*, *Management of Waste*, *Management of Pollution Generation Potential*.
- **Final shaping**
  - Make safe all borrow pits, quarries and dangerous excavations outside of the dam basin by backfilling, grading and blasting as required.

- Compare sites with records from pre-construction survey.
- Confirm post-mining reinstatement in consultation with the affected landowner.
- Mined areas to be reinstated to achieve the following:
  - Sites to blend in with the surrounding areas and to appear as a natural extension to the adjacent, undisturbed ground profiles;
  - Sharp angles / corners to be avoided; and
  - Smooth / flowing curves to be created that blend with the surrounding landscape;
  - Even contours to be created.
- All material in and around the mined areas, whether spoil, excess stockpiled material, oversize material left in the borrow pit, material resulting from clearing and grubbing, or excess overburden may be used for shaping if approved by the Project Manager, or appropriately disposed of. Material not capable of supporting vegetation shall be buried in the borrow pit and covered with at least 500 mm of soft material.
- In general, no slopes steeper than 1(V):3(H) are permitted, unless otherwise specified by the Project Manager. Steeper slopes require protection. New slopes must mimic the natural slopes and topography, where possible.
- Monitor filled areas for subsidence (as the backfill settles) and fill depressions using available material.
- Shape all mined areas to blend in with the surrounding landscape, where possible.

- **Stormwater Management**
  - The mining areas should be phased, developed and finished in such a manner that, on completion of the rehabilitation process, the areas drain properly and run-off water does not cause erosion.
  - Measures to prevent soil erosion should be established in all rehabilitated areas, including access roads, mined areas, areas used for site infrastructure and stockpiles, and any other areas disturbed during mining that have natural drainage routes running through them or which are not level. It is noted that a drainage line passes through the quarry site.
  - Provision should be made for permanent drainage works to facilitate the management of run-off in all rehabilitated areas. This could include the construction of a bund and/ or cut-off drain.
  - Drainage should be designed in such a manner that it will minimize ponding, and ideally borrow pits should be free-draining.
  - Drainage systems should be designed to minimize erosion caused by runoff and major rainfall events.
- **Topsoil replacement and soil amelioration**
  - Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
  - Execute topsoil placement only after all mining activities have ceased.

- Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the borrow pits and quarry, as well as temporary access routes. Replace topsoil to the original depth.
- Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
- The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage.
- Do not use topsoil suspected to be contaminated with the seed of alien vegetation (e.g. black wattle). Alternatively, the soil is to be appropriately treated.
- Ensure that storm water run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it.
- Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.
- After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.

- **Ripping and scarifying**
  - Rip and/or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary will be based on the site conditions immediately before these works begin.
  - Rip and/or scarify all disturbed (and other specified) areas of the mined areas, including temporary access routes and roads, compacted during the execution of the mining activities.
  - Rip and/or scarify along the contour to prevent the creation of down-slope channels.
  - Do not rip and/or scarify areas under wet conditions, as the soil will not break up.
- **Planting**
  - *Transplanted plants*
    - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
    - Transplanting entails the removal of plant material and replanting the same plants in another designated position.
    - Transplant trees and shrubs into designated positions.
    - Establish further specifications for transplanted plants.
  - *Nursery plants*
    - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
    - Plant all trees, shrubs and individual plants in designated positions.

- Planting should preferably be done during the rainy season.
- After planting, each plant must be well watered, adding more soil upon settlement if necessary.
- Establish further specifications for nursery plants.

- *Seeds and seedlings*
  - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
  - Tree seedling material should be fresh and of local origin. Resist using plants from far afield as they may not be best suited to local climatic or soil conditions.
  - Small seedlings are likely to transplant more successfully than will large ones. These should be potted and kept under nursery conditions until they are large enough to plant out.
  - Establish further specifications for seeds and seedlings.

- **Grassing**
  - Suitably trained personnel must undertake grassing by making use of the appropriate equipment and grass species as specified by the terrestrial ecologist.
  - Sodding may be done at any time of the year, but seeding must be done during the summer when the germination rate is better.
  - Hydroseeding with a winter mix will only be specified where regrassing is urgent, and cannot wait for the summer.
  - Establish further specifications for sods, runners and hand seeding.
- **Maintenance**
  - Monitor the re-growth of invasive vegetative material.
  - Cordon off areas that are under rehabilitation as no-go areas. Once revegetated, areas should be protected to prevent trampling and erosion. No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated.
  - Revegetation must match the vegetation type, which previously existed, unless otherwise indicated by a suitable specialist.
  - Control invasive plant species and noxious weeds by means of extraction, cutting or other approved methods.
  - For planted areas that have failed to establish, replace plants with the same species as originally specified.
  - Any runnels, erosion channels or wash aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.
  - Establish further specifications for maintenance.

- The holder of the authorisation will stay liable until a Closure Certificate has been issued for the site by the DMR.

- **Post-closure Access**
  - Where rehabilitation sites are located within actively grazed areas, they should be fenced. This fencing should be removed once a sound vegetative cover has been achieved.
  - Where the mined areas are likely to pose significant risks after rehabilitation, e.g. dangerous slopes (steeper than 1:2 or unstable), not free draining, poor visibility, etc., then the perimeter of area, as defined by the expropriation or landowner agreement, should be secured with permanent fencing. Stock-proof fencing to be provided and appropriate signage to be erected.
  - A gate should be provided to permit access to the site for the ongoing monitoring and management of the site rehabilitation..

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Pre-construction survey records.
- Designs.
- Landowner agreements.
- Contractor’s method statement.
- Photographic evidence of clean-up.
- Waste register.
- Disposal certificates.

14 REFERENCES

DWS, 2014. Feasibility Study for Foxwood Dam: Geotechnical Investigation Report. P WMA 15/Q92/00/2113/12. Department of Water and Sanitation (DWS), Pretoria.

WCPA, 2006. Operational Manual, Chapter 7: Closure of Depleted Borrow Pits. Western Cape Provincial Administration.