

DEPARTMENT OF WATER AND SANITATION

DWS06-0219 (WTE)

**THE DRILLING AND GROUTING OF THE FOUNDATION OF THE CLANWILLIAM DAM IN THE
WESTERN CAPE PROVINCE**

C4. DRAWINGS

CONTENTS

C4.1 TENDER DRAWINGS

C4.1 TENDER DRAWINGS

The drawings issued to the tenders as part of the tender documents must be regarded as provisional and preliminary for the tenderer's benefit to generally assess the scope of work.

The work shall be carried out in accordance with the latest available revision of the drawings approved for construction (AFC)

At commencement of the contract, the Engineer shall deliver to the Contractor copies of the AFC drawings and any instructions required for the commencement of the works. From time to time there after during progress of the works, the Engineer may issue further drawings for construction purposes as may be necessary for adequate construction, completion and defects correction of the works.

All drawings and specifications and copies thereof remain the property of the Employer, and the Contractor shall return all drawings and copies thereof to the Employer at the completion of the contract.

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CWD 1101	Consolidation Grouting Details
CWD 1102	Typical Curtain and Consolidation grouting Details
CWD 1121	Coffer Dam Grouting Plan
CWD 1122	Coffer Dam Grouting: Section 01-01
CWD 1123	RCC Coffer Dam Grouting Details

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POLLUTANTS-DOOM RIVER WATER RESOURCES PROJECTIONS (Feb. 3, 4, 1987)

RAISING OF CLANNILLIAM DAM

TABLE 2: PIPE CHARACTERISTICS

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1.3 THE "PIL- OFF MENUS" NEED TO GO, MYSTIC BEGS AGAIN & SAYS-OF WHICH MANY BE BORN TO BELIEVE, WE NEED SOMETHING BETWEEN THE COASTING AND THE INSIDE.

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1.6 THE ABOVE REPORT SHALL BE USED TO DETERMINE THE DIFFERENCE BETWEEN, E.G. CASH-BUYING, WHOLE-LETTING ETC. TO BE PRESENTED TO MONITOR THE ISSUES CONCERNING SUCH.

7. **THE COMPANY'S POLICY** IS TO PROVIDE THE BEST SERVICE AND QUALITY OF WORKMANSHIP TO ALL CUSTOMERS AND TO MAINTAIN THE HIGHEST STANDARDS OF INTEGRITY AND ETHICS IN ALL BUSINESS DEALINGS.

1.2 100% SECURED TO BE AT LEAST 1.5 x 1.5 x 1.5 METRE
WIDE IN ALL DIRECTIONS.

1.9 THE FOLLOWING TEST MUST BE PERFORMED ON ALL MOUNTAIN BIKES
IN EACH TEST SECTION.

1.8 SIDE PULL-OFF TEST IN THE CAPTAIN POST OR AT LEAST A

1. **IF YOU ARE NOT SURE OF THE ANSWER, GUESS**

THE POSSIBLE EFFECT OF COMPARISON OF THE PRESENCE AND ABSENCE OF A NUMBER OF MEDICAL INDICES AND OTHER FACTORS.

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OLYMPIAN-DOUGEN RIVER WATER RESOURCES PROJECT
BIDDING OF CONTRACTS

RAISING OF LANMILLIAM DAM SPILLWAY EXCAVATION DRAGGERS AND FIXED SURFACE PREPARATION

UNIVERSITY OF
MICHIGAN

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6J - CONSTRUCTION JOINT



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4	14.5	13.5	12.5	11.5
5	13.5	12.5	11.5	10.5
6	12.5	11.5	10.5	9.5
7	11.5	10.5	9.5	8.5
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DEPARTMENT OF WATER AND SANITATION

BID REF0126-08-18 (WTE)

**THE DRILLING AND GROUTING OF THE FOUNDATION OF THE CLANWILLIAM DAM IN THE
WESTERN CAPE PROVINCE**

C5. SITE INFORMATION

CONTENTS

C5.1 FIRST ENGINEERING GEOLOGY REPORT

C5.1 FIRST ENGINEERING GEOLOGY REPORT

The document will be handed out as a CD at the compulsory site meeting.

The information and interpretations made in the above mentioned First Engineering Geological Report for Design are provided to assist bidders. No responsibility, for the accuracy of any information contained in this report, is accepted by the Employer. No subsequent claims made by the Contractor for losses or additional costs caused by information contained in the above report or any interpretation thereof will be considered by the Engineer.

DEPARTMENT OF WATER AND SANITATION

BID REF0126-08-18 (WTE)

THE DRILLING AND GROUTING OF THE FOUNDATION OF THE CLANWILLIAM DAM IN THE WESTERN CAPE PROVINCE

C6. ENVIRONMENTAL MANAGEMENT PROGRAMME (EMP)

C6.1 EMP DOCUMENT

The EMP document is as it has been approved by Western Cape Government: Ministry of Local Government, Environmental Affairs and Development Planning.

C6.2 FIRST ENGINEERING GEOLOGY REPORT

The document will be handed out as a CD at the compulsory site meeting.

The information and interpretations made in the above mentioned First Engineering Geological Report for Design are provided to assist bidders. No responsibility, for the accuracy of any information contained in this report, is accepted by the Employer. No subsequent claims made by the Contractor for losses or additional costs caused by information contained in the above report or any interpretation thereof will be considered by the Engineer.



water & sanitation

Department
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



**REVISED ENVIRONMENTAL
MANAGEMENT PROGRAMME FOR
THE STRENGTHENING AND RAISING
OF CLANWILLIAM DAM**

Report No : 13086-46-Rep-001-EMP

REV 0



PREPARED BY:

TLOU INTEGRATED TECH

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water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

OLIFANTS-DORING RIVERS THE STRENGTHENING AND RISING OF CLANWILLIAM DAM

ENVIRONMENTAL MANAGEMENT PROGRAMME

Revision 0

October 2014



TLOU INTEGRATED TECH cc.

27 de Wet 17 of 2002 as amended

PROJECT DETAILS

Title: *Revised EMPr for the Strengthening and Raising of Clanwillian Dam*

Client: *Department of Water and Sanitation
Private bag x 313
Pretoria
0001*

Project number: *WP 0895 WTE*

Date: *October 2014*

Authors : *Isabel Radebe (Pr Tech Eng & Post Grad)*
(Tlou Integrated Tech cc)
Dr Mathys Vosloo (Phd.D Zoology & Registered Pr Science)
(Zitholele Environmental Consulting)

Approved on behalf of Tlou Integrated Tech cc:

.....
SL Kekana Pr Tech Eng & Post Grad.
Project Leader

Approved on behalf of the Department of Water and Sanitations:

.....
Mark Anthony-Williams
Infrastructure Management Services - Chief Director

EMPr – Clanwilliam Dam

Document Control Record and Inputs

Revision	Consultations	Department	Dates	Description
1	Mark Anthony-Williams	DWS	October 2014	Rev 1
	Mishelle Govender	DWS		
	Levy Kekana	PSP		
	Isabel Radebe	PSP		
	Dr Mathys Vosloo	PSP		
	Shandre Laven	PSP		
	Harry Swart	DWS		
	Johannes Van Zyl	DWS		
	Wouter Fourie	PSP		

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LIST OF ACROYNYS

Acronym	Description
CA	Competent Authority
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme in terms of the NEMA
EMPr	Environmental Management Programme in terms of the MPRDA
HIA	Heritage Impact Assessment
MPRDA	Mineral Petroleum Resources Development Act (28 of 2002) as amended
NEMA	National Environmental Management Act (107 of 1998) as amended
NWA	National Water Act (36 of 1998) as amended
S&EIR	Scoping and Environmental Impact Reporting
BPEO	Best Practicable Environmental Option
I&AP	Interested and Affect Party

GLOSSARY OF TERMS

Term	Description
Best Practicable Environmental Option	<p>Best Practicable Environmental Option means the option that provides the most benefit or causes the least damage to the environment as a whole at a cost acceptable to society in the long term as well as in the short term.</p> <p>Environment means the surroundings within which humans exist and that are made up of –</p> <p>(i) the land, water and atmosphere of the earth;</p> <p>(ii) micro-organisms, plant and animal life;</p> <p>(iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and</p> <p>(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.</p>
Pollution	<p>Pollution means any change in the environment caused by –</p> <p>(i) substances;</p> <p>(ii) radioactive or other waves; or</p> <p>(iii) noise, odours, dust or heat,</p> <p>emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.</p>
Environmental Aspect	<p>Element of an organization's activities or products or services that can interact with the environment.</p>
Environmental Impact	<p>Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.</p>
Interested and Affected Party	<p>Interested and Affected Party for the purposes of Chapter 5 of the NEMA and in relation to the assessment of the environmental impact of a listed activity or related activity, means an interested and affected party contemplated in Section 24(4)(a)(v) of the NEMA and which includes –</p> <p>a) Any person, group of persons or organisation interested in or affected by such operation or activity; and</p> <p>b) Any organ of state that may have jurisdiction over any aspect of the operation or activity.</p>
Environmental Assessment Practitioner	<p>Individual responsible for the planning, management, coordination or review of Environmental Impact Assessments, Strategic Environmental Assessments, Environmental Management Programmes or any other appropriate environmental instruments introduced through regulations.</p>

1 Introduction

The Department of Water and Sanitation (DWS) (previous Department of Water Affairs) intend to proceed with the implementation of the Strengthening and Raising of the existing Clanwilliam Dam and associated re-alignment of certain secondary roads Project (hereafter referred to as the proposed project). The mandatory Environmental Authorisation Process for the proposed project was concluded with the granting of Environmental Authorisation by the Western Cape Department of Environmental Affairs and Development Planning (WCDEADP). The proposed project was prompted by the opportunity to increase the water-yield of the existing Clanwilliam Dam brought by the necessity to conform with the dam safety requirements stipulated in Chapter 12, Section 123 of the National Water Act (36 of 1998) (NWA) and regulations thereunder. The projected marginal cost of raising over and above the cost of strengthening the dam wall, is such that the raising is considered as economically viable, socially desirable and environmentally acceptable.

The Clanwilliam Dam is an existing impoundment structure (see Figure 1) and was constructed in 1935 prior to the coming into effect of the National Environmental Management Act (107 of 1998) (NEMA), the NWA as well as Specific Environmental Management Acts such as the National Environmental Management: Waste Act (59 of 2008) (NEMWA). Structural changes made to the Clanwilliam Dam to date include raising the dam wall with the addition of 13 crest gates and through the use of pre-stressed cables. The Clanwilliam Dam wall is 43 meters high and the dam has a storage capacity of 124 million m³ which will be increased to 362 million m³ with the proposed raising of the dam



Figure 1: View of existing Clanwilliam Dam Wall from western bank

wall.

The activities required for the Strengthening and Raising of the existing Clanwilliam Dam and associated re-alignment of certain secondary roads fall within the ambit of the National Environmental Management Act (107 of 1998) and as such require Environmental Authorisation (EA) before the activities can proceed. The Environmental Impact Assessment carried out for the proposed project was initiated during November 2004, prior to promulgation of the NEMA Environmental Impact Assessment Regulations 2010, as such the EIA Process for the proposed project was carried out in accordance with the EIA regulations (R.1183¹) promulgated in terms of the Environment Conservation Act (73 of 1989) (ECA). Environmental Authorisation for the proposed project was granted by the WCDEADP on 22 February 2010, allowing the proposed project to be implemented. Prior to the implementation of the Construction Phase a number of conditions provided in the Environmental Authorisation must be met including revising the DWS' generic Environmental Management Programme to ensure that the document is project specific all that EA Conditions are incorporated. The revision and amendment of the EMP_r for the proposed project will ensure that the management measures provided in the document are adapted to suit the project specific conditions and nature of the receiving environment.

1.1 Purpose of the Environmental Management Programme

The application of the EIA Process, for the proposed project, served as a pre-decision making Environmental Management Tool for determining and evaluating the significance of the environmental consequences that the implementation of the project activities. The environmental consequences (i.e. environmental impacts) and mitigation measures formulated to manage these impacts informed the conditions provided in the EA and consideration of the Application by the WCDEADP. Managing the environmental consequences through preventing or reducing the significance thereof lies in the implementation of the mitigation measures.

The mitigation measures provided in the Environmental Impact Report (titled "Proposed raising of Clanwilliam Dam and associated realignment of affected roads Final

¹ Environment Conservation Act (73 of 1989) Regulations regarding activities identified under Section 21(1). 1997. (Notice 1183). *Government gazette*. 8261:1, 5 Sept.

Environmental Impact Report") dated September 2007, have been translated into enforceable EA Conditions and have been incorporated into this EMPr. This document serves as the Revised EMPr for the proposed Strengthening and Raising of the existing Clanwilliam Dam and associated re-alignment of certain secondary roads Project. Furthermore the EMPr is intended to achieve the following primary objectives:

- Conform to the information requirements stipulated in Regulation 33 of the NEMA EIA Regulations 2010 (Government Notice R.543)
- Ensure that environmental management practices are tailored to the site specific conditions are implemented throughout the project lifecycle;
- Ensure that the conditions provided in the EA are translated into management actions, and to report on the measures that have been taken to comply with the EA Conditions;
- Conform to Condition 23 of the Environmental Authorisation issued by the WCDEADP for the proposed project; and
- Ensure that all reasonable measures are taken to prevent the realisation of adverse environmental consequences that be prevented with the implementation of mitigation measures.

1.2 Particulars of the Environmental Assessment Practitioner

In keeping with the requirements of Condition 23 of the Environmental Authorisation granted by the WCDEADP for the proposed project, Tlou Integrated Tech (referred to as "Tlou") were appointed by the DWS to update and refine the DWS' Generic Environmental Management Plan which was submitted with the initial EIA Application. In its team, Tlou has included a professional team members from Zitholele Environmental Consulting to look at specialist component of the project. The overall details and competencies of the project team members who contributed to and were instrumental in preparing this EMPr is provided in Table 1.

Table 1-1: Details of Project Team Members

Team Member	General responsibilities	Qualifications	Core competencies under this framework appointment
Isabel Radebe	Professional Staff – Project management	Registered Pr Tech Eng and Post Grad. Dipl in Business Management from University of Johannesburg and University of Natal.	EIA Project Manager, Review of deliverables, EIA Project and financial management, Client Liaison, EIA reporting, Management of specialists.
Dr Mathys Vosloo	Professional Staff – Environmental Assessment Practitioner	Ph.D. - Zoology (Nelson Mandela Metropolitan University, 2012). SACNASP, Pr Sci.Nat registered	EIA Project Manager, Review of deliverables, EIA Project and financial management, Management of GIS, Client Liaison, EIA reporting, Management of specialists, Technical mentoring, Management of statutory processes and risk assessment
Mrs Shandr� Laven	Professional Staff – Environmental Assessment Practitioner	BSc Hons. – Environmental Science (North West University, 2009). SACNASP, Cand.Sci.Nat. registered	

All existing feasibility, preliminary design, Ecological Water Requirements (EWR), and EIA documents was used to prepare the EMP. These documents were provided by project proponent upon the appointment of Tlou. The conditions provided in the EA called for the development of mitigation measures aimed at protecting groundwater resources and the appointment of a Heritage Expert to assist with the recording of heritage resources and implementation of mitigation measures.

1.3 Document Roadmap – Rationale for document structure

The regulations promulgated under the ECA which related to EIA did not make any provision for the inclusion or contents of an Environmental Management Plan in the submissions made to the Competent Authority. Although the Environmental Impact Assessment Process for the proposed project was carried out in accordance with the EIA regulations (R.1183) promulgated in terms of the ECA this EMP has been structured to conform to the requirements provided in Regulation 33 of the NEMA EIA Regulations 2010.

1.3.1 Content of EMPr – Regulation 33 of NEMA EIA Regulations 2010

Specific provisions which are included in Regulation 33 of the Environmental Impact Assessment (EIA) Regulations 2010 (R.543²) relating to the contents of an EMPr is provided in Table 1-2. It should be noted that obligations imposed by the EMPr are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this project. Non-compliance to environmental law is a criminal offence and if prosecuted Eskom will be liable for any environmental damage incurred.

Table 1-2: Document Roadmap

DOCUMENT ROADMAP		
Regulation 33 of the EIA Regulations (2010)	Description of Regulation	Relevant chapter of document
Regulation 33(a)	details of – (i) the person who prepared the environmental management programme; and (ii) the expertise of that person to prepare an environmental management programme;	Part 1.2
Regulation 33(b)	information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of— (i) planning and design; (ii) pre-construction and construction activities; (iii) operation or undertaking of the activity; (iv) rehabilitation of the environment; and (v) closure, where relevant.	Part 6
Regulation 33(c)	a detailed description of the aspects of the activity that are covered by the draft environmental management programme;	Part 6
Regulation 33(d)	an identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);	Part 4
Regulation 33(e)	proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;	Part 7
		Part 8
Regulation 33(f)	as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures;	Part 6.17

² South Africa. 2010. National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations, 2010. (Notice 543). *Government gazette* 33306:3, 18 June

DOCUMENT ROADMAP		
Regulation 33 of the EIA Regulations (2010)	Description of Regulation	Relevant chapter of document
Regulation 33(g)	a description of the manner in which it intends to— (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of pollutants; (iii) comply with any prescribed environmental management standards or practices; (iv) comply with any applicable provisions of the Act regarding closure, where applicable; (v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	Part 8
Regulation 33(h)	time periods within which the measures contemplated in the environmental management programme must be implemented;	Part 6
		Part 7
		Part 8
Regulation 33(i)	the process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;	Part 8.5
Regulation 33(j)	an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;	Part 8.1
Regulation 33(k)	Where appropriate, closure plans, including closure objectives.	Not Applicable

1.3.2 Incorporation of EA Conditions

Where the management and mitigation measures provided in this EMP serves to conform and respond to a specific condition provided in the EA, it will be indicated as such.

2 Project Description

2.1 Project Background and Description

The Clanwilliam Dam was built in 1935 and is situated on the Olifants River adjacent to the N7 in close proximity to the town of Clanwilliam in the Western Cape Province of the Republic of South Africa. Dam safety investigation concluded that the Clanwilliam Dam requires remedial work for dam safety reasons. Specific concerns are related to the pre-stressed cables having lost their shear resistance ability and there also being problems with alkali-aggregate reaction. As a result, the hazard and risk levels for the dam fall within an unacceptable range according to current DWS standards.

The Department of Water Affairs has received a conditional Environmental Authorisation for the raising of the existing Clanwilliam Dam by 15 m from 43 m to 58 m on 12 May 2009. The Environmental Authorisation for the dam raising requires that a comprehensive and detailed Environmental Management Programme for minimising and mitigating impacts be compiled and approved prior to the start of construction.

The proposed strengthening and raising of the Clanwilliam Dam Wall will entail the following overarching project activities:

- The strengthening of the dam wall by the addition of a concrete apron on the downstream face of the wall and adding additional concrete on the crest and downstream face;
- Raising the dam wall height from 43 meters to 58 meters, thereby increasing of the net storage volume of the Clanwilliam Dam with 240 million m³/a;
- Upgrading the dam to accommodate the reserve release requirements, which will include the construction of a multi-level intake structure on the upstream face of the dam wall, which will include drilling and cutting through the existing dam wall, accommodating the existing mini-hydropower station, and the construction of a new stilling basin for the outlets on the downstream side of the dam.

The raising of the Clanwilliam Dam Wall will necessitate roadworks relating to the realignment of the existing gravel access road on the eastern side of the dam as well as portions of the divisional and minor roads. The following roadworks associated with the proposed project will be carried out:

- To allow access to the raised Clanwilliam Dam Wall crest and outlet works, existing gravel access road located on the eastern side of the dam will be realigned;

- Realignment and raising, and possible closure, of portions of the gravel road between Clanwilliam and Citrusdal (Divisional Road DR2183) including the construction of a large culvert and bridge;
- Raising portions of the road between the N7 and Algeria (Divisional Road DR1487 / Minor Road MR539) including the construction of a bridge to replace the existing causeway over the Oliphant's River;
- Raising portions of the Citrusdal Road (Minor Road MR539) including the construction of a culvert to lift portions of the road; and
- Raising and realignment as well as the possible closure, of portions of the Renbaan Road (Minor Road MR16/2) including the construction of a large culvert.

Lastly, the proposed remedial work and possible raising of the dam would require numerous construction related activities which include, inter alia:

- The establishment of a construction camp (basic infrastructural services, sewerage and wastewater treatment, roads and storm water drainage, and erection of temporary or permanent housing).
- The establishment of a construction site (basic infrastructural services such as water and electrical reticulation, sewerage and wastewater treatment, roads and storm water drainage, administration offices, workshops, material storage areas).
- The construction of a permanent gravel road on the eastern side of the dam to provide access.
- The extension of the existing quarry to source and stockpile construction material

The maintenance and management of South Africa's National Road Network falls within the ambit of the SANRAL³. A separate EA Process for the realignment and raising of portions of the N7 to accommodate the raised Clanwilliam Dam Wall. EA was granted by the WCDEADP allowing the following project activities to proceed:

- Realignment of the portion of the N7 National Road between km 89.32 and km 95.92; and
- Raising of the portion of the N7 National Road between km 68.77 and km 70.22.

³ SANRAL: South African National Roads Agency Limited

2.2 Project Activities and Phasing

Due to the long nature of the proposed construction activities associated with the raising of the Clanwilliam Dam, it is proposed to consider construction activities in a phased approach, thus allowing sufficient time for compliance with pre-construction conditions stipulated in the environmental authorisation (EA) dated 12 May 2009. The phased approach including proposed construction timeframes and pre-construction conditions stipulated in the EA are presented in the Table 2-1 below.

Table 2-1: Phased approach to construction activities for the Clanwilliam Dam raising project.

Phase No	Phase	Construction activities	Impact area	Phase timing	Pre-construction conditions from RoD to comply with	Pre-construction conditions deadline
1	Construction site establishment	The establishment of a construction camp (Batching plant, silos, laydown areas, offices)	Area west of the existing quarry and N7 road	November 2014 to April 2015 (6 Months)	Conditions 3, 4, 11, 14, 22, 23, 23.13, 24	1 December 2014
		The establishment of a construction site	Immediately downstream of dam wall			
		The construction of a permanent gravel road	Eastern side of dam			
		The extension of the existing quarry	Existing quarry location			
2	Rehabilitation and raising of dam wall	Construction of temporary access roads	West of dam from construction camp to dam wall	February 2015 to December 2017 (35 months)	Conditions 6, 8, 16, 19, 20, 21, 27	15 January 2015
		Clearing of the foundation footprint in the river and on the valley flanks	Within 100m radius from dam wall			
		Demolition of various components of the existing dam				
		Excavations				
		Infilling and cut-off grouting below the new foundation				
		Drilling and blasting o drainage addlits into the valley flanks below the raised dam				
3	Raising, realignment and/or	Cutting of openings through the existing dam	Existing road alignments, area between existing	January 2018 - October	Conditions 9, 15	01 November 2017
		Erection of form work and casting of concrete				
		Portions of the gravel road between Clanwilliam and Citrusdal (Divisional Road DR 2183) including construction a large culvert and bridge				

Phase No	Phase	Construction activities	Impact area	Phase timing	Pre-construction conditions from RoD to comply with	Pre-construction conditions deadline
	decommissioning of existing provincial and minor roads	Raising of portions of the road between the N7 and Algeria (Divisional Road DR 1487 / Minor Road MR 539) including constructing a bridge to replace the causeway over the Oliphants River	dam level to new dam purchase line	2018 (10 months)		
		Raising of portions of the Citrusdal Road (Minor Road MR 539) including constructing a culvert to lift portions of the road				
		Raising and re-alignment, and possible closure, of portions of the Renbaan Road (Minor Road MR 16/2) including constructing a large culvert				
4	Raising of the water level in the dam and inundation of new area	Dam level rises causing inundation of the area below the purchase line.		Post October 2018	Conditions 10	30 September 2018

2.3 Design Considerations

2.3.1 Existing structure

Clanwilliam Dam is a concrete gravity dam with a non-overspill crest (NOC) length of approximately 250 m. The spillway section is 117.5 m long and has an approximated ogee shape. Spillway discharge is controlled with 13 vertical spillway gates. The gates are used to provide additional storage above the spillway invert level. Piers support the gates and deck over the spillway, resulting in an effective spillway length of 101 m. The full supply level (FSL) of the dam is at RL 105.25 m and the crest of the ogee at RL 102.20 m. Two outlet pipes of nominal diameter (ϕ) 1 219 mm discharges into the river. Their inlets are at RL 80.51 m. Discharge is controlled with sleeve valves. The maximum discharge capacity is approximately 10 m³/s. An additional outlet pipe delivers water to the hydropower plant, which is currently dysfunctional, and the irrigation canal on the downstream right flank.

The existing outlet works comprise of two 1219 mm pipes (RL 79,55) and two 914 mm pipes (RL 81,99). Both 1219 mm pipes are located within the spillway section, with one being just left of the existing outlet chamber and the other towards the middle of the spillway. Releases to the river are undertaken through these pipes.

2.3.2 Design philosophy

The design philosophy for the Clanwilliam Dam raising project centres on achieving the following aspects:

- Long-term structural reliability;
- Minimal operational requirements / predictable operation;
- Minimal maintenance requirements; and
- The budget for the project should be acceptable to the sponsor:

2.3.3 Availability of material

Results from geotechnical investigations indicate that adequate aggregate is available for the proposed raising by roller compacted concrete (RCC). RCC is the preferred material mainly due to the rapid tempo at which it can be placed, resulting in shorter construction periods and its relatively low heat of hydration. For the purposes of this report the design was based on the use of RCC. The eventual choice of spillway type and construction programme may dictate the use of mass concrete.

2.3.4 Dam wall structure considerations

The proposed dam wall structure is recommended to have the following characteristics:

- Construction of a concrete apron on the downstream face of the existing structure
- Additional concrete on the crest and downstream face of the existing structure;
- Raising the dam wall height from 43 meters to 58 meters
- Construction of a multi-level intake structure on the upstream face of the dam wall
- Drilling and cutting through the existing dam wall
- Construction of a new stilling basin for the outlets on the downstream side of the dam.

2.3.5 Non-Overspill Crests (NOC's)

It is recommended that NOC's are raised vertically including the addition of waterproof concrete balustrades or parapet walls. This will add to the storage height of the structure. Both the left and right NOC's are assumed to be 4,5 m wide. The crest levels of the NOC's are assumed to be at the maximum water levels. This means that a 0 m freeboard is accepted during the Safety Evaluation Flood.

2.3.6 New outlet works

The new outlet works will comprise of a combination of 1200 mm pipes and 900 mm pipes. The 900 mm pipes will be used to extend the existing 914 mm pipes. All other pipes will have a diameter of 1200 mm. Discharging shall be done by means of 900 mm sleeve valves for the 1200 mm pipes, and 600 mm sleeve valves for the 900 mm pipes. The combination and quantity of valves shall depend on the required discharge capacity of the outlet works.

2.4 Potential impacts resulting from the raising of the dam

The following impacts may affect the bio-physical and social environments within the study area.

2.4.1 Operational phase impacts

- Impact on flora;
- Impact on terrestrial fauna;
- Impact of reservoir-induced seismicity;
- Impact on ability to achieve recommended scenario for EWRs
- Impact on Riverine Fish; and
- Impact on groundwater resources.
- Visual impacts;
- Impact on heritage resources;

-
- Impact of inundation of roads on access.
 - Impact of inundation of existing infrastructure, other than roads
 - Impact of loss of agricultural land on livelihood security
 - Impact on assurance of supply to farmers
 - Impact of increased water yield on Resource Poor Farmers
 - Impact on the local economy
 - Macro-economic impacts

2.4.2 Construction phase impacts

- Disturbance of flora
- Disturbance of fauna
- Sedimentation and erosion
- Deterioration of water quality
- Traffic impacts
- Interruption of water releases
- Storage and utilisation of hazardous substances on site
- Risk of fire
- Creation of employment opportunities
- Influx of workers to the area (health and safety risks)
- Influx of job seekers
- Creation of business opportunities for local businesses
- Disturbance to sense of place, visual aesthetics
- Windblown dust
- Litter/ waste pollution
- Noise pollution
- Light pollution
- Impact of sourcing construction material

3 Environmental Legislative Requirements

3.1 Framework Legislation

All environmental and applicable legislation, as well as other requirements will be complied with during the course of implementation of this project. Any changes in legislation, or other requirements, will be updated as and when required and communicated to all role-players involved in the project. A list of applicable legislation is provided in Table 3-1 below.

Table 3-1: List of applicable legislation for the raising of the Clanwilliam Dam wall

No	Legislation
1	Advertising on Roads and Ribbon Developments Act, Act 21 of 1940
2	Conservation and Agricultural Resources Act, Act 43 of 1983 (CARA)
3	Constitution of the Republic of South Africa Act, Act 108 of 1996
4	Development Facilitation Act, Act 67 of 1995
5	Environment Conservation Act, Act 73 of 1989
6	Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act, Act 36 of 1947
7	Hazardous Substances Act, Act 15 of 1973
8	Intergovernmental Relations Framework Act, Act 13 of 2005
9	Mineral and Petroleum Resources Development Act, Act 28 of 2002
10	Mountain Catchment Area Act, Act 63 of 1970
11	Municipal Structures Act, Act 117 of 1998
12	Municipal Systems Act, Act 32 of 2000
13	National Building Regulations and Building Standards Act, Act 103 of 1977
14	National Building Regulations and Building Standards Amendment Act, Act 30 of 1982
15	National Building Regulations and Building Standards Amendment Act, Act 36 of 1984
16	National Environmental Management Act, Act 107 of 1998 (NEMA)
17	National Environmental Management: Air Quality Act, Act 39 of 2004
18	National Environmental Management: Biodiversity Act, Act 10 of 2004
19	National Environmental Management: Protected Areas Act, Act 57 of 2003
20	National Environmental Management: Waste Act, Act 59 of 2008
21	National Forest Act, Act 84 of 1998
22	National Forest and Fire Laws Amendment Act, Act 12 of 2001
23	National Heritage Resources Act, Act 25 of 1999
24	National Road Traffic Act, Act 93 of 1996
25	National Veld and Forest Fire Act, Act 101 of 1998
26	National Water Act, Act 36 of 1998
27	Occupational Health and Safety Amendment Act, Act 181 of 1993
28	Promotion of Access to Information Act, Act 2 of 2000
29	Promotion of Administrative Justice Act (PAJA), Act 3 of 2000
30	Protected Disclosure Act, Act 26 of 2000

No	Legislation
31	Provincial Nature Conservation Ordinances
32	Public Finance Management Act, Act 1 of 1999
33	Traditional Leadership and Governance Framework Amendment Act, Act 41 of 2003
34	White Paper on Environmental Management
35	White Paper On Integrated Pollution and Waste Management For South Africa
36	White Paper on Land
37	White Paper on the Conservation and Sustainable use of South Africa's Biodiversity

3.2 Environmental principles

The following principles should be considered at all times during all phases of the proposed dam raising activities.

- The environment is considered to be composed of both biophysical and social components.
- Construction is a disruptive activity and all due consideration must be given to the environment, including the social environment, during the execution of a project to minimise the impact on affected parties.
- Minimisation of areas disturbed by construction activities (i.e. the footprint of the construction area) should minimise many of the construction related environmental impacts of the project and reduce rehabilitation requirements and costs.
- As minimum requirements, all relevant standards relating to International, national, provincial and local legislation, as applicable, shall be adhered to. This includes requirements relating to waste emissions (e.g. hazardous, airborne, liquid and solid), waste disposal practices, noise regulations, road traffic ordinances, etc.
- Every effort should be made to minimise, reclaim and/or recycle "waste" material.
- The proponent shall exercise the "Duty of Care" principle at all times during the life of the dam raising project.
- The proponent shall also prescribe to the "Polluter Pays" principle and shall manage the project in a pro-active manner to avoid any incidents of pollution.

3.3 Licences and Permits Requirements

A number of permits and licences are generally required for projects of this nature before construction can commence. A list of such permits or licences is provided in Table 3-2 below.

Table 3-2: List of possible permits or licences that may be applicable

Permit / Licence	Relevant legislation / Regulating authority
Blasting	Blasting permits are required from the Department of Mineral Resources in accordance with the Explosives Act (Act No 26 of 1956).
Waste disposal	All wastes (general and hazardous) generated during the construction may only be disposed of at appropriately licensed sites. Government Notice (GN) 921, promulgated in terms of the National Environmental Management Waste Act (Act 59 of 2008) (NEMWA), lists Waste Management Activities in respect of which a waste management licence is required; these include various activities associated with the storage of waste, reuse, recycling and recovery of waste, treatment of waste (which includes the remediation of contaminated land) and disposal of waste. NEMWA GN 926 presents the norms and standards for the storage of waste. The Department of Environmental Affairs is the regulating authority for waste management activities.
Storage of hazardous substances	Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which may include the Hazardous Substances Act, the Occupational Health and Safety Act, and relevant associated Regulations.
Health and safety of work teams	Construction Regulations (2003) published under the Occupational Health and Safety Act (Act No 85 of 1993) apply to construction activities including "the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work". A "health and safety plan" which addresses hazards, and includes safe working procedures to mitigate, reduce or control the hazards identified, is required under this Act. A risk assessment must also be undertaken by an appropriately qualified person(s) and the Contractor shall ensure that all employees under his or her control are informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences.
Heritage resources	Before any heritage resources are demolished or damaged a permit should be obtained prior to any actions been taken. Permit applications must be submitted to South African Heritage Resources Agency (SAHRA).
Removal of trees	The removal of trees from the dam basin requires a permit in terms of the National Forest Act (No 84 of 1998).
Removal and transportation of endangered fauna and flora	A permit must be obtained from the relevant nature conservation agency for the removal or destruction of indigenous protected and endangered plant and animal species. Copies of permits required must be submitted to the DEA for record keeping purposes.
Water abstractions	Water abstracted from any sources for construction purposes requires authorisation in terms of the National Water Act, No 36 of 1998.
Removal of graves	Permits are required for the removal of graves in terms of the National Heritage Resources Act (No 25 of 1999) section 36.
Asphalt Plants	GN 893 of 2013 in GG 37054 dated 22 November 2013 provides a list of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage. Activities include Macadam preparation (the mixing of aggregate and tar or bitumen to produce road surfacing in permanent facilities and mobile plants). These activities require an Atmospheric Emission Licence in terms of Section 37 of the Act.
Borrow areas and Quarries	Government Gazette No 26501 dated July 2004 states that the Minister of the Mineral Resources, acting in terms of section 106 (1) of the Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) (MPRDA) exempts the Department of Water Affairs, amongst other institutions, from the provisions of sections 16, 20, 22 and 27 of said Act in respect of any activity to remove any mineral for the construction and maintenance of dams, harbours, roads and railway lines and for purposes incidental thereto. Section 106 (2) of the MPRDA says that in such cases the

Permit / Licence	Relevant legislation / Regulating authority
	DWA must still compile an Environmental Management Programme (EMP) for approval in terms of Section 39 (4) of the Act.

4 Structure and responsibility for environmental management

4.1 Implementation of Environmental Management Programme

The implementation of the mitigation, environmental management and EA conditions documented in this EMPr requires the commitment of various stakeholders and role players. Although the onus of ensuring that all project activities associated with the proposed project comply with mitigation, environmental management and EA conditions rest with the holder of the EA, various parties will play a role in the implementation of this EMPr. Taking the aforementioned into account, this section of the EMPr is intended to clearly define the responsibilities for management actions contained in this document and to explain arrangements for coordination among the role players involved in the implementation of the proposed project lifecycle.

4.2 Regulating / Commenting Authority

In accordance with Section 31 of the National Environmental Management Amendment Act (62 of 2009), the Competent Authority (DEA) is responsible for the application and enforcement of the NEMA as amended and Specific Environmental Management Acts. Concerning the implementation of this EMPr the specific role of the Competent Authority will entail the following:

- Review the revised EMPr submission and based on the review, approve the EMPr (with or without conditions) or request amendments to be made to the document as well as the resubmission thereof;
- Review all monitoring and audit reports submitted by the ECO and advise of any additional corrective measures to be implemented;
- Conduct routine inspections at any reasonable time with the intend to determine compliance with the EMPr, EA Conditions and Method Statements; and
- In instances where required assist the Project Proponent in understanding and meeting the specified conditions provided in the EA.

4.3 Roles of Key Stakeholders

4.3.1 Project Proponent

The project proponent (holder of the EA) namely the DWS is required to ensure that all conditions provided in the EA, as well as any other reasonable condition that the Competent Authority (DEA) considers necessary for the protection of the environment, are met. In keeping with the requirements of Section 28 of the NEMA as amended, the holder of the EA is also required to take all reasonable measures and to implement mitigation / management measures to prevent adverse environmental consequences, associated with the implementation of the project activities, from happening.

The project proponent is responsible for ensuring that the mitigation measures provided in this EMPr are implemented and that the mitigation measures are clearly understood by all relevant parties. Where the implementation of Construction and / or Operational activities associated with the proposed project are contracted out (e.g. to Contractors and / or Sub-contractors), the legal responsibility associated with non-compliance still rests with the Project Proponent (*unless otherwise agreed upon by the Competent Authority*). The project activities may not commence until such time when all required Environmental Authorisations have been granted by the various Competent Authorities within whose mandate the project activities fall.

Additional responsibilities of the Project Proponent also include the following:

- Ensure compliance with the EA Conditions by any person acting on their behalf, including but not limited to, an agent, sub-contractor, employee or any person rendering a service to the holder of the EA;
- Notify the WCDEADP, ECO any other relevant authority, in writing, within 24 hours thereof if any condition of the EA is not adhered to;
- Ensure that a copy of the EA is kept onsite at all times. The EA must be provided to authorised official of the WCDEADP who requests to see it and must be made available for inspection any employee or agent of the holder of the EA who works or undertakes work within the development footprint;
- Notify the WCDEADP, within 30 days, of any changes of the ownership and / or project developer. It must be explained to the new owner / developer that the conditions provided in the EA are legally binding and must be adhered to;
- Notify the WCDEADP of any change of the contact details including the name of the responsible person, the physical or postal address and / or telephonic details and provide the Department with the new details; and

- Allow Departmental Officials access to the development site for the purpose of assessing and / or monitoring compliance with the EA Conditions.

The project proponent will also be required (as requested by the Competent Authority) to:

- Provide a report which provides details regarding the following:
 - Extent to which the EA conditions are / not being complied with;
 - The nature of, and reasons for, any non-compliance with a condition provided in the EA; and
 - Any action taken, or to be taken, to mitigate the effects of any non-compliance or to prevent any recurrence of the non-compliance;
- Environmental Audit Reports on the impacts of the authorised activity on the environment, at specified times or intervals or whenever requested by the competent authority;
- Provide the Competent Authority with proof of compliance with the requirements regarding financial provision for the implementation of the management measures provided in this EMP.

4.3.2 Engineer

The Project Proponent will appoint an Engineer who will function to ensure that all construction activities are carried out in accordance with the approved detail design for the raising and strengthening of the Clanwilliam Dam and supervision of the contract. In addition the role and responsibility of the Engineer will include:

- Providing assistance to the ECO in the monitoring and execution of the Contractors or Sub-contractors' Method Statements;
- Review and approve the Method Statements developed by the Contractor;
- Maintaining a photographic record of the construction activities
- Verifying that the EMPs have been included in the contract documents;
- Ensuring that Environmental Compliance Matters are addressed during all Site Meetings;
- Provide technical guidance and assistance to onsite teams regarding the implementation and compliance with the EMP;
- Consults and co-operates with the ECO concerning environmental matters;
- The Engineer may appoint an Engineer's Environmental Representative (EER) to plan and direct the implementation of the EMP and provide advice on environmental matters;
- Conduct regular (weekly) site inspections to determine whether construction activities are carried out as per the detailed design and management measures provided in the EMP and Method Statements; and
- Provide inputs, as and when required, to the monthly Environmental Compliance Report prepared by the ECO.

4.3.3 Project Manager

The Project Manager, appointed by the DWS will function to coordinate and manage the Construction and Operational Phases of the proposed project. Separate Project Managers for the Construction Phase and Operation Phase may be appointed. Any project activity, which may result in adverse environmental consequences and for which mitigation and management measures are not provided in this EMPr must be approved by the Project Manager. The Project Manager must instruct the Contractor / Sub-contractor to cease any construction activity which is in contravention of this EMPr and the EA.

4.3.4 Contractor and Sub-contractor

Where specific EMPr responsibilities are assigned to Contractors or Sub-contractors, there must be clearly stipulated and included in the contract documentation. Any construction activities or actions of onsite personnel which results in environmental damage, non-compliance with the EA and EMPr, must be reported to the project proponent by the Contractor. The roles and responsibilities of the Contractor will also include the following:

- To prepare Method Statements which sets out the manner in which the management actions contained in an EMPr will be implemented;
- Ensure that all sub-contractors and onsite personnel understand and are familiar with the management measures provided in the EMPr;
- Ensure that all mitigation and management measures relating to construction activities are implemented;
- Report any non-compliance with the EMPr and / or EA Conditions are reported to the project proponent and ECO; and
- Rehabilitate the construction footprint as well as damage to any sensitive environment caused by negligence on the part of the Contractor, to the satisfaction of the ECO.

4.3.5 Environmental Control Officer

The Environmental Control Officer (ECO) will be appointed by the project proponent for the duration of the Construction Phase up to the completion of rehabilitation. In accordance with Condition 24 of the EA, the ECO must be appointed prior to the commencement of any site preparation, land clearing or construction activities. The ECO's primary role will be to monitor compliance with the conditions provided in the EA and the implementation of the EMPr, and to report the compliance / non-compliance to the Competent Authority. The appointed ECO must meet the following requirements:

- Have an appropriate Environmental Management / Science qualification / degree and be registered with a recognised professional affiliation;
- Appropriate training and experience in the implementation of environmental management specifications; and
- Have no vested interest in the proposed project.

The responsibilities of the ECO will include the following:

- Conduct weekly site inspections / audits and record compliance / non-compliance with the management and mitigation measures provided in the EMPr and EA Conditions observed during the inspection;
- Based on the observations made during weekly site inspections issue site instructions to the contractor for any corrective actions which may be required;
- Document the findings of the site inspection / audits against. Monthly Environmental Compliance Audit Reports should be submitted to the Competent Authority. The Environmental Compliance Report should provide an overview of any trends in non-compliance recorded;
- Develop and maintain a I&APs Complaints Register in which all complaints are recorded, as well as remedial action taken and the response provided to the I&APs;
- Verify that the management and mitigation measures provided in the EMPr as well as the EA Conditions have been communicated to, and are understood by all personnel on site including the Contractors and Sub-contractors;
- Report incidents which have lead / may lead to substantial danger to the surrounding communities /public or significant environmental damage, to the Competent Authority. Any remediation or corrective measures which have been / proposed to be implemented to prevent danger to the surrounding communities /public or significant environmental damage from occurring must also be reported to the Competent Authority (WCDEADP Appeals Management Unit);
- Ensure that a copy of the approved revised EMPr and EA is kept onsite and accessible to all personnel on site;
- Provide Environmental Awareness Training to all personnel on site, Contractor and Sub-contractor. Documented proof of the Environmental Awareness Training as well as the content of the training must be kept onsite and should be made available to the Competent Authority upon request.

4.3.6 Interested and Affected Parties

The role of Interested and Affected Parties will include the following:

- Request updates on the progress of the Construction Phase and the effectiveness of the EMPr implementation;
- Provide input into corrective actions where appropriate and to the revisions of the EMPr;
- Report any non-conformance with the EA Conditions and EMPr observed to the Competent Authority and ECO; and

- Ensure that the communication platforms provided, such as the Community Consultative Forum are utilised to communicate any queries or concerns relating to the Construction Phase Activities.

4.3.7 Environmental Assessment Practitioner

Within the context of this EMPr and in keeping with the requirements of Condition 23 of the EA the role of the EAP is focussed on updating and refining the DWS' generic EMPr that was submitted to the Competent Authority as an appendix of the final Environmental Impact Report. Although due diligence have been exercised to ensure that the EMPr meets the requirements of the relevant national and provincial standards and guidelines for EIA processes and specialist studies, the EAP is also required to ensure that the EMPr includes the following:

- Submit the revised EMPr, following review of the document by the DWS, to the WCDEADP for review and approval;
- Take into account and be based on the WCDEADP Guideline for Environmental Management Plans (2005);
- Address the mitigation measures provided in the Environmental Impact Assessment Report and the aspects highlighted in the EA;
- Describe the level and type of competency required of the ECO;
- Determine the frequency of site visits to be carried out by the ECO;
- Make provision and call for the inclusion of the revised EMPr in all contract documentation for the Construction Phase of the proposed project;
- Define and allocated roles and responsibilities for all aspects of the EMPr;
- Define the code of conduct for engineers, contractors and sub-contractors, including all other parties operating on the site during construction and include penalties for non-conformance with the EA Conditions;
- Include Environmental Awareness and Training Programmes for all contractors, sub-contractors and labourers.

5 Pre-Construction Specifications

5.1 Additional submissions to Competent Authority

5.1.1 Clanwilliam Dam and Bulshoek Weir Operating Procedures

5.1.2 Riverine Monitoring Programme

5.1.3 Olifants / Doring Water Management Area Catchment Management Plan

5.1.4 Environmental rehabilitation and restoration plan

6 Construction Phase environmental management and mitigation

6.1 Management of Flora

6.1.1 Aspect

Site preparation activities carried out to accommodate the required supporting infrastructure (e.g. concrete batching plants and offices etc.) will necessitate the clearing of vegetation within the footprint of the site camp.

6.1.2 Impact

Vegetation clearing within the development footprint carried out as part of site preparation will result in the loss of indigenous, Red Data Listed species and endangered vegetation types. Areas disturbed by vegetation clearing will create conditions conducive to the establishment of alien / invasive plant species.

6.1.3 Objective

Through the implementation of the management and mitigation measures, the loss of vegetation beyond the demarcated construction area must be prevented.

6.1.4 Target

Eradication of, and prevention of the establishment of alien plants and invasive species.
No disturbance to or loss of protected flora species outside of construction footprint.

6.1.5 Management and Mitigation Measures

The implementation of the following management and mitigation measures are intended to prevent or reduce the significance of the anticipated impacts on the flora within the development area:

- All plants within the inundation area which are representative of the local species composition of the area (including bulbs and succulents) should be transplanted into similar soil conditions within the areas disturbed by construction activities. Where no suitable location for transplanting can be identified the removed plants must be used to enrich parts of the Ramskop Nature Reserve at Clanwilliam. Removing the plants, selected for transplantation, from the soil and re-planting it within the identified areas, will

be carried out once prior to the establishment of the site. The mitigation measure will therefore not be carried out repeatedly during the Construction Phase. A level of maintenance and monitoring the growth of the transplanted plants will be required for a minimum of one growing season;

- A plant nursery should be established during the construction phase, for the temporary storage of rescued plants that will be used during the Rehabilitation Phase to restore vegetation cover. Maintenance of all rescued plants kept in the nursery will continue for the duration of the Construction Phase up to completion of rehabilitation activities to the satisfaction of the ECO and WCDEADP;
- Vegetation cover should be retained for as long as possible, and vegetation clearance should occur in a phased manner from one side of the site to the other;
- The movement of construction vehicles and the use of equipment should only be permitted on predetermined access routes and predetermined area, respectively, thereby limiting the area disturbance and necessity for the removal of vegetation;
- The removal of vegetation, in particular protected and endangered species outside the construction footprint, or where it does not fall within the construction working area will not be permitted;
- All reasonable measures must be taken to control and eradicate any alien invasive species that has been listed in terms of Section 70(1) of the National Environmental Management Biodiversity Act (10 of 2004). The relevant Competent Authority must be notified of the occurrence of any listed invasive species occurring and be provided with an Alien Invasive Control and Management Plan;
- The reseedling of disturbed areas should be carried out at the end of the dry season to ensure optimum conditions for germination and rapid vegetation establishment.

The mitigation and management measures listed above must be implemented for the duration of the Construction Phase. The Contractor will assume responsibility for ensuring that the mitigation and management measures are executed. All management measures which relate to information being provided to the Competent Authority and the preparation of any additional management plans will be done by the ECO in consultation with the project proponent.

6.1.6 Corresponding Environmental Authorisation Condition

As per Condition 23.13.1, the Environmental Rehabilitation and Restoration Plan must provide details of the approach that will be adopted for "the search for, harvesting of and storage of bulbs, succulents and other suitable horticultural material from areas to be inundated and disturbed that can be used to re-vegetate disturbed areas. The requirement for ongoing alien plant species eradication and management is provided in Condition 23.12.17 of the EA.

6.2 Management of Fauna

6.2.1 Aspect

The increased human presence, movement of workers onsite, operation of equipment and nature of the construction activities (e.g. Drilling and Grouting) will constitute an intrusion in the natural habitat of the fauna found within the development footprint and adjacent areas.

6.2.2 Impact

The movement of workers onsite, operation of equipment and nature of the construction activities (e.g. Drilling and Grouting) may give rise to the following:

- Disturbance to fauna resulting in mobile animals leaving their natural habitat for the duration of the Construction Phase;
- Injury and harm;
- Obstruction of movement; and
- Preventing access to watering points.

6.2.3 Objective

Through the implementation of the management and mitigation measures, prevent any harm that may be caused to the animal life, by the execution of any construction and / or related activity.

6.2.4 Target

No harm to any animal life resulting from the construction activities.

6.2.5 Management and Mitigation Measures

The implementation of the following management and mitigation measures are intended to prevent or reduce the significance of the anticipated impacts on the animal life within the development area:

- Information provided in the Environmental Awareness Training must lay emphasis on the fact that no intentional harm inflicted on animals will be permitted;
- Any fauna that is found within the construction footprint shall be carefully and safely removed from site to an equivalent environment;

- Snakes or dangerous wildlife that are found within the construction footprint may only be removed from site and relocated by a suitably qualified expert, under the supervision of the ECO;
- The capturing and hunting of any animal as well as the placing of snares will under no circumstances be permitted; and
- No domestic animals will be permitted on site.

The mitigation and management measures listed above must be implemented for the duration of the Construction Phase. The Contractor will assume responsibility for ensuring that the mitigation and management measures are executed.

6.2.6 Corresponding Environmental Authorisation Condition

Condition 23.12.6 of the Environmental Authorisation explicitly calls for the revised EMPr (this document) to include provisions relating to the implementation of environmental controls and procedures aimed the management and protection of fauna.

6.3 Consultation and Public Relations, and Socio-Economic Environment

6.3.1 Aspect

The increase in areas of inundation is likely to result in the loss of land, built structures and infrastructure. The social dynamic of nearby town including the town of Ebenheaser may be altered by the influx of speculative job seekers employment during the Construction Phase.

6.3.2 Impact

The influx of job seekers from surrounding areas may give rise to the following:

- Limited available land and resources as well as the additional pressure placed on basic service delivery may aggravate social unrest;
- Sexual exploitation of women and the rate of HIV infections may increase.

6.3.3 Objective

Ensure that a system which provides a platform for Interested and Affected Parties (I&APs) to raise any concerns and queries relating to the Construction and associated activities is developed and put in place. The implementation of the communication system will facilitate

maintaining clear lines of communication between I&APs and the role players that are defined in Section 4 of this EMPr.

6.3.4 Target

The following targets will be indicative of whether the set environmental objective has been reached:

- Provide I&APs with regular formal updates on the milestones reached with regards to the construction activities. The aforementioned updates should be provided in the form of a newsletter or be conveyed in formal written correspondence to the Community Consultative Forum;
- Acknowledge and respond to all complaints recorded in the Complaints and Comments Register within 7 working days; and
- Timeously inform I&APs of any disruptive activities which may result from the Construction Activities.

6.3.5 Management and Mitigation Measures

- A Public Consultative Forum must be established. The members of the Consultative Forum should include the ECO and representatives of the Ebenheaser community, Ward Councillors, and applicable Catchment Management Agency;
- The DWS in consultation with the Clanwilliam Municipality and Clanwilliam Aquatic Club must identify alternative sites to locate the facilities (i.e. Clanwilliam Municipal Resort) lost due the raising of the dam
- A Complaints and Comments Register must be kept onsite at all times and should be provided to any I&AP who wishes to report a complaint relating to the proposed project. The following information must be recorded in the Complaints and Comments Register:
 - Name and contact detail of the complainant;
 - Date, time and nature of the complaint;
 - Corrective measures that were implemented / manner in which the complaint or comment was addressed;
 - Summary and evidence of formal response provided to the I&AP by the Contractor in consultation with the ECO.
- A Workforce Recruitment Policy aimed at controlling the influx of speculative job seekers and ensuring that the local community benefit from employment opportunities that are generated during the Construction Phase, should be developed. The Workforce Recruitment Policy should be developed by the Contractor in consultation with the Public Consultative Forum and project proponent; and
- Where reasonably possible and practical the Contractor should provide onsite housing to workers which are not local. In consultation with, and providing that the surrounding communities are in agreement, workers may be housed in surrounding communities;

The mitigation and management measures listed above must be implemented for the duration of the Construction Phase. The Contractor will assume responsibility for ensuring that the mitigation and management measures are executed.

6.3.6 Corresponding Environmental Authorisation Condition

Condition 23.10 and Condition 23.11 of the Environmental Authorisation explicitly calls for the revised EMPr (this document) to include a strategy to ensure ongoing communication between I&APs and the Project Team throughout the Construction Phase as well as provisions to address social impacts associated with the influx of workers to the area.

6.4 Storm water and Erosion Control

6.4.1 Aspect

All bare and exposed areas will be vulnerable to erosion. The construction of culvert inlets and outlets, side drains, and coffer dams are likely to leave these areas susceptible to soil erosion in the vicinity of the construction site, and lead to elevated turbidity levels in the river. Contaminated storm water from the batching plant may adversely impact on water resources in the area.

6.4.2 Impact

Sediment laden runoff from construction areas will result in elevated levels suspended solids in the watercourse. The increased volume of suspended solids in the watercourse will reduce the clarity of the water and sunlight penetration. This will in turn adversely impact on the biota of a river, smothering and abrading plants and animals, blocking out light, and reducing the overall productivity of the system. Inadequate control of storm water runoff from the batching plant will result in the release of contaminated water into the receiving environment.

6.4.3 Objective

It must be ensured that all reasonable measures are put in place to prevent erosion and the release of contaminated storm water and sediment laden into the receiving environment.

6.4.4 Target

The following targets will be indicative of whether the set environmental objective has been reached:

- No formation of erosion channels caused by construction activities; and
- No release of contaminated storm water into the receiving environment.

6.4.5 Management and Mitigation Measures

The following management and mitigation measures relating to storm water runoff and erosion prevention must be implemented:

- The volume of water required for the operation of the batching plant must be regulated to maintain the required moisture content and wastage of water and additional runoff from these areas;
- The implementation of dust-control activities which entails dampening the surface through wetting may not result in run-off volumes that are large enough to result in erosion;
- All reasonable measures must be taken to avoid the concentration surface water or storm water to be concentrated (i.e. avoid ponding of water);
- Erosion control measures including the use of berms to direct runoff to settling ponds as well as the construction and maintenance of coffer dams to settle sediments must be employed. Settling ponds with accumulated sediments need to be cleared before the onset of winter rains, and the construction of roads and causeways should be confined to the period October to May;
- Monitoring of the sediment load within the watercourse should take place both upstream and downstream of the construction site and in accordance with the approved Riverline Monitoring Programme. The maximum turbidity must be determined by an aquatic ecosystem specialist prior to the commencement of construction activities; and
- Vegetation cover must be retained for as long as possible and only clear areas of the site where it is necessary for construction;
- Any erosion channels caused by construction activities must be suitably stabilised and rehabilitated to an acceptable condition.

Management measures relating specifically to the operation of the batching plant include:

- The release / discharge of contaminated water to the environment will not be permitted;
- Unused cement bags will be stored in a sealed container;
- Contaminated and wastewater generated by the cleaning of equipment and flushing of mixers will not be released into the environment;
- A wastewater collection system must be developed to store all contaminated wastewater prior to the appropriate disposal thereof to a registered waste disposal facility; and
- All visible remains of excess concrete will be physically removed from the batching plant area following the completion of the construction activities.

The mitigation and management measures listed above must be implemented for the duration of the Construction Phase. The Contractor will assume responsibility for ensuring that the mitigation and management measures are executed, unless otherwise indicated.

6.4.6 Corresponding Environmental Authorisation Condition

Condition 20 and Condition 23.12.3 of the Environmental Authorisation explicitly calls for the revised EMPr (this document) to include storm water control measures as well as for the development of a Riverine Monitoring Programme, respectively.

6.5 Construction site preparation

6.5.1 Aspect

The establishment of the site will entail demarcating, preparation and clearing of the site as per the approved site plan, erecting site offices, and concrete aggregate stockpiles as well as material storage areas.

6.5.2 Impact

The establishment of the site will necessitate site preparation and clearing, which will result in a loss of vegetation within the demarcated site camp area.

6.5.3 Objective

Minimise environmental impacts associated with site establishment.

6.5.4 Target

Establishment of the In accordance with the approved Site Plan, thereby confining the associated environmental impacts to the predetermined area.

6.5.5 Management and Mitigation Measures

- Identify and demarcate the extent of the site camp as per the approved location described in Section I of the Environmental Authorisation; and
- The Contractor must provide a Site Plan for the approval of the ECO and the Engineer prior to the establishment of the site. The Site Plan must show the following:
 - Buildings and structures;
 - Contractors' accommodation;
 - Contractors' camp and lay down areas;
 - Site offices;

- Access Route;
- Site laboratories; and
- Batching plants.

6.5.6 Corresponding Environmental Authorisation Condition

Condition 23 of the Environmental Authorisation calls for the revision and amendment of the EMPR to incorporate the final detailed designs, to update and refine DWS' Generic EMP that was submitted to the WCDEADep as part of the final EIR submission.

6.6 Solid Waste Management

6.6.1 Environmental Aspect

The inherent nature of construction activities will generate domestic and solid waste.

6.6.2 Environmental Impact

The inappropriate storage and disposal of solid waste will result in environmental pollution.

6.6.3 Environmental Objective

The waste management hierarchy, which advocates that the disposal of waste as a last resort and only implemented in the event where the generation of waste cannot be avoided, nor reduced, will be applied to all construction activities

6.6.4 Environmental Target

The adoption of the waste management hierarchy will result in continual reduced volumes of waste being generated and disposed of at an appropriate, registered landfill site.

6.6.5 Management and Mitigation Measures

The following waste management measures relating specifically to solid waste must be implemented:

- All domestic waste must be placed in litter bins located as required on the Work Site and within the Contractors camp;
- Where possible, waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes);
- Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out;
- Ensure that personnel make use of the litter bins provided. Keep all Work Sites and at the Contractors camp tidy and litter free at all times.

-
- All litter bins weekly (or as required before they reach capacity);
 - Dedicated temporary waste storage area must identified within the construction footprint;
 - A Safe Disposal Slip Register must be maintained by the Contractor;
 - Ensure suitable housekeeping; and
 - The Contractor will ensure that no burying, dumping or burning of waste materials, vegetation, litter or refuse occurs;
 - All solid waste will be disposed of at suitable licensed disposal sites; and
 - As far as reasonably possible wastes should be removed during off-peak periods to reduce the impact on the movement of local traffic.

6.6.6 Corresponding Environmental Authorisation Condition

Condition 23 of the Environmental Authorisation calls for the revision and amendment of the EMPr to incorporate the final detailed designs, to update and refine DWS' Generic EMP that was submitted to the WCDEADep as part of the final EIR submission. The EA also refers to the adoption of the Waste Management Hierarchy.

6.7 Hazardous waste management

6.7.1 Aspect

Hazardous substances will be used and stored on site and will include diesel, curing compounds, shutter oil and cement.

The inappropriate handling or storage of any hazardous substance which is released into the receiving environment (i.e. through spillage) will result in the contamination of soil and immediate watercourses. A significant hazardous substance spills which enters the watercourse will adversely impact on the aquatic ecosystem and reduce the quality of water used by downstream farmers for irrigation.

6.7.2 Objective

Ensure the protection of the receiving and sensitive environments through the correct management and handling of hazardous substances.

6.7.3 Target

No environmental pollution caused by the handling and storage of hazardous substances.

6.7.4 Management and Mitigation Measures

The following management and mitigation measures relating to the storage and handling of hazardous substances must be implemented:

- All hazardous substances (including paint and fuel) must be stored in secure, safe and weatherproof facilities, underlain by a bunded concrete slab to protect against soil and water pollution;
- Any accidental spills must be cleaned immediately, treating the spilled material using absorbent material. A spill kit must be kept on site to use in the event of a hazardous substance spillage;
- Unused cement bags will be stored in an area not exposed to the weather and packed neatly to prevent hardening or leakage of cement;
- Used cement bags will be stored so as to prevent windblown dust and potential water contamination and will be appropriately disposed of;
- Controlled loading / unloading areas must be underlain by impervious paving or PVC sheet to protect against soil and water pollution;
- Environmental Awareness Training must include the correct handling, use and disposal of any spilled hazardous substance;
- Material Safety Data Sheets which provides all information relating to the specific hazardous substances stored on site must be prepared and be readily accessible;
- Empty containers in which hazardous substances were kept are to be treated as hazardous waste and disposed of at a licenced hazardous waste disposal facility;
- All storage tanks containing hazardous materials must be placed in bunded areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material.

The following management and mitigation relate specifically to the temporary storage of fuel onsite:

- The fuel tanks must be designated and installed in accordance with the relevant Oil Industry Standards and SANS codes where applicable for above ground storage tanks;
- Fuel storage tanks must be located within bund (110% of the tank's storage capacity);
- During fuel tanker delivery, the tanker driver must be present at all times during product offloading. Should an incident occur, an emergency cut-off switch must be used to immediately stop fuel delivery. Flexible hoses with dry-beak couplings and emergency isolation must be used;
- The project proponent must ensure that effective stock inventory monitoring, recording and regular auditing takes place for early identification of possible leaks and maintain a leak history for the site;
- The requirements of the Occupational Health and Safety Act (85 of 1993) must be adhered to;
- Crash barriers must be installed around the fuel tanks;
- An onsite emergency plan must be developed and implemented and must be drafted in consultation with the relevant Municipality's Emergency Services; and

- Within six months of the tanks ceasing to be functional for the purpose of temporary fuel storage, the tanks and associated infrastructure must be removed from site at the expense of the project proponent. The area associated with the fuel storage tanks and associated infrastructure must be rehabilitated to the satisfaction of the ECO and relevant local municipality.

6.7.5 Corresponding Environmental Authorisation Condition

Condition 17 of the EA provides management and mitigation measures specific to the temporary storage of fuel to be implemented. As per Condition 23.12.8 of the EA, the revised EMPr must include management and mitigation measures relating to the storage and management of hazardous materials and other construction materials such as cement, detergents and paints.

6.8 Aquatic ecosystems management

6.8.1 Aspect

Water quality, especially turbidity and pH, in the Olifants River immediately downstream of the construction site may deteriorate due to construction related activities. Furthermore, pollutants may find their way into the river system. Typical sources of pollution include oils and fuels from construction vehicles and construction material such as cement, detergents, paints and other chemicals.

6.8.2 Impact

Any pollutants which find their way into the river system could damage to the riparian habitat, lead to increased siltation (water quality deterioration) and adversely affect aquatic biota (e.g. Clogging of gills, influence movement).

6.8.3 Objective

Ensure that all reasonable measures are taken to prevent any impacts on the characteristics of the watercourses associated with the development area.

6.8.4 Target

- The downstream flow regime must remain unchanged,
- The downstream water quality to remain within acceptable ranges, as prescribed by Resource Water Quality Objectives.

6.8.5 Management and Mitigation Measures

The following management and mitigation measures aimed at preventing any adverse impacts on the aquatic biota must be implemented:

- Silt traps during construction within the watercourse channel and along the riparian habitat should be installed and maintained.
- If silt traps are not deemed feasible, other suitable measures need to be taken to limit the suspension of unnaturally high sediment volumes in the stream;
- Implement site specific and suitable storm water measures during construction to prevent the ingress of runoff into watercourses; and
- Ensure proper storage and safe handling of hazardous substances.

6.8.6 Corresponding Environmental Authorisation Condition

Condition 23.12.11 of the Environmental Authorisation stipulates that the revised EMP must make provision for the management and rehabilitation of sedimentation of the riverine systems caused by construction activities.

6.9 Material sourcing, earthworks and stockpiles

6.9.1 Environmental Objective

Ensure that materials are sourced from authorised operations and that stockpiled material potential impacts the environment is limited.

6.9.2 Environmental Target

A comprehensive record providing the source of all sourced material will be maintained. Stockpiled material must not exceed heights that will create a visual intrusion nor generated dust pollution.

6.9.3 Management and Mitigation Measures

The following management and mitigation measures should be implemented to achieve the set environmental target relating to material sourcing, earthworks and stockpiles:

- The Contractor will be required to prepare a source statement to indicate the sources of all construction materials and submit these to the Engineer for approval. The Source Statement must include sources from commercial suppliers;
- Stockpiles will not be allowed underneath trees or against the trunks of trees;
- Stockpiles will be constructed and maintained to avoid erosion of the material and contamination of the surrounding environment;

- Stockpiles will be kept free of all alien vegetation;
- The heights of stockpiles should be minimised as far as possible to reduce wind entrainment and stockpiles should be located as far away from sensitive receptors as possible; and
- Windbreaks should be erected around stockpiles where possible in order to reduce wind entrainment of dust emissions.

6.10 Topsoil management

6.10.1 Aspect

Prior to the commencement of the construction activities, the topsoil from the areas where construction activities will be undertaken, excluding the batching plant and construction site camp.

6.10.2 Impact

The incorrect handling and storage of topsoil will reduce the re-growth potential of the topsoil to be used for rehabilitation of the construction footprint.

6.10.3 Objective

Ensure that all reasonable management measures are implemented to maintain the re-growth potential of the topsoil to be used for rehabilitation of the construction footprint.

6.10.4 Target

To retain the usefulness of topsoil for the rehabilitation of the site.

6.10.5 Management and Mitigation Measures

Management and mitigation measures relating to the removal, storage and maintenance of topsoil includes the following:

- Prior to the commencement of the construction activities the topsoil layer must be removed and be stockpiled separately from overburden (subsoil and rocky material). In the absence of a recognizable topsoil layer, strip the upper most 300mm of soil;
- Co-ordinate works to limit unnecessarily prolonged exposure of stripped areas and stockpiles. Vegetation cover must be retained for as long as possible;
- Stripping of the topsoil must not be carried out when wet;
- Topsoil must be stored in a demarcated area;
- Stripping of the topsoil may not be carried out during wet / high rainfall periods;
- Stockpile topsoil stripped from different sites separately, as reapplication during rehabilitation must preferably be site specific. If necessary keep a stockpile register.

- Do not mix topsoil obtained from different sites.
- Topsoil is to be handled twice only – once to strip and stockpile, and once to replace and level.
- Position topsoil stockpiles on the higher side of a disturbed area, and above a 1:50 year flood line wherever possible.
- Ensure that all topsoil is stored in such a way and in such a place that it will not cause the damming up of water, erosion gullies, or wash away itself.
- Stockpiled material may not exceed a height of 2 meters;
- Protect topsoil stockpiles from erosion;
- Exotic / invasive plants and broad leaf weeds that emerge on topsoil stockpiles removed by hand;
- If topsoil is to be stockpiled for extended periods, especially during the wet season, stockpiles may be re-vegetated with indigenous grasses and covered with a protective material such as hessian mats;
- Ensure that topsoil is at no time buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles or machinery. This will render the topsoil unsuitable for use during rehabilitation; and
- The Contractor will be held liable for the replacement of any topsoil rendered unsuitable for use during rehabilitation, for reasons due to his negligence or mismanagement on site.

6.11 Visual and Aesthetics Management

6.11.1 Aspect

The establishment of the construction site, construction activities, establishment of site infrastructure and security lighting the construction area during the evening will alter the visual aesthetics of the immediate area.

6.11.2 Impact

Safety and security lighting of the site camp area, batching plant and specific construction areas where such activities are carried out during the evening will create a visual intrusion on residences in close proximity to the site and by-passers. Dust generated by the construction activities can also result in a visual intrusion. The establishment of the construction site, construction activities and the visibility of the site infrastructure will constitute a visual intrusion.

6.11.3 Objective

Ensure that all reasonable management measures are implemented to reduce the significance of the impact on the aesthetic character of the area.

6.11.4 Target

No complaints raised by I&APs relating specifically to the impacts to visual quality associated with the proposed project.

6.11.5 Management and Mitigation Measures

- The visual impact of raising the dam wall by 15 m, by adding concrete on the downstream face of the overspill, cannot be significantly mitigated due to its scale in the landscape. Viewer related mitigation measures could however be implemented, including for example, the planting of trees at receptor sites (e.g. Cederview) to screen the raised wall and accordingly minimise the visual impact. In this regard, DWS could provide saplings for those who would like to plant and screen the raised wall as an exercise of goodwill, i.e. make trees available to landowners for planting during and at the end of construction;
- All reasonable measures must be taken to avoid the generation of dust as provided in Part 6.14 of this EMPr;
- The stockpiles may not exceed heights which will be visible beyond the demarcated stock area. Where practical stockpiles should also be located in areas which are not in the line of sight of surrounding land users;
- The movement of construction vehicles and workers must as far as reasonably possible be restricted to the immediate site and access roads;
- As far as reasonably possible construction activities should be confined to daylight hours;
- It must be ensured that rubble, litter and construction rubble are collected and appropriately stored until the collection and disposal thereof at an appropriate registered landfill site;
- Appropriately site the construction camp as well as other storage areas and consider screening through the erection of shade cloth; and
- The visual intrusion associated with lighting of the construction site must be managed through the implementation of the following (but not limited to):
 - The mounting height of light fixtures must be kept as low as possible; and
 - Making use of motion detectors on security lighting, to ensure that area remains dark until lighting is required for security purposes.

6.11.6 Corresponding Environmental Authorisation Condition

Condition 23.12.10 of the Environmental Authorisation specifies that the revised EMPr must make provision for management measures aimed at mitigating the visual impacts associated with the proposed project, with specific reference to light pollution during the evening.

6.12 Air Quality Management

6.12.1 Aspect

The movement of construction vehicles across bare soil surfaces and the exhaust fumes gaseous pollutants (e.g. sulphur dioxide) released from vehicle exhausts will alter the ambient air quality of the immediate area. High wind speeds is likely to generate dust particles from topsoil and spoil stockpiles.

6.12.2 Impact

The release of pollutants generated by gaseous emissions and the release of particulate matter into the air, will reduce the quality of air in the immediate areas surrounding the construction footprint.

6.12.3 Objective

It must be ensured that the volumes of dust generated by the construction and associated activities, do not exceed the National Ambient Air Quality Standards and Minimum Emissions Standards and may not result in any adverse impacts on human health.

6.12.4 Target

The following will serve as indicators of the extent to which the environmental objectives relating to the management of air quality, have been reached:

- No complaints recorded by I&APs relating specifically to dust pollution and health concerns;

6.12.5 Management and Mitigation Measures

- Appropriate dust suppression measures or temporary stabilising mechanisms must be used in instances where 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 servitude, access roads, borrow pits, site yard, etc.;
- Any dust control system (i.e. sprinkler or vacuum) that is installed must be maintained and controlled to prevent impacts associated with excessive runoff (e.g. soil erosion);
- Within the construction area, construction vehicle will not be permitted to travel at speeds exceeding 40 km/h; and

- The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of I&APs).

6.12.6 Corresponding Environmental Authorisation Condition

Condition 23.12.7 of the EA stipulates that the revised EMPr must include management measures relating to dust control.

6.13 Noise control

6.13.1 Aspect

The movement of construction activities, construction vehicles and heavy machinery as well as construction personnel will alter the ambient noise levels in the area. The construction site would operate 24-hours per day, for a portion of the construction period, if not for the full duration.

6.13.2 Impact

The increased noise levels caused by the movement of construction activities, construction vehicles and heavy machinery as well as construction personnel, and which is audible by the surrounding receptors may cause a nuisance and disturbance.

6.13.3 Objective

Increased noise levels must be maintained below levels which will be audible by the surrounding receptors.

6.13.4 Target

Noise levels at the boundary of the development footprint will not exceed 7 dB above ambient levels.

6.13.5 Management and Mitigation Measures

The following management and mitigation measures relating to the control of noise generated during the Construction Phase must be implemented:

- Noise mufflers and/or soft explosives must be used during blasting to minimise the impact on humans and animals;
- No amplified music will be permitted on site and in construction camps;
- All noise levels must be controlled at the source;

- If the noise levels at the boundaries of the site exceed 7 dB above ambient levels, the local health authorities must be informed;
- All onsite workers must be provided with the necessary ear protection gear;
- I&APs must be informed of the excessive noise factors;
- Local municipal by-laws specific to noise must be adhered to;
- Blasting operations must be strictly controlled with regard to the size of explosive charge in order to minimise noise and air blast, and timings of explosions. The number of blasts per day should be limited, blasting should be undertaken at the same times each day and no blasting should be allowed at night;
- The SANS10103 (2008) should be applied to provides a guidance for determining the community's response to the increase in the general ambient noise level caused by the construction Phase;
- Blasting and noise intensive operations must be restricted to normal working hours (7 am to 5 pm);
- Amplified noise such as sirens and announcements limited to restricted hours other than cases of emergency;
- Ensure that employees and staff conduct themselves in an acceptable manner while on site, both during Work hours and after hours; and
- Respond to community complaints with regard to noise generation, taking reasonable action to ameliorate the impact. Where complaints cannot be addressed to the satisfaction of all parties, the Contractor will, upon instruction by the Project Manager, provide an independent and registered Noise Monitor to undertake a survey of the noise output levels.

6.13.6 Corresponding Environmental Authorisation Condition

Condition 23.12.7 of the EA stipulates that noise control measures must be provided in the updated EMPr.

6.14 Traffic and Roads Management

6.14.1 Aspect

Construction vehicles would make use of the existing roads in the area, including the N7 to transport material to the dam site. In addition the construction site would operate on a 24-hour basis. A high volume of traffic currently travels on the N7 between Clanwilliam and Citrusdal, and the road is poor, in parts with no shoulders or passing lanes.

6.14.2 Impact

The increased traffic volumes caused by the travelling of construction vehicles to and from the construction area will impact negatively on the traffic flow, the structural integrity of the N7 and may exacerbate the risk of vehicular accidents, especially at night.

6.14.3 Objective

It must be ensured that the number of construction vehicles and trips undertaken by the construction vehicles to and from the construction area

6.14.4 Target

- No road accidents involving or caused by the construction vehicles travelling on public roads; and
- No complaints reported by I&APs relating to the traffic impacts associated with the travelling of construction vehicles on public roads.

6.14.5 Management and Mitigation Measures

The following management and mitigation measures relating to the management of the traffic impacts resulting from the movement of construction vehicles to and from site during the Construction Phase must be implemented:

- The phasing of the construction of the dam should be considered as a means of ensuring that access for traffic on the N7 is maintained, and conflicts between construction traffic hauling material between the quarry and the dam wall and the traffic on the N7 are reduced;
- The method of transporting concrete from the batching facility (west of the N7 and dam wall) to the dam wall, would need to be carefully considered to reduce the impact on traffic using the N7, i.e. a conveyor system across the existing N7 to the wall would not be desirable, as the risk of spillage over the N7 would pose a significant safety risk to road users. It would accordingly be preferable for concrete pipe/s to be jacked under the road fill to accommodate the conveyor system, thereby reducing the safety risk and traffic impacts; and
- Ensuring that all regulations relating to traffic management are observed and by notifying the local traffic officials of programmed construction activities. As far as possible, attempts should be made to ensure that high construction-related road usage coincides with low traffic flow periods.

6.14.6 Corresponding Environmental Authorisation Condition

Condition 23 of the Environmental Authorisation calls for the revision and amendment of the EMPr to incorporate the final detailed designs, to update and refine DWS' Generic EMP that was submitted to the WCDEADep as part of the final EIR submission.

6.15 Heritage Resource Management

6.15.1 Aspect

The Clan William Dam is located in an area where numerous sites containing rock art, Stone Age tool deposits and other culturally significant artefacts are found.

6.15.2 Impact

The raising of the dam could result in the inundation of inter alia significant artefacts and rock paintings from the Early, Middle and Later Stone Ages, as well as historical structures, road infrastructure, industrial infrastructure, quarries and graves.

6.15.3 Objective

Ensure that a documented record all heritage and paleontological artefacts within the development area is established. Prevent disturbance and damage of unmarked graves (e.g. Khoisan Graves).

6.15.4 Target

No disturbance to sites of heritage importance and burial sites.

6.15.5 Management and Mitigation Measures

The following management and mitigation measures relating to reduce the significance and / or damage to heritage and paleontological artefacts during the Construction Phase must be implemented:

- Any heritage or paleontological artefact (e.g. Early Stone Artefacts) uncovered / found during the Construction Phase should be fenced off for protection. The provincial Heritage Resource Agency must be notified of any found heritage or paleontological artefact. Furthermore a professional archaeologist must monitor such operations at a schedule agreed upon by the provincial Heritage Resource Agency;
- In the event where any remains be found on site that is potentially human remains, the South African Police Service must be informed thereof and all works surrounding the area should be halted. Following public consultation, the graves must be exhumed and re-interred either in a new cemetery or relocated to the Municipal Cemetery in Clanwilliam;
- The photographic record of the development footprint as specified in Condition 22 of the EA must be verified by a professional archaeologist prior to the onset of the construction activities; and

- No heritage material be destroyed or removed from site without a relevant permit issued by the Provincial Heritage Resources Authority.

6.15.6 Corresponding Environmental Authorisation Condition

Condition 22 of the EA stipulates mitigation measures that must be implemented to reduce the significance / prevent impacts on heritage resources as well as management measures to be implemented in the event of any heritage remains being uncovered.

The proponent has appointed a heritage resources specialist that has commenced with the relocation of rock art within the inundation zone between the current water level and anticipated purchase line. The specialist expects to complete mitigation actions and relocations by end of 2015.

6.16 Health and Safety

6.16.1 Aspect

The nature of the construction activities and magnitude of the proposed project activities inherently have the potential to impact on the health of the construction workers and the community.

6.16.2 Impact

Unsafe working conditions and the absence of a Health and Safety Plan may result in injury to workers and loss of life.

6.16.3 Objective

Provision of a safe working environment to construction workers and the public.

6.16.4 Target

Ensuring that safe working environment is provided will be dependent on the following:

- Implementation of an approved Health and Safety Plan
- No incidents, injury or loss of human life; and
- Compliance with the Occupational Health and Safety Act.

6.16.5 Management and Mitigation Measures

The following mitigation and management measure aimed at ensuring the safety of working and preventing injury or loss of human life must be implemented:

- The safety of all construction and operational personnel, as well as any member of the public on the site is the responsibility of the Contractor.
- Control access onto and off the site by means of a register system;
- Ensure that first aid / emergency facilities / procedures are in place;
- Ensure that all personnel are trained in basic site safety procedures;
- A register with contact numbers of all people employed and one emergency contact person for each employee;
- Keep a list of all relevant emergency numbers in an easily accessible location on site.
- Maintain a record of all incidents, accidents and illnesses on site and make the information available at meetings;
- Ensure that proper footwear is worn by employees at all times;
- Ensure that employees are issued with and make use of the necessary safety equipment when working in dusty, noisy and / or dangerous situations. Such equipment may include, but is not necessarily limited to hardhats, goggles, masks, earplugs, gloves, safety footwear and safety ropes as required.
- Ensure that adequate drinking water, wash water and sanitary facilities are available at all times and on all work sites.
- A designated area for food storage, preparation and consumption must be provided on site;
- Ensure that all vehicle and machine operators are qualified and licensed to operate their vehicles / machines;
- The Contractor will prepare and submit a Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval by a Health and Safety Officer prior to the commencement of the construction activities;
- Fencing and barriers must be put in place in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993).
- Applicable notice boards and hazard warning notices will be put in place and secured.
- All construction personnel must be clearly identifiable and provided 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); and
- Cordon off dangerous excavations or Works that may pose a hazard to humans and animals.

6.17 Site rehabilitation

6.17.1 Aspect

The rehabilitation works carried out following the completion of all construction activities will include the following:

- Removal of structures and infrastructure;
- Inert waste and rubble;
- Hazardous waste and pollution control;

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- Final shaping;
 - Topsoil replacement and soil amelioration;
 - Ripping and scarifying;
 - Planting;
 - Grassing; and
 - Maintenance of the rehabilitated areas.

6.17.2 Objective

Reinstatement and rehabilitation of construction site to the Satisfaction of the ECO and WCDEADP.

6.17.3 Target

The rehabilitation and remediation activities will ensure that a complete site clean-up is carried out and that the entire construction site is reinstated and rehabilitated.

6.17.4 Management and Mitigation Measures

Removal of structures and infrastructure

Following the completion of the construction activities, the area must be rehabilitated by appropriate landscaping, levelling, topsoil dressing, land preparation, alien plant eradication and vegetation establishment. All construction plant, equipment, storage containers and temporary fencing must be removed from site;

Inert waste and rubble

- Rubble, including surplus rock, foundations and batching plant aggregates will be removed from the construction site and disposed of at a registered landfill site; and
- All waste storage containers will be removed from site.

Hazardous waste and pollution control

- All portable sanitation facilities will be removed by a certified contractor. It must be ensured that no leaks or spillage from sanitation facilities occurs during the removal thereof; and
- All hazardous waste which is temporary stored on site, including the storage containers must be removed from site and disposed of at a registered hazardous landfill site.

Final Shaping

- Where possible all disturbed areas must shaped so as to blend in with the surrounding landscape;

- Where possible, programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results;
- Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material; and
- Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is smoothed over to blend in with the surrounding landscape.

Grassing

- Grassing must be undertaken by a suitably qualified Contractor;
- Grass areas using the method specified on the plant plans;
- Sodding may be done at any time of the year, but seeding must be done during the summer when the germination rate is higher; and
- Hydro-seeding with a winter mix will only be specified where re-grassing is urgent, and cannot be postponed until summer.

Ripping and Scarifying

- Rip and / or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. The ECO will specify whether ripping and / or scarifying is necessary, based on the site conditions immediately before these works begin;
- Rip and / or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the works;
- Rip and / or scarify along the contour to prevent the creation of down-slope channels;
- Rip and / or scarify all areas at 300mm intervals (but not more than 400mm intervals), ensuring that the lines overlap; and
- Areas may not be ripped / scarified under wet conditions, as the soil will not break up.

Topsoil replacement and soil amelioration

- The principle of Progressive Reinstatement must be followed wherever possible. This includes the reinstatement of disturbed areas on an ongoing basis, immediately after the specified construction activities for that area are concluded;
- Execute top soiling activity prior to the rainy season or any expected wet weather conditions;
- Execute topsoil placement concurrently with construction where possible, or as soon as construction in an area has ceased;
- Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes and roads. Replace topsoil to the original depth. These areas will be quantified by the ECO;
- 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, and approved by the ECO; and
- Do not use topsoil suspected to be contaminated with the seed of alien vegetation.

Maintenance of rehabilitated areas

- Allow for a maintenance period of one year following practical completion;
- Landscape maintenance must be undertaken by a suitably qualified professional landscape architect;
- Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access.
- Re-vegetation must match the vegetation type which previously existed, unless otherwise indicated in the Contract or specified by the EO / ECO.
- Water all transplanted, planted and grassed areas;
- For planted areas that have failed to establish, replace plants with the same species as originally specified. The same species as originally specified must be used unless otherwise specified by the EO / ECO; and
- A minimum grass cover of 80% is required, and individual plants must be strong and healthy growers at the end of the Maintenance Period.