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P WMA 19/G10/00/2516/3



Environmental Impact Assessment for the Proposed Surface Water Developments for Augmentation of the Western Cape Water Supply System

SCOPING REPORT

Final

October 2016

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Authors:	***S Gerber, V Stippel, D Henning and N Naidoo***
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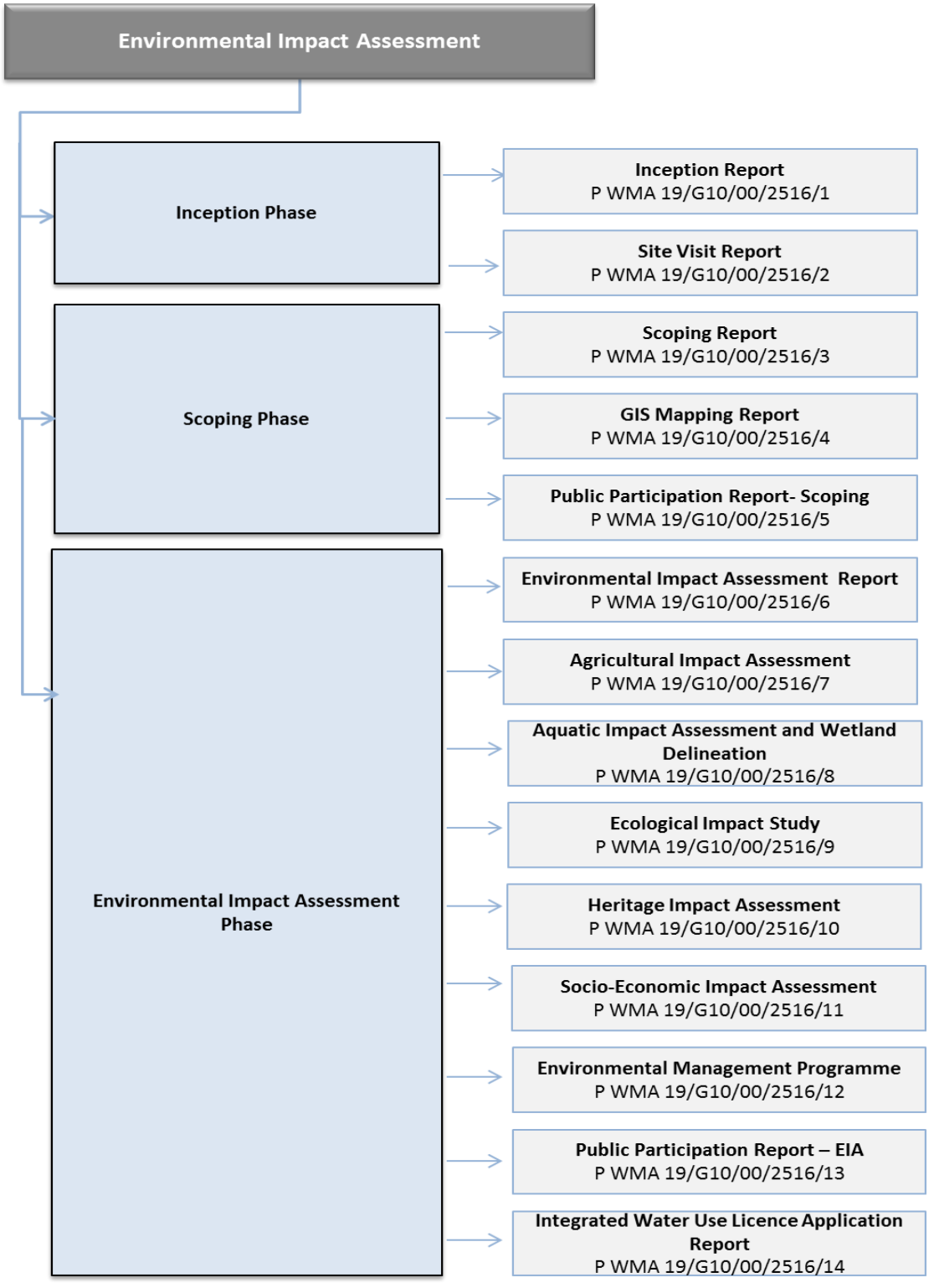
List of Study Reports



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Amendments Page

Date:	Nature of Amendment	Amendment Number:
23/09/2016	Draft for Public and Authority Review	00
28/10/2016	Final for DEA decision-making	01

Executive Summary

Nemai Consulting was appointed by the Department of Water and Sanitation as the Environmental Assessment Practitioner to undertake the Environmental Impact Assessment for the proposed surface water developments for augmentation of the Western Cape Water Supply System.

The proposed augmentation triggers activities contained in the 2014 Environmental Impact Assessment Regulations (Government Notice 983, Government Notice 984 and Government Notice 985 of 4 December 2014) and thus a Scoping and Environmental Impact Assessment Process is required. Further, as the project occurs within a regulated area of a watercourse and involves abstraction of water, it triggers activities that are listed under Section 21 (a), (c) and (i) of the National Water Act (Act No. 36 of 1998). As such a Water Use Licence Application process will also be undertaken.

The Western Cape Water Supply System serves the City of Cape Town, surrounding urban centres and irrigators. It consists of infrastructure components owned and operated by both the City of Cape Town and the Department of Water and Sanitation. In 2007, the Western Cape Reconciliation Strategy Study was commissioned by the Department of Water and Sanitation to determine future water requirements for a 25 year planning horizon. The Study investigated a number of options and found that whilst 556 million m^3 per annum would be available from 2007, the estimated water requirement in 2011 would be 560 million m^3/a, with the implication that the system supply will then be fully utilised and thus additional interventions will thus be required.

Based on the above, Department of Water and Sanitation identified the need for augmentation of the Western Cape Water Supply System by 2019 and proceeded with pre-feasibility and feasibility studies into potential surface water development options. Initially six options were assessed at a pre-feasibility level of detail. These options were then prioritized to identify the two most viable options. These were:

- Berg River-Voëlvlei Augmentation Scheme (also known as the First Phase Augmentation of Voëlvlei Dam); and
- Breede-Berg Transfer Scheme (also known as the Michell's Pass Diversion Scheme).

Ultimately, the Feasibility Study found that the Berg River-Voëlvlei Augmentation Scheme option was the most favourable surface water intervention and as such the Department of Water and Sanitation proposes to implement this scheme which involves the transfer of approximately 23 million m^3 per annum from the Berg River to the existing Voëlvlei Dam i.e. the yield of the dam would be 23 million m^3 per annum more than it is currently.

The proposed project is situated in Western Cape in the Drakenstein Local Municipality of the Cape Winelands District as well as the Swartland Local Municipality of the West Coast District.

The proposed developments fall within the Berg River Catchment of the Berg–Olifants Water Management Area. Both Voëlvlei Dam and the Lorelei abstraction site are located in quaternary catchment G10F of the Berg River Catchment.

The project components include the following:

- A low level weir, abstraction works and 4 m^3/s raw water pump station on the Berg River;
- A rising main pipeline from the Berg River to Voëlvlei Dam;
- A potential new summer release connection at the existing Swartland Water Treatment Works to facilitate summer releases into the Berg River for environmental requirements thus eliminating the need to utilize the existing canal from which water losses occur.

All the infrastructure and activities that require environmental authorisation need to be assessed as part of the EIA. In this regard, the following associated infrastructure was identified:

- Abstraction works;
- Rising main pipeline and pump station;
- Diversion weir;
- Access roads during construction;
- Access roads during operation;
- Powerlines for construction and operation; and
- Construction camp (footprint).

Three pipeline route alternatives and associated discharge points are assessed in the report. The feasible options will be taken forward in the impact assessment phase, where the potential positive and adverse effects to the environmental features and attributes are examined further. The Environmental Impact Assessment phase will include a detailed comparative analysis of the project's feasible alternatives that emanate from the Scoping exercise, which will include environmental (with specialist input) and technical evaluations. This will ultimately result in the selection of a Best Practicable Environmental Option.

The Scoping Report provides a full account of the Public Participation Process that was followed for the Scoping Phase for the proposed surface water developments for augmentation of the Western Cape Water Supply System.

An initial 30 day registration period was conducted from 26 May 2016 to 27 June 2016. The Draft Scoping Report was made available to Interested and Affected Parties for a 30 day

review period after the Application Form is submitted to the Department of Environmental Affairs.

A summary of the process is provided below.

Scoping and EIA Phase	Proposed Timeframe
Project Notification / Announcement	24 May 2016 and 25 May 2016
IAP Registration Period	26 May 2016 to 27 June 2016
Submission of Application Form to DEA	22 September 2016
Submission of Draft Scoping Report to DEA	23 September 2016
Public Meeting to Present the Draft Scoping Report	04 October 2016
Authority and Registered IAPs Review Period of Draft Scoping Report – 30 Days	23 September 2016 to 25 October 2016
Submission of Final Scoping Report to DEA	28 October 2016
DEA Review and Decision Making	01 November 2016 to 06 January 2017
Notification of Draft EIA Review	13 February 2017 to 14 February 2017
Authority and Registered IAPs Review Period of Draft EIA Report – 30 Days	15 February 2017 to 17 March 2017
Public Meeting to Present the Draft EIA Report	TBD
Submission of Final EIA Report to DEA	12 April 2017

The following specialist studies will be undertaken during the Environmental Impact Assessment to inform the best alternative for the project:

- Ecological Impact Study;
- Aquatic Assessment and Wetland Delineation;
- Socio-Economic Assessment;
- Phase 1 Heritage Impact Assessment; and
- Agricultural Impact Assessment.

All comments received during the public participation process will be assessed in the Final Scoping Report and will also be noted in the Comments and Response Report. Comments received from Interested and Affected Parties will help shape the subsequent Environmental Impact Assessment Phase. The Final Scoping Report will then be made available for further public review (if deemed necessary) before being submitted to the Department of Environmental Affairs, who is the Competent Authority in respect to this proposed development.

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List of Abbreviations

AGIS	Agricultural Geographic Information System
BBTS	Breede-Berg Transfer Scheme
BID	Background Information Document
BPEO	Best Practicable Environmental Option
BRVAS	Berg River – Voëlvlei Augmentation Scheme
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Areas
CCT	City of Cape Town
CCTMM	City of Cape Town Metropolitan Municipality
CITES	Convention on the International Trade in Endangered Species of Wild Fauna and Flora
CFR	Cape Floristic Region
CPS	Cape Piscatorial Society
CR	Critically Endangered
DEA	Department of Environmental Affairs
DEAT	(Department of Environmental Affairs and Tourism
DAFF	Department of Forestry and Fisheries
DMR	Department of Mineral Resources
DWA	Department of Water and Sanitation
DWAF	Department of Water and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EBA	Endemic Bird Area
ECO	Environmental Control Officer
EDC	Endocrine Disrupting Compounds
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Areas
ESAge	Early Stone Age
EWR	Environmental Water Requirements
FAII	Fish Assemblage Integrity Index
GDP	Gross Domestic Product
GI	Geomorphical Index

GIS	Geographic Information System
GN	Government Notice
GRP	Glass-Fibre Reinforced Polyester
HIA	Heritage Impact Assessment
IAPs	Interested and Affected Parties
IBA	Important Bird and Biodiversity Areas
IMI	Index of Habitat Integrity
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
MRPDA	Mineral Resources and Petroleum Development Act (No 28 of 2002)
NEMA	National Environmental Management Act (No 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM:PA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEM:WA	National Environmental Management Waste Act (Act No. 56 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NT	Near Threatened
NWA	National Water Act (No 36 of 1998)
NWRP	National Water Resources Planning
OHS	Occupational Health and Safety
PES	Present Ecological Status
PIP	Public Involvement Process
POP	Persistent Organic Pollutants
PRESIS	Pretoria Computerised Information System
PSC	Project Steering Committee
PSP	Professional Service Provider
QDS	Quarter Degree Squares
RID	Record of Implementation Decision
RMP	Resource Management Plan
RVI	Riparian Vegetation Index
SABAP	Southern African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SASS	South African Scoring System
SAWS	South African Weather Services
SDF	Spatial Development Framework
SIP	Strategic Infrastructure Project
TAC	Tulbagh Angling Club
ToR	Terms of Reference

VU	Vulnerable
VYC	Vogelvlei Yacht Club
WAC	Witzenberg Angling Club
WCAD	Western Cape Adventure
WC DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
WCDM	West Coast District Municipality
WCH	Western Cape Heritage
WCRSS	Western Cape Reconciliation Strategy Study
WCWC-JV	Western Cape Water Consultants Joint Venture
WCWSS	Western Cape Water Supply System
WIP	Weeds and Invasive Plants
WMA	Water Management Area
WPALAS	Western Province Artificial Lure Angling Society
WPFAA	Western Province Freshwater Angler's Association
WTW	Water Treatment Works
WULA	Water Use Licence Application
WWTW	Waste Water Treatment Works

1 PURPOSE OF THIS DOCUMENT

Nemai Consulting was appointed by the Department of Water and Sanitation (DWS) as the Independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed surface water developments for augmentation of the Western Cape Water Supply System (WCWSS), which is also known as the First Phase Augmentation of Voëlvlei Dam.

The document serves as the Final Scoping Report for the proposed surface water developments for augmentation of the WCWSS. The proposed project consists of the following:

- A low level weir, abstraction works and 4 m^3/s raw water pump station on the Berg River;
- A rising main pipeline from the Berg River to Voëlvlei Dam;
- A potential new summer release connection at the existing Swartland Water Treatment Works (WTW) to facilitate summer releases into the Berg River for environmental requirements thus eliminating the need to utilize the existing canal from which water losses occur.

All the infrastructure and activities that require environmental authorisation need to be assessed as part of the EIA. In this regard, the following main components have been identified:

- Abstraction works;
- Rising main pipeline and pump station;
- Diversion weir;
- Access roads during construction;
- Access roads during operation;
- Powerlines for construction and operation; and
- Construction camp (footprint).

Scoping is the first phase of the formal EIA process and as such the Scoping process to be followed for the proposed surface water developments for augmentation of the WCWSS aims to:

- Identify and engage with Interested and Affected Parties (IAPs) and allow for adequate participation in the process;
- Duly consider alternatives for achieving the project's objectives;

- Identify significant issues to be investigated further during the execution of the EIA phase;
- Clarify the roles and responsibilities of various stakeholders in the process;
- Determine the scope of the ensuing EIA phase, in terms of specialist studies, public participation, assessment of impacts and appraisal of alternatives; and
- Allow for informed decision-making with regard to the EIA process.

Further, according to Appendix 2 of the 2014 EIA Regulations, the objectives of the Scoping Process are, through consultation, to:

- Identify the relevant policies and legislation applicable to the Activity;
- Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the proposed location;
- Identify and confirm the preferred activity and technology alternative through impact and risk assessment and ranking process;
- Identify and confirm the preferred site, through a detailed site selection process which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on geographical, physical, biological, social, economic and cultural aspects of the environment;
- Identify the key issues to be addressed in the assessment phase;
- Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required, as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
- Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of residual risks that need to be managed or monitored.

An initial 30 day registration period was conducted from 26 May 2016 to 27 June 2016. The Draft Scoping Report was made available to IAPs for a 30 day review period after the Application Form was submitted to the Department of Environmental Affairs (DEA). All comments received were assessed in the Final Scoping Report and are also noted in the Comments and Response Report. The Final Scoping Report will then be made available for further public review (if deemed necessary) before being submitted to the DEA, who is the Competent Authority in respect to this proposed development. Comments received from IAPs will help shape the subsequent EIA Phase.

2 DOCUMENT ROADMAP

The Scoping Report is intended to meet all requirements as stipulated in Appendix 2 of Government Notice (GN) No. 982 (04 December 2014). In order to provide clarity to the reader, a document roadmap is provided in terms of the aforementioned regulatory requirements (**Table 1**).

Table 1: Document Roadmap

Chapter	Title	Correlation with Appendix 2 of GN No. 982	
1	Purpose of the Document	N/A	
2	Document Roadmap	N/A	
3	Project Background	N/A	
4	Project Location and Catchment Context	2 (b)	The location of the activity including – (i) The 21 digit Surveyor General code of each Cadastral land parcel; (ii) Where available, the physical address and farm name; and (iii) Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property or properties
		2 (c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or if it is – (i) A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is undertaken; and (ii) On land where the property has not yet been defined, the coordinates within which the activity is to be undertaken.
5	Legislation and Guidelines Considered	2 (e)	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.
6	Scoping and EIA Process	N/A	
7	Environmental Assessment Practitioner	2 (a)	Details of – (i) the EAP who prepared the report; and (ii) the expertise of the EAP to carry out scoping procedures.
8	Assumptions and Limitations	N/A	

Chapter	Title	Correlation with Appendix 2 of GN No. 982	
9	Need and Desirability	2 (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity within the context of the preferred location.
10	Project Description	2 (d)	A description of the scope of the proposed activity, including – (i) All listed and specified activities triggered; and (ii) A description of the activities to be undertaken, including associated structures and infrastructure.
11	Alternatives	2 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including: (i) Details of all alternatives considered; (ii) The outcome of the site selection matrix; If no alternatives including alternative locations for the activity were investigated, the motivation for not considering such.
12	Profile of the Receiving Environment	2 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including: (iv) The environment attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
13	Public Participation	2 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including: (ii) Details of the public participation process undertaken in terms of regulation 41 of the Regulations including copies of supporting documents and inputs; and (iii) A summary of the issues raised by IAPS and an indication of the manner in which the issues were incorporated or the reasons for not including them.
14	Environmental Issues	2 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including: (i) Details of all alternatives considered; (ii) The impacts and risks identified for each alternative including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed, may cause irreplaceable loss of resources; and can be avoided, managed or mitigated; (iii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected

Chapter	Title	Correlation with Appendix 2 of GN No. 982	
			focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects. (iv) The possible mitigation measures that could be applied and level of residual risk.
15	Methodology to Assess the Identified Impacts	2 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including: (i) The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives.
16	Plan of Study for EIA	2 (i)	A plan of study for undertaking the environmental impact assessment process to be undertaken including – (i) A description of the alternatives to be considered and assessed within the preferred site including the option of not proceeding with the activity; (ii) A description of the aspects to be assessed as part of the EIA process; (iii) Aspects to be assessed by specialists; (iv) A description of the proposed method of assessing the environmental aspects including the proposed method for assessing the environmental aspects including aspects to be assessed by specialists; (v) A description of the proposed method of assessing duration and significance; (vi) An indication of the stages at which the competent authority will be consulted; (vii) Particulars of the public participation process that will be conducted during the EIA Phase; (viii) A description of the tasks that will be undertaken as part of the EIA Phase; and (ix) Identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.
17	EAP Declaration and Conclusion	2 (j)	An undertaking under oath or affirmation by the EAP in relation to: (i) The correctness of the information provided in the report; (ii) The inclusion of comments and inputs from stakeholders and IAPS; and (iii) Any information provided by the EAP to IAPS and any responses by the EAP to comments or inputs made by IAPS.
		2 (k)	An undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and IAPs on the Plan of

Chapter	Title	Correlation with Appendix 2 of GN No. 982	
			Study for undertaking the EIA.
		2 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including: (i) A concluding statement indicating the preferred alternative, including preferred location of the activity.
N/A		2 (l)	Where applicable, any specific information required by the Competent Authority.
N/A		2 (m)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act.

Please note that the following sections of Appendix 2 of GN No. R. 982 (04 December 2014) will be investigated further and reported on in the EIA Report, following the execution of the relevant specialist studies and targeted public participation:

2(h)(v)	The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (a) can be reversed; (b) may cause irreplaceable loss of resources; and (c) can be avoided, managed or mitigated.
2(h)(vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.
2(h)(viii)	The possible mitigation measures that could be applied and level of residual risk.
2(h)(ix)	The outcome of the site selection matrix.
2(h)(xi)	A concluding statement indicating the preferred alternatives, including preferred location of the activity.

3 PROJECT BACKGROUND AND MOTIVATION

3.1 The Western Cape Water Supply System

The WCWSS serves the City of Cape Town (CCT), surrounding urban centres and irrigators. It consists of infrastructure components owned and operated by both the CCT and the DWS (Department of Water Affairs, 2012). In 2007, the WCRSS was commissioned by DWS (then the Department of Water Affairs and Forestry – DWAF) to facilitate the reconciliation of predicted future water requirement scenarios for a 25 year planning horizon. The WCRSS investigated a number of options such as desalination, effluent treatment for re-use, groundwater development and possible surface water augmentation options (DWAF, 2007).

According to the WCRSS undertaken in 2007, the WCWSS's total present water use was estimated at about 465 million m^3/a with the existing sources yielding only about 475 million m^3/a (DWAF, 2007). The study also noted that whilst the Berg Water Project (Berg River Dam and its supplement scheme) would increase the yield to 582 million m^3/a from 2007, the estimated water requirement (even with water conservation and demand management) by 2019 could exceed this. The implication is that the system supply would then be fully

utilised and thus additional interventions would thus be required to come online by that time (**Figure 1**) (DWAF, 2007).

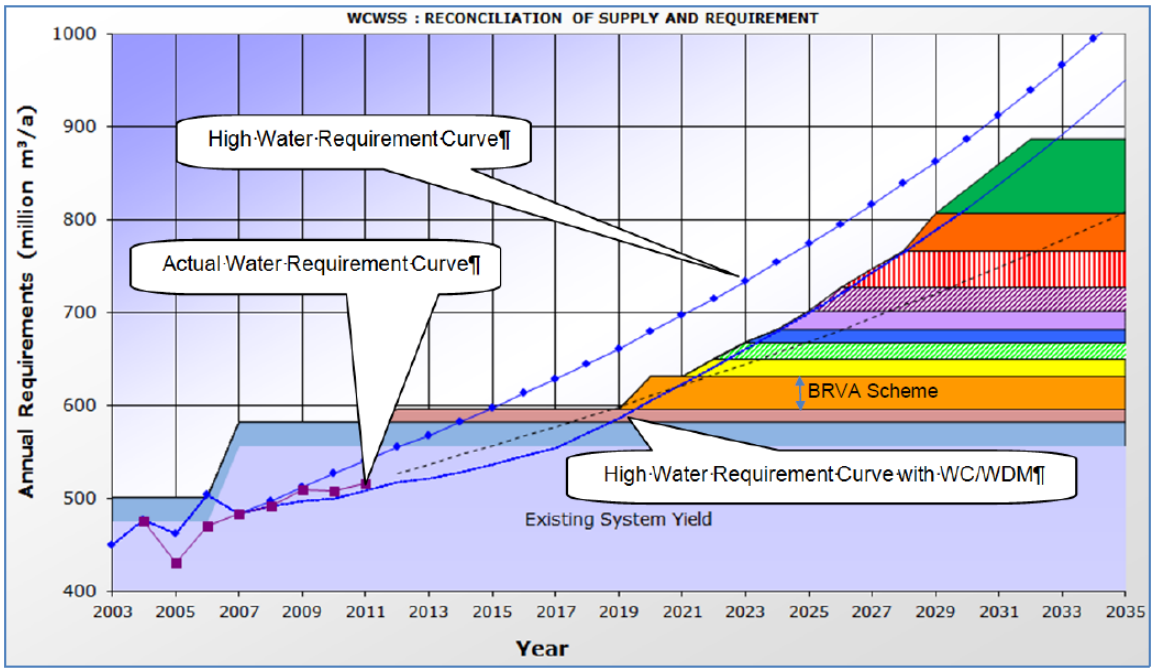


Figure 1: WCWSS Reconciliation of Supply and Requirements (DWA, 2012a)

Based on the figure above, the WCRSS has therefore identified the need for augmentation of the WCWSS by 2019. Based on this, the DWS appointed the Western Cape Water Consultants Joint Venture (WCWC JV) to undertake pre-feasibility level (Phase 1) investigations into six potential surface water development options. These options included the following:

- Michell's Pass Diversion Scheme;
- First Phase Augmentation of Voëlvlei Dam;
- Further Phases of Voëlvlei Dam Augmentation;
- Molenaars River Diversion;
- Upper Wit River Diversion; and
- Further Phases of the Palmiet Transfer Scheme.

The location of the six possible options is shown in **Figure 2** below.

Both DWS and the CCT are currently also undertaking further feasibility studies into alternative sources, such as sea water desalination, groundwater abstraction from the Table Mountain Group Aquifer, and water reclamation. These further studies are being implemented in order to timeously identify the next most feasible option for further augmentation of the system in the future.

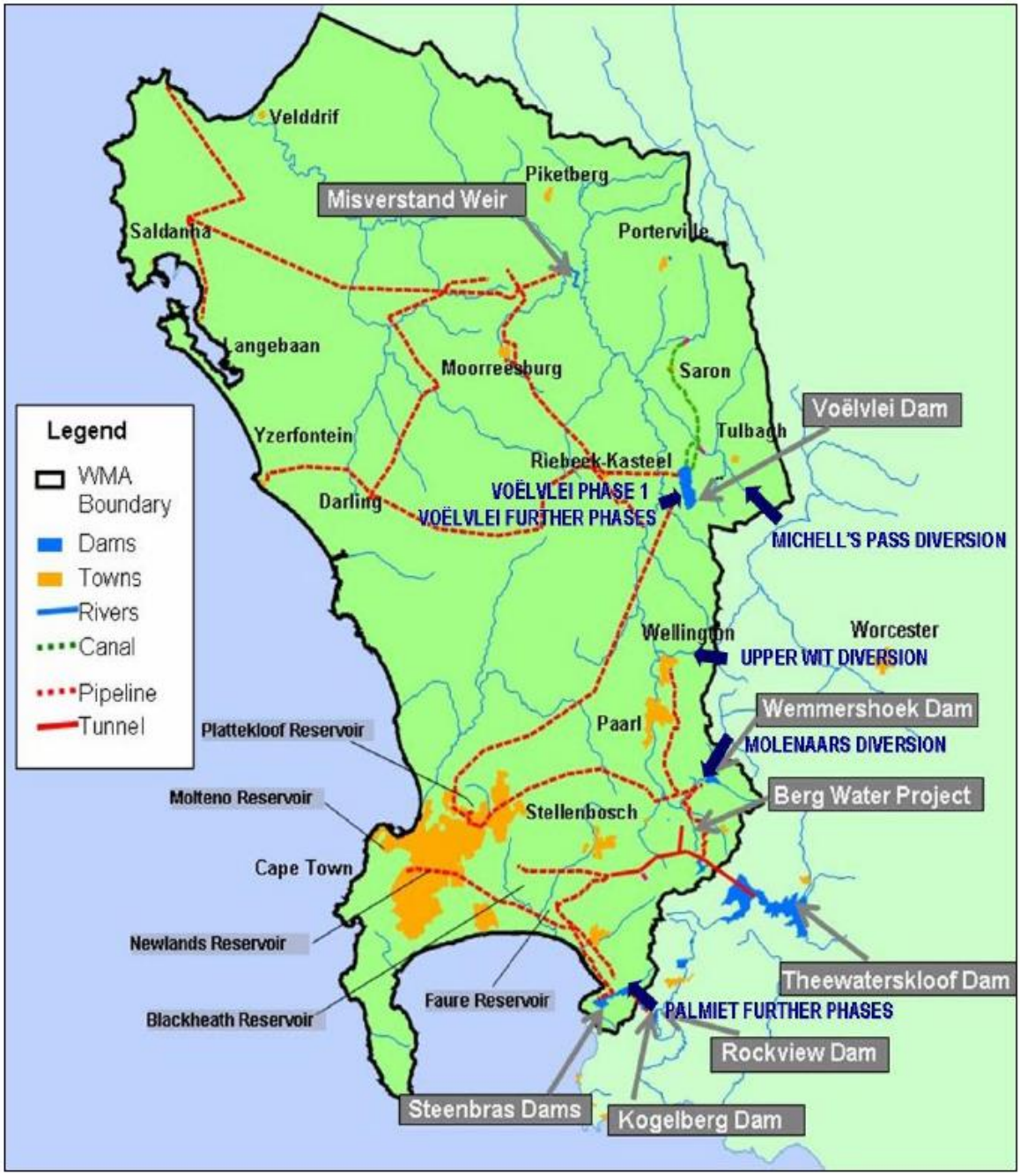


Figure 2: The WCWSS and the Location of the Options Investigated (DWA, 2010)

Based on the findings of the pre-feasibility study, the six possible options investigated were then prioritized to identify the two most viable options for further investigation at a Feasibility Study level in Phase 2. The Phase 1 outcome indicated the following two priority schemes.

- Berg River-Voëlvlei Augmentation Scheme (BRVAS) (also known as the First Phase Augmentation of Voëlvlei Dam); and
- Breede-Berg Transfer Scheme (BBTS) (also known as the Michell's Pass Diversion Scheme).

Both of these schemes would be based on the overall operating rule that only surplus winter water would be abstracted and only such amounts after provision is made for the downstream ecological flow requirements. No abstraction will take place outside of those periods.

The Feasibility Study recommended that the BRVAS option was the most favourable of the size potential schemes for a number of reasons which include the following:

- The proposed abstraction site from the Berg River at Lorelei Farm has favourable geology and sedimentation control characteristics. It would also provide the shortest possible pipeline route to convey the abstracted water in winter into the Voëlvlei Dam, where it would be stored;
- The proposed pipeline route offers opportunity to limit environmental impacts on the Voëlvlei Conservancy;
- The proposed rising main from the Berg River to Voëlvlei Dam could also serve as a closed conduit for making releases from the dam in summer, back into the Berg River. These releases are required for providing water to downstream users including irrigators and parts of the West Coast District Municipality. This could replace the existing open discharge concrete canal which currently serves to make those releases, but which experiences substantial losses;
- The water quality impacts of transferring winter water from the Berg River into the Voëlvlei Dam have been investigated and are not considered to be a limitation on the implementation of the scheme;
- Planning by the CCT's Bulk Water Department for future reservoirs and link pipelines to the existing CCT pipeline (feeding the Plattekloof Reservoir) would facilitate improved integration of this scheme into the WCWSS;
- The estimated capital cost of BRVAS scheme is relatively attractive; and
- The potential delivery of water by the BRVAS scheme could be possible by 2019, which is when the next water supply scheme to augment the WCWSS would be required.

3.2 Existing Voëlvlei Government Water Scheme

Voëlvlei Dam was commissioned in 1952 and was the first large water supply scheme in the Berg River Catchment. It was constructed by impounding the natural Vogelvlei Lake near Gouda in the Drakenstein Local Municipality (DWAF 2004). The natural catchment of the Dam is very small (only 31 km^2) and additional water was obtained via a concrete lined canal feeding water from the Klein Berg River to the dam (max 1.3 million cubic metres per day; DWAF 2004). In 1969, Cape Town's increasing water demand resulted in the dam wall being raised. Additional water was then abstracted from the Klein Berg River (max. 1.7 million

cubic metres per day). In addition, a new canal was constructed to divert water from the Twenty Four River and Leeu River (max. 2.9 million cubic metres per day) into the dam.

The main purpose of the dam is to supply water for domestic use to the West Coast District Municipality (WCDM) including Riebeek-Kasteel, Riebeek-Wes, Malmesbury, Darling, Moorreesburg and the CCT Metropolitan Municipality. The dam also supplies water for irrigation purposes along the Lower Berg River.

Voëlvlei Dam is owned by DWS and has an estimated yield of 105 million m^3/annum which supplies the City of Cape Town, the Lower Berg River irrigators and the WCDM. Therefore, the dam is currently over-allocated. It has a very small incremented catchment over and above the transfers (31km^2) and thus relies on existing diversion schemes from the Klein Berg River, as well as the Leeu River and the Twenty Four River whereby water from these rivers is diverted into two canal systems into the dam (DWA, 2012b). The Klein Berg canal is 8 km long and has a capacity of 20 m^3/s whilst the canal from the Leeu River and Twenty Four River is 29 km long with a capacity of 34 m^3/s (DWA, 2012a).

Both the WCDM and the CCT own and operate Water Treatment Works (WTW) which are supplied from the Voëlvlei Dam. From the CCT WTW, a 1.5 m diameter pipeline of 80 km length conveys treated water that is pumped from the WTW to the City's Plattekloof Reservoir. This pipeline only has spare capacity in winter and this places a key constraint on the future uptake of water from the proposed scheme.

In addition, treated water is supplied to users in the WCDM (Malmesbury to St Helena Bay) via the Swartland WTWs (owned and operated by the WCDM) at the Voëlvlei Dam. Water is also released from the Voëlvlei Dam via the existing outlet canal into the Berg River from whence abstraction takes place at Misverstand Dam into the Withoogte WTW (also owned and operated by the WCDM) (DWA, 2012a).

As the dam is located within a winter rainfall area, characterised by wet winters and dry summers, it is filled during the wet winter months, from May to October, when about 90% of the annual runoff occurs. During this period the water requirement comprises only about 30% of the annual requirement. During the dry summer months, from November to April, inflows to the dam in the Western Cape are small and irrigation and garden watering requirements in the urban areas are large. Approximately 50% of the dams' storage is required for storage during the winter so that the high water requirement during the summer can be met. The remaining 50% of the dams' storage is required to provide long-term carry-over storage for periods of drought (DWA, 2012a).

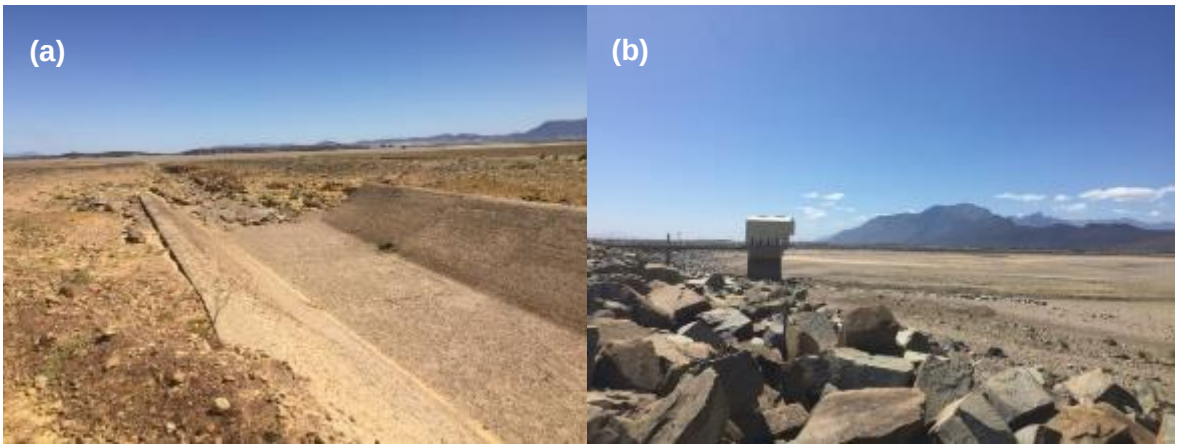


Figure 3: Canal feeding Voëlvlei Dam (a) and a dry Intake tower at Voëlvlei Dam (during the summer of 2016 (b)

4 PROJECT LOCATION AND CATCHMENT CONTEXT

The project area is situated in Western Cape in the Drakenstein Local Municipality of the Cape Winelands District Municipality as well as the Swartland Local Municipality of the West Coast District Municipality. A locality map is provided in **Figure 4**. Please note larger maps are provided in **Appendix B.**

The proposed development falls within the Berg River Catchment of the Berg–Olifants Water Management Area (WMA). The Berg River Catchment covers an area of almost 9 000 km^2 in the Western Cape Province, and is subdivided into 12 quaternary catchments ranging in size from 125 km^2 near the headwaters to 2000 km^2 in the drier western parts of the catchment (**Figure 5**) (C.A.P.E., 2008). Both Voëlvlei Dam and the proposed Berg River abstraction site are located in quaternary catchment, G10F of the Berg River Catchment.

The Berg River Catchment receives most precipitation during the winter rainfall season, with the east of the catchment receiving relatively high volumes of rain (ca. 5 000 mm per annum) in contrast to the lower-lying foothills and floodplains to the west receiving only 400 – 500 mm per annum, decreasing towards the sea. The river headwaters (perennial and semi-perennial mountain streams that rise in the Franschhoek and Drakenstein Mountains) therefore supply most of the water to the system. Mean annual runoff for the entire catchment is approximately 682 Mm^3 (C.A.P.E., 2008).

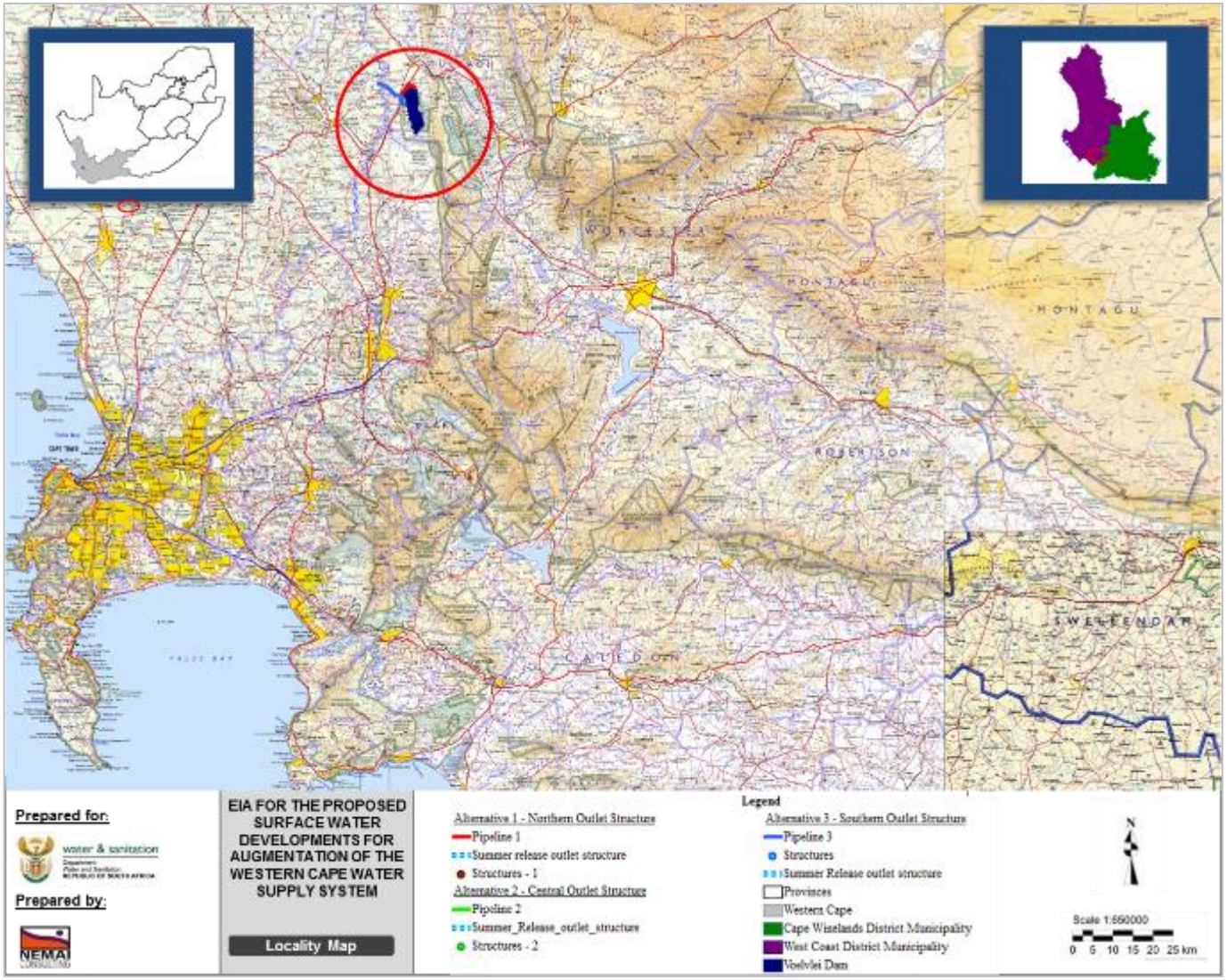


Figure 4: Locality Map

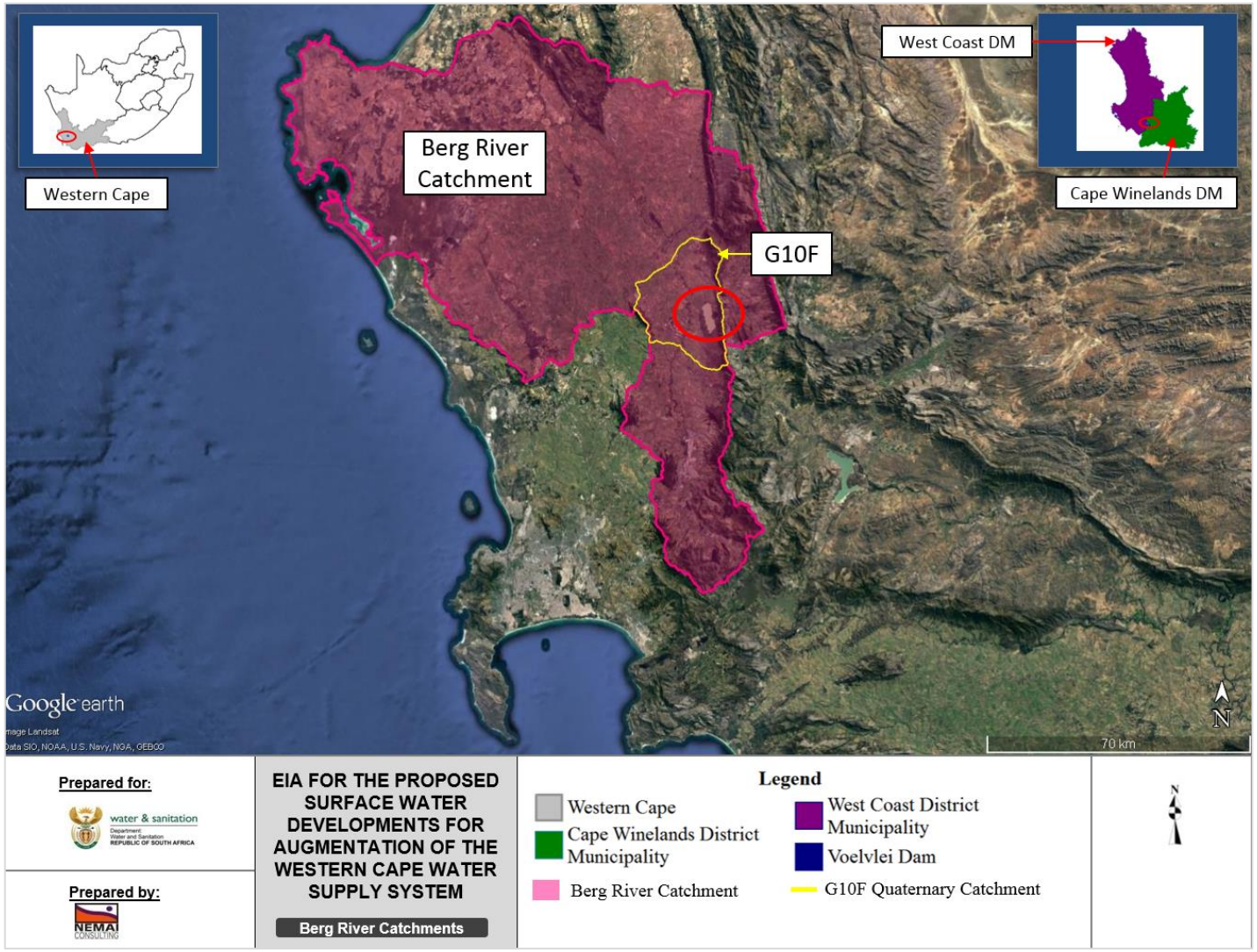


Figure 5: Berg WMA and Berg River Catchment

The closest town to the proposed scheme is Gouda and it is located approximately 5km away from the proposed developments. The project developments are mostly located on privately-owned properties that are primarily used for agricultural practices, except for one property located north of the proposed pipeline which is owned by the Drakenstein Local Municipality. Some properties are owned by DWS. The properties that are directly affected by the proposed development are shown in **Figure 6** and listed in **Table 2**.

Table 2: Directly affected properties

Project Component	Farm Name	Portion	SG Code
Pipeline and associated Discharge Points	Half Gewaagd 73	21	C07500000000007300021
	Sonquas Doordrift 647	2	C04600000000064700002
	Tulburgh Road 441	0	C07500000000044100000
	Tulburgh Road 412	0	C07500000000041200000
	Tulburgh Road 412	0	C07500000000041200000
	Farm 201	2	C07500000000020100002
	Doorn Boom 199	1	C07500000000019900001
	Farm 200	0	C07500000000020000000
	Vogel Valley 207	0	C07500000000020700000
	Sonquas Doordrift 648	1	C04600000000064800001
	Zonquasdrif 1129	3	C04600000000112900003
	Half Gewaagd 73	25	C07500000000007300025
	Farm 392	0	C07500000000039200000
	Farm 201	1	C07500000000020100001
Pump Station	Sonquas Doordrift 648	1	C04600000000064800001
Weir	Sonquas Doordrift 648	1	C04600000000064800001
Access Roads	Sonquas Doordrift 648	2	C04600000000064800002
	Zonquasdrift 1129	5	C04600000000112900005
	Zonquasdrift 1129	0	C04600000000112900000
	Zonquasdrift 1129	6	C04600000000112900006
	Farm 441 Tulbugh Road	-	C07500000000044100000
	Farm 392	0	C07500000000039200000
Construction Camps	Vogel Valley 207	0	C07500000000020700000

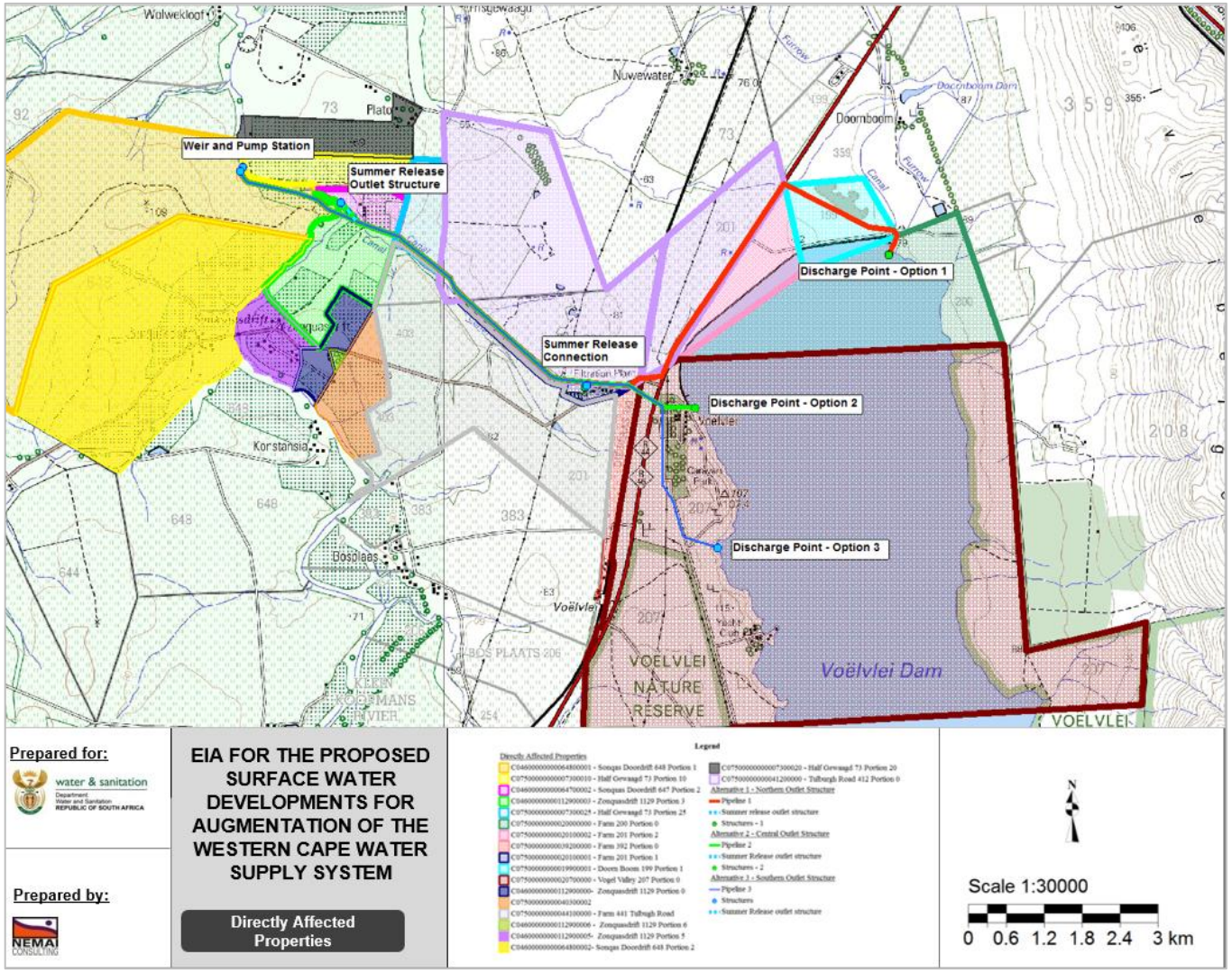


Figure 6: Directly affected properties

5 LEGISLATION AND GUIDELINES CONSIDERED

5.1 Overview of Legislation

Some of the pertinent environmental legislation that has bearing on the proposed development is captured below (**Table 3**). More detailed information is provided in **Section 5.2.** to **5.15**. This Section aims to satisfy 2(e) of Appendix 2 of GN No. R. 921 of 04 December 2014 (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process).

Table 3: Environmental Statutory Framework

Legislation	Relevance
Constitution of the Republic of South Africa (Act No. 108 of 1996)	Chapter 2 – Bill of Rights. Section 24 – environmental rights.
National Environmental Management Act (Act No. 107 of 1998)	Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment). Section 28 – Duty of care and remediation of environmental damage. Environmental management principles. Authority – DEA.
Government Notice No. R. 982 of 04 December 2014	Purpose – regulate the procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.
Government Notice No. R. 983 of 04 December 2014 (Listing Notice 1)	Process for undertaking Basic Assessment / Scoping and EIA process.
Government Notice No. R. 984 of 04 December 2014 (Listing Notice 2)	Activities that need to be assessed through a Basic Assessment process.
Government Notice No. R. 985 of 04 December 2014 (Listing Notice 3)	Activities that need to be assessed through a Scoping and EIA process.
National Water Act (Act No. 36 of 1998)	Chapter 3 – Protection of water resources. Section 19 – Prevention and remedying effects of pollution. Section 20 – Control of emergency incidents. Chapter 4 – Water use. Chapter 12 – Safety of dams Authority – DWS.
National Environmental	Protection and conservation of ecologically viable areas

Legislation	Relevance
Management: Protected Areas Act (Act No. 57 of 2003)	representative of South Africa's biological diversity and natural landscapes. Authority –DEA.
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	Air quality management. Section 32 – dust control. Section 34 – noise control. Authority – DEA.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	Management and conservation of the country's biodiversity. Protection of species and ecosystems. Authority – DEA.
National Environmental Management: Waste Act (Act No. 59 of 2008)	Chapter 5 – licensing requirements for listed waste activities (Schedule 1). Authority – Minister (DEA) or MEC (provincial authority)
Occupational Health & Safety Act (Act No. 85 of 1993)	Provisions for Occupational Health & Safety. Authority – Department of Labour.
National Heritage Resources Act (Act No. 25 of 1999)	Section 34 – protection of structure older than 60 years. Section 35 – protection of heritage resources. Section 36 – protection of graves and burial grounds. Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m^2 in extent. Authority – Western Cape Heritage (WCH).
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	Control measures for erosion. Control measures for alien and invasive plant species. Authority – Department of Forestry and Fisheries (DAFF).
National Forestry Act (Act No. 84 of 1998)	Section 15 – authorisation required for impacts to protected trees. Authority – DAFF.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	Permit required for borrow pits. Authority – Department of Mineral Resources (DMR).
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	Control measures for erosion. Control measures for alien and invasive plant species. Authority – Department of Agriculture.
National Road Traffic Act (Act No. 93 of 1996)	Authority – Western Cape Department of Roads and Public Works.
Tourism Act of 1993	Authority – South African Tourism Board.

5.2 The Constitution (Act No. 108 of 1996)

The Constitution of the Republic of South Africa, Act No. 108 of 1996, is the supreme law of the land and provides amongst others the legal framework for legislation regulating coastal management in general. It also emphasises the need for co-operative governance. In addition, the Environmental clause in Section 24 of the Constitution provides that:

"Everyone has the right –

a) To an environment which is not harmful to their health or wellbeing;

b) To have the environment protected for the benefit of present and future generations through reasonable legislation and other measures that:

I. Prevent pollution and ecological degradation;

II. Promotes conservation;

III. Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development".

The Constitution provides the overarching framework for sustainable development.

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

The proposed surface water developments for augmentation of WCWSS requires authorisation in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), and the EIA will be undertaken in accordance with the EIA Regulations (04 December 2014).

The 2014 EIA Regulations consist of the following:

- EIA procedures - Government Notice No. R. 982;
- Listing Notice 1 - Government Notice No. R. 983;
- Listing Notice 2 - Government Notice No. R. 984; and
- Listing Notice 3 - Government Notice No. R. 985.

The proposed developments triggered activities under Listing Notices 1 and 2, and thus a Scoping and EIA process needs to be undertaken. The listed activities are fully explained in context of the project in **Table 4**.

Table 4: Listed Activities triggered by the proposed project

Listed Activity	Listed Activity Description per project
GN No. R 983 – Activity 9 (i) The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.	A new rising main pipeline will be constructed in order to transfer water from the Berg River to the existing Voëlvlei Dam. The pipeline will be between 5000 and 8115m in length and will have a diameter of 1.7m.
GN No. R 983 – Activity 11(i)	Power supply to the abstraction site will be required. The potential size of that transmission line, its routing and

Listed Activity	Listed Activity Description per project
The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	associated transformers was not undertaken during the feasibility study. Conceptual arrangements will be assessed by Aurecon, as part of this EIA support task, but this information is not available now.
GN No. R 983 – Activity 12 (iii) (v) (x) (xii) The development of- (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will	New weir, pump station building and infrastructure more than 100m^2 in size within 32m of the Berg River will be constructed. The footprint of the pump station alone will be in the order of 80 x 30m (~2400m^2) on the left bank (looking downstream). The weir footprint extends well onto the right bank and will also exceed 100m^2. The scheme could be operated in one of two ways. Either a possible 4m^3/s abstraction via a stepped pumping rule into a 1.7m dia pipe, or via a variable speed abstraction of up to 6m^3/s into a 1.9m dia pipe. The recommended is the former one (i.e. 1.7m dia pipe with a stepped pumping rule up to 4m^3/s), which is more easily operated.

Listed Activity	Listed Activity Description per project
not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.	
GN No. R. 983 – Activity 19 (i) The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	The proposed development will include the construction of various infrastructure within the Berg River, including: • Low level weir; • Pipeline; and • Pump station. This will result in the excavating, dredging and infilling within a watercourse of more than $5m^3$. The access road is proposed to be via the existing Sonquasdrift Road which currently crosses the Berg River in the direction of Riebeeck Kasteel. That road is wide enough (6m surface and 15-20m servitude). From the existing Sonquasdrift Road to the abstraction / pump station site there may be small watercourses to cross (depending on which of the three possible access routes on Goudklip Farm are selected).
GN No. R. 983 – Activity 27 The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in	The exact dimensions of the Pump Station are not known however together with weir, clearing will likely exceed 1 ha. The footprint of the pump station alone will be in the order of 80 x 30m (~$2400m^2$) on the left bank (looking downstream). The weir footprint extends well onto the right bank and will also exceed $100m^2$.

Listed Activity	Listed Activity Description per project
accordance with a maintenance management plan.	
GN No. R. 983 – Activity 30 Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	The proposed developments fall within the Swartland Shale Renosterveld, and the Swartland Alluvium Fynbos, both of which are categorised as Critically Endangered, according to data sourced from SANBI. The proposed developments also fall within both Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) regions.
GN No. R. 984 – Activity 11 The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following - (i) water catchments; (ii) water treatment works; or (iii) impoundments; excluding treatment works where water is to be treated for drinking purposes.	The proposed development involves the transfer of approximately 23 million cubic metres per annum between the Berg River and the existing Voëlvlei Dam. Water from the Dam is abstracted by West Coast District Municipality and City of Cape Town.
GN No. R. 985 – Activity 12(a) (i) (ii) The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (i) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; (ii) Within critical biodiversity areas identified in bioregional plans; (iii) Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; or (iv) On land, where, at the time of the coming into	The proposed development will result in more than 300 square metres of indigenous vegetation being cleared. Part of the pipeline route occurs within a CBA area as well as an area indicated in the National Spatial Biodiversity Assessment (2004) as CE.

Listed Activity	Listed Activity Description per project
effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.	
GN No. R. 985 – Activity 18(f) (i) (aa) The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. (f) In Western Cape: All areas outside urban areas: (aa) Areas containing indigenous vegetation; (bb) Areas on the estuary side of the development setback line or in an estuarine functional zone where no such setback line has been determined.; or ii. In urban areas: (aa) Areas zoned for conservation use; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority	The existing Sonquasdrift Road is proposed as the main access route, from where access would then be via existing farm roads (the farm roads would need widening). The Sonquasdrift Road itself has a current surface width of 6m and a min servitude of 15m and is wide enough. The on-farm roads will required widening and wearing courses – conceptual designs not available yet.

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

The National Environmental Management Waste Act (NEM: WA) (Act No. 56 of 2008) regulates waste management in order to protect the health and environment of South African citizens. This is achieved through pollution prevention, institutional arrangements and planning matters, national norms and standards and the licensing and control of waste management activities.

The list of waste management activities that have or are likely to have a detrimental effect (GN No. 921 of 29 November 2013) contains activities listed in Categories A and B that would require licensing from the provincial or national authorities and activities contained in Category C which would require meeting the requirements of various Norms and Standards.

The purpose of the Norms and Standards for the Storage of Waste is to provide a uniform approach to the management of waste storage facilities, ensure best practice is the management of waste storage facilities and provide minimum standards for the design and operation of new and existing waste storage facilities.

The Norms and Standards require registration of new storage facilities. They also provide details on the management of all storage facilities in terms of access control and notices,

operation, general requirements of waste storage containers, minimum requirements for above ground storage facilities and minimum requirements for below ground storage facilities.

The Norms and Standards also require that training be undertaken and an emergency preparedness plan be compiled. In addition, specific monitoring and inspections need to be undertaken as well as internal and external audits.

As part of the operation of the facility, waste will be stored temporarily on site prior to disposal. These storage facilities will be managed in line with the Norms and Standards for Storage.

No authorisation will be required in terms of the NEM: WA (Act No. 59 of 2008), as the project will not include any listed waste management activities.

The following should be noted with regards to waste management during the Construction Phase:

- Temporary waste storage facilities will remain below the thresholds contained in the listed activities under Schedule 1 of NEM: WA; and
- The Environmental Management Programme (EMPr) will make suitable provisions for waste management, including the storage, handling and disposal of waste.

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

Borrow areas and quarries have been identified to source construction material for the project. Under Section 106(1) of the Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002), DWS is exempt from the provisions of Sections 16, 20, 22 and 27 "*in respect of any activity to remove any mineral for road construction, building of dams or other purpose which may be identified in such notice*".

No Mining Permits are required for the proposed developments as borrow pit material (e.g. soil, gravel or sand) will be sourced from a commercial source.

5.6 The National Water Act (Act No. 36 of 1998)

The National Water Act (NWA) (Act No. 36 of 1998) regulates the water resource of South Africa and aims to achieve the sustainable use water for the benefit of all users. Water is considered a scarce commodity and should therefore be adequately protected. Amongst others, the act deals with the protection of water sources, water uses, water management strategies and catchment management, dam safety and general powers and functions, as well as water quality.

The purpose of the act is to ensure that South Africa's water resources are protected, used, developed, conserved, managed and controlled, and for achieving this purpose, to establish suitable institutions and to ensure that they have appropriate community, racial and gender representation..

The NWA definition for a Water Resource includes:

1. A Watercourse;
2. Surface Water;
3. An Estuary; and
4. An Aquifer.

The NWA defines a watercourse as follows:

a) A river or spring;
b) A natural channel in which water flows regularly or intermittently;
c) A wetland, lake or dam into which, or from which, water flows; and
d) Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse include, where relevant, its bed and banks.

Section 21 of the NWA provides information on what water uses require approval (i.e. Water Use License Applications or WULAs). These include:

a) Taking water from a water resource;
b) Storing water;
c) Impeding or diverting the flow of water in a watercourse;
d) Engaging in a stream flow reduction activity;
e) Engaging in a controlled activity;
f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g) Disposing of waste in a manner which may detrimentally impact on a water resource;
h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
i) Altering the bed, banks, course or characteristics of a watercourse;
j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
k) Using water for recreational purposes.

The two most common water uses are Section 21 (c) and (i) and in terms of the presence of watercourses near the site are the activities that are relevant:

(c) Impeding or diverting the flow of water in a watercourse; and

(i) Altering the bed, banks, course or characteristics of a watercourse.

In terms of Section 21 (c):

The definition of impeding is as follows:

"Temporary or permanent obstruction or hindrance to the flow of water into watercourse by structures built either fully or partially in or across a watercourse"

The definition of diverting is as follows:

Temporary or permanent diversion of flow for –

a) Prospecting, mining and quarrying;
b) Agriculture;
c) Management of waste disposal sites including landfills; and
d) Construction and maintenance purposes of infrastructure.

(Obtained from GN No 26187 published in Government Gazette No. 398, dated 26 March 2004)

Thus, in simplified terms, this water use entails "causing an obstruction to the flow of water in a watercourse, or diverting some or all of the flow in or from a watercourse".

In terms of Section 21 (i):

Altering the bed, banks, course or characteristics of a watercourse means any changes affecting:

- The morphology and topography (bed, banks, macro-channels) of the watercourse including changes affecting the riparian and instream habitat characteristics; and
- The dynamics of a watercourse including the chemical characteristics, flood dynamics and biotic components (These alterations include changes affecting floodlines and changes in land use, vegetation cover, discharges, soil, sediment, geology, geohydrology and topography).

Any wetland or any water resource within a distance of 500 meters upstream or downstream from the boundary of any wetland.

The NWA specifies that for a S21(i) water use the applicant must delineate the watercourse and riparian habitat using the DWAF guideline: "*A practical field procedure for identification and delineation of wetlands and riparian areas*" and indicate the proposed activity location in relation to the riparian area, the 1:50 and 1:100 year floodlines on a map of appropriate scale.

Any development within the riparian habitat or 1:100 year floodline whichever is the greatest distance from the watercourse, will require an authorisation from the Department. However, the only way to determine the riparian area is through a riparian habitat delineation. Due to the sensitive nature of wetlands, any activity within the 500m buffer of a wetland will also require a WULA.

As the proposed developments occur within a regulated area of a watercourse and involves abstraction of water, a WULA is required in terms of Sections 21 (a), (c) and (i). In addition, an Aquatic and Wetland Delineation will be conducted as part of the EIA Phase.

5.7 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004) was promulgated for the management and conservation of South Africa's biodiversity through the protection of species and ecosystems and the sustainable use of indigenous biological resources.

The main implication of this act is the protection of biodiversity.

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

The aim of the National Environmental Management: Protected Areas Act (NEMPA) (Act No. 57 of 2003) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a Protected Environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

The proposed developments do occur near a Protected Areas, namely the Voëlvlei Nature Reserve managed by Cape Nature. However, the proposed developments do not encroach on the Reserve.

5.9 The Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983) requires the maintenance of riparian vegetation and provides a list of invasive alien vegetation that must be controlled or eradicated.

The proposed developments partly contains agricultural land. The impacts of the proposed developments will be assessed in the EIA phase as there will be a complete loss of the existing agricultural land. In addition, an Agricultural Impact Assessment will be conducted as part of the EIA Phase.

5.10 National Forest Act (Act 84 of 1998)

In terms of the National Forests Act (Act 84, 1998), trees in natural forests or protected tree species (as listed in Government Gazette Notice 1012 of 27 August 2004) may not be cut,

disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the DAFF.

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

The National Heritage Resources Act (Act No. 25 of 1999) was promulgated for the protection of National Heritage Resources and the empowerment of civil society to conserve their heritage resources.

The proposed developments will trigger certain categories as listed below that require a heritage impact assessment (HIA) in terms of Section 38 of the National Heritage Resources Act. These categories are:

- Any development or other activity which will change the character of a site
    - Exceeding 5 000 m^2 in extent; or
    - Involving three or more existing erven or subdivisions thereof; or
    - Involving three or more erven or divisions thereof which have been consolidated within the past five years;
    - The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; or
    - Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

The Act also makes provision for General Protections, which apply automatically to certain categories of heritage resources such as archaeological and paleontological sites, cemeteries and graves, and structures older than 60 years.

Based on the size of the development, a Phase 1 HIA is required; the report needs to be approved by the WCH as well as South African Heritage Resource Authority (SAHRA).

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

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) provides for the setting of national norms and standards for regulating air quality monitoring, management and control and describes specific air quality measures so as to protect the environment and human health or well-being by:

- Preventing pollution and ecological degradation; and
- Promoting sustainable development through reasonable resource use.

It also includes the establishment of national ambient dust fall out levels that may be relevant to the construction.

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

The Occupational Health and Safety Act (Act No. 85 of 1993) provides for the health and safety of people at work as well as the health and safety of persons using plant and machinery.

This act will need to be taken into account should the proposed development be approved.

5.14 Policy, Programmes, Guidelines and Plans

5.14.1 Guidelines

The following guidelines were used in the preparation of this report.

- Integrated Environmental Management Information Series, in particular Series 2 – Scoping (DEAT, 2002);
- Guideline on Alternatives: NEMA Environmental Impact Assessment Regulations (prepared by the Western Cape Department of Environmental Affairs and Development Planning, 2006);
- Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005. Integrated Environmental Management Guideline Series (DEAT, 2005a);
- Guideline 4: Public Participation, in support of the EIA Regulations. Integrated Environmental Management Guideline Series (DEAT, 2005);
- Guideline on Need and Desirability, NEMA Environmental Impact Assessment Regulations Guideline and Information Document Series. Department of Environmental Affairs and Development Planning (DEADP, 2009); and
- Assessment of alternatives and impacts (Guideline 5) in support of the EIA Regulations, Department of Environmental Affairs and Tourism, Pretoria (DEAT, 2006).

5.14.2 Regional Plans

The following regional plans will be considered during the execution of the EIA:

- National Development Plan;
- Western Cape Provincial Spatial Development Framework (SDF);
- West Coast District IDP;
- Cape Winelands SDF;
- Voëlvlei Resource Management Plan (RMP); and
- Relevant provincial, district and local policies and strategies.

The need for the proposed development may be linked to these existing policies and strategies.

6 SCOPING AND EIA PROCESS

6.1 Environmental Assessment Authorities

In terms of the EIA Regulations, the lead decision-making authority for the environmental assessment is the DEA.

6.2 Scoping Process

6.2.1 Formal Process

According to DEAT (2002), Scoping is typically divided into three phases, namely:

- Planning the scoping procedure;
- A process of stakeholder engagement to identify the key issues; and
- Reporting on the terms of reference for the next Phase of the assessment.

An outline if the Scoping and EIA process for the proposed surface water developments is provided in **Figure 7**.

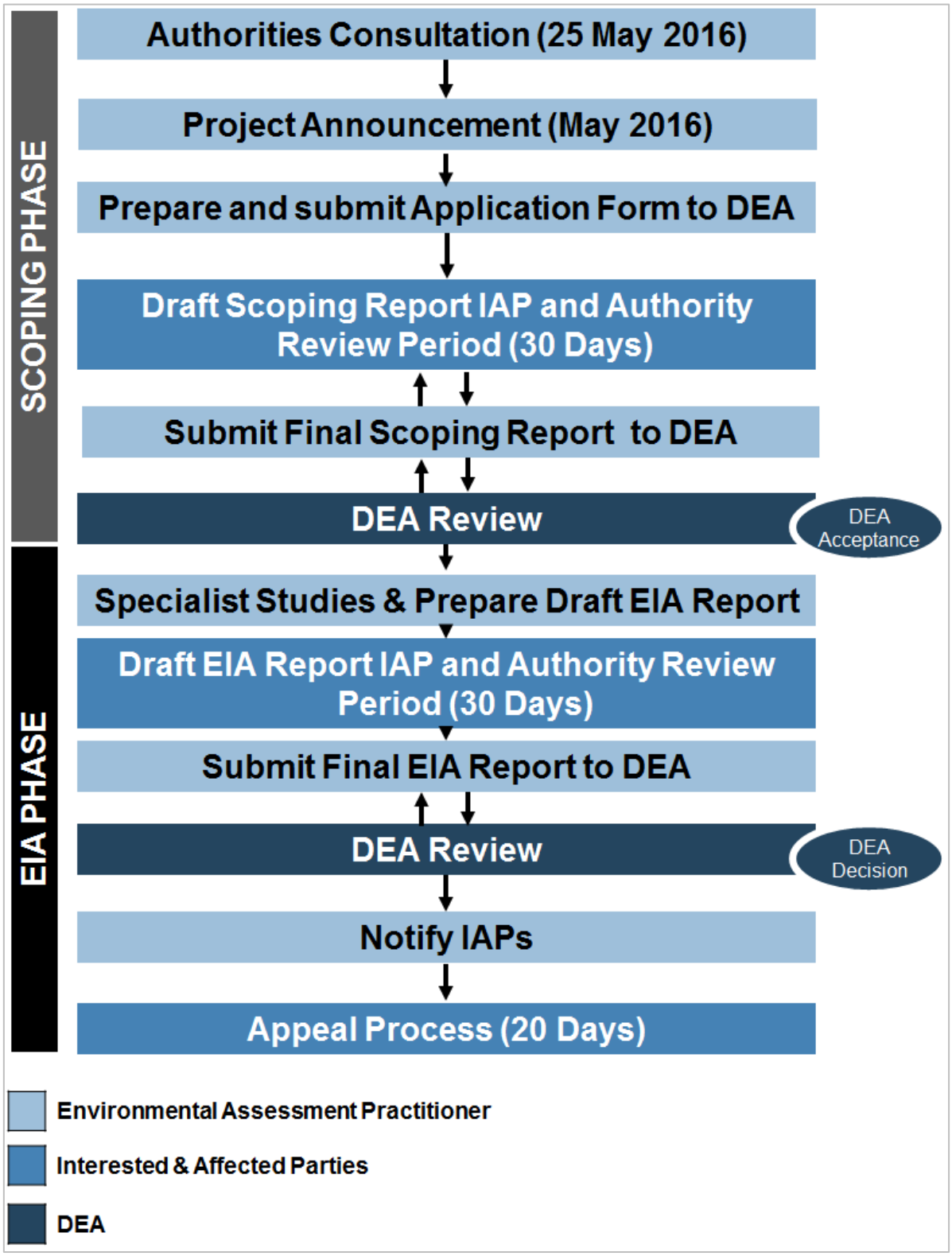


Figure 7: Scoping and EIA Authorisation Process

The purpose of Scoping, which constitutes the first phase of the formal EIA process, is as follows:

- Identify and engage with IAPs and allow for adequate participation in the process;
- Duly consider alternatives for achieving the project's objectives;
- Identify significant issues to be investigated further during the execution of the EIA phase;
- Clarify the roles and responsibilities of various stakeholders in the process;
- Determine the scope of the ensuing EIA phase, in terms of specialist studies, public participation, assessment of impacts and appraisal of alternatives; and
- Allow for informed decision-making with regard to the EIA process.

6.2.2 Landowner Notification

Table 2 lists the various farms affected by the project (refer to cadastral map contained in **Figure 7**. The details of the affected landowners are included in the IAP database contained in **Appendix D5**.

The landowners, farm managers and occupiers were notified of the project. The landowners of the properties possibly traversed by the access roads were also notified.

Proof of written notification to the landowners / persons in control of the land is included in **Appendix D1**.

6.2.3 Application Form

An Application Form for the Scoping and EIA, in terms of Regulation 10 of GN No. R. 982 of 04 December 2014, was submitted to DEA on 22 September 2016.

The activities triggered in terms of GN No. R. 983, R. 984 and R. 985 of 4 December 2014 will be confirmed based on the following:

- Current understanding of the project;
- Available technical information;
- Feedback received from the technical team; and
- Feedback received from DEA and Western Cape Department of Environmental Affairs and Development Planning (WC DEA&DP).

Initially, the Application Form included Activity 14 of GN No R985 of 04 December 2014, however, WC DEA&DP stated that Activity 14 would not be applicable as the site is not located in a protected area in terms of NEMA; no environmental management framework and/or systematic biodiversity plans have been adopted by the competent authority; and the site is not located in a core area in a biosphere reserve. Therefore, an Amended Application Form will be submitted to DEA on 28 October 2016 along with the Final Scoping Report.

A copy of the Application Form that was submitted on 22 September 2016 and a copy of the Amended Application Form is provided in **Appendix E**.

6.2.4 Screening of Alternatives

Various options to meeting the project's objectives were considered during previous studies (including the Pre-Feasibility Study), which eventually lead to the identification of alternatives. This includes the assessment of these options as part of the Scoping exercise, which forms part of the Scoping and EIA phase. The "no go" option is also evaluated to understand the implications of the project not proceeding.

The feasible options are taken forward in the impact prediction, where the potential positive and adverse effects to the environmental features and attributes are examined further. The EIA phase will include a detailed comparative analysis of the project's feasible alternatives that emanate from the Scoping exercise, which will include environmental (with specialist input) and technical evaluations. This will ultimately result in the selection of a Best Practicable Environmental Option (BPEO).

See **Section 11** for further discussions on alternatives.

6.2.5 Impact Prediction

The potential environmental impacts associated with the proposed developments were identified during the Scoping phase through an appraisal of the following:

- Proposed location and footprint of the project infrastructure and components, which included a desktop evaluation with a Geographical Information System (GIS) and aerial photography, as well as site investigations;
- Activities associated with the project life-cycle (i.e. pre-construction, construction, operation and decommissioning);
- Nature and profile of the receiving environment and potential sensitive environmental features and attributes;
- Input received during public participation from authorities and IAPs; and
- Legal and policy context.

The Scoping exercise aimed to identify and qualitatively predict significant environmental issues for further consideration and prioritisation during the EIA stage (**Section 14**). Note that "significance" relates to whether the effect (i.e. change to the environmental feature/attribute) is of sufficient importance that it ought to be considered and have an influence on decision-making.

During the EIA stage, a detailed quantitative impact assessment will be conducted via contributions from the project team and requisite specialist studies, and through the application of the impact assessment methodology (**Section 14**). Suitable mitigation

measures will be identified to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and will be included in an EMPr.

6.2.6 Public Participation and Review of Scoping Report

Scoping is the first phase of the formal EIA process and as such the Scoping process to be followed for the proposed surface water developments aims to:

- Identify and engage with IAPs and allow for adequate participation in the process;
- Duly consider alternatives for achieving the project's objectives;
- Identify significant issues to be investigated further during the execution of the EIA phase;
- Clarify the roles and responsibilities of various stakeholders in the process;
- Determine the scope of the ensuing EIA phase, in terms of specialist studies, public participation, assessment of impacts and appraisal of alternatives; and
- Allow for informed decision-making with regard to the EIA process.

In order to meet the aforementioned aims, the draft Scoping Report will provide the following:

- Information on the Need and Desirability of the proposed development;
- Information on how the proposed development will be undertaken (if approved);
- Information on Alternatives which are being considered;
- Information on the Specialist Studies required in the pending EIA Phase;
- Information on the receiving environment that could be affected by the proposed project;
- Information on the Scoping and EIA processes as well as the Public Participation Process;
- Information on the legislation that has been considered; and
- Information on the Plan of Study for the pending EIA Phase of the project.

More information on the public participation process for the Scoping Report is provided in **Section 13** however in summary:

- The public were given the opportunity to register as IAPs from 26 May 2016 to 27 June 2016;
- Newspaper advertisements were placed in the Paarl Post and the Daily Voice, both published on 26 May 2016;
- Onsite notices were placed at all specific points around the project area; and
- Background Information Documents (BIDs) were emailed to IAPs on this database. IAPs were requested to register as IAPs during this period.

Further, the Draft Scoping Report is made available to all registered IAPs for a 30 day review period from 23 September 2016 to 25 October 2016. All comments received will be taken

into account in the Final Scoping Report and added to the Comments and Response Report. The Final Scoping Report will be made available for further public review at the same time as being submitted to DEA who is the Competent Authority in respect to this proposed WCWSS developments to grant approval.

7 NEED AND DESIRABILITY

In terms of Regulation 2(f) of Appendix 2 of GN No. R. 921 of 04 December 2014, this section discusses the need and desirability of the project. The format contained in the Guideline on Need and Desirability (DEA&DP, 2009) has been used in **Table 5**.

Table 5: Need and Desirability of the project

No.	Question	Response
NEED ('timing')		
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	Water from the Voëlvlei Dam is supplied to the WTW and farms in the surrounding areas. The WCDM SDF states that agriculture is considered the primary economic growth sector in the majority of towns in the West Coast District. As the West Coast District is confronted by an increased demand for water, it becomes more difficult to address these demands efficiently due to capacity constraints in the existing distribution schemes and water sources. Therefore, the proposed developments are considered part of the mandate to provide water to communities and industries within the Western Cape.
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	The proposed development is in line with surrounding land use as the dam and associated pipeline will supply irrigation to surrounding agricultural farms, as well as supply water to the WTW which in turn supplies treated water to towns and municipalities.
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate)	The surrounding agricultural areas, WTWs, and the two District Municipalities receive water from the dam and there is currently an increased demand for water that becomes more difficult to address due to water shortages, therefore an increase in the amount of water supplied is needed in the area.

4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	This project is an augmentation to an existing scheme so appropriate capacity is available to take up the water. Power supply to the abstraction site will be required. The potential size of that transmission line, its routing and associated transformers was not undertaken during the feasibility study. Conceptual arrangements will be assessed by Aurecon, as part of this EIA support task, but this information is not available now.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services)?	The proposed developments are categorised as water service provision and therefore is planned for under both municipalities due to the need for increased water supply to the region although the project is not mentioned by the municipalities due it being driven by DWS.
6.	Is this project part of a national programme to address an issue of national concern or importance?	There is an urgent need to provide water services to communities within South Africa.
DESIRABILITY ('placing')		
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	Six site options were investigated during the Feasibility Studies. From these six options, the following two priority schemes were determined as the most feasible: • BRVAS (also known as the First Phase Augmentation of Voëlvlei Dam); and • BBTS (also known as the Michell's Pass Diversion Scheme). Both schemes rely on the utilisation of the existing storage capacity in the Voëlvlei Dam, and on the existing capacity of the CCT's pipeline, from their WTWs at the dam, to their Plattekloof reservoir in Cape Town. It was found that the BRVAS option was the more favourable surface water intervention option.
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and Spatial Development Framework (SDF) as agreed to by the relevant authorities?	It is not anticipated that the proposed developments will contradict or be in conflict with the Metropolitan IDP and SDF.
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if	Currently, there is no existing EMF for the region. Therefore, this application will not compromise the integrity of the environmental priorities for the area.

	so, can it be justified in terms of sustainability considerations?	
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context).	The proposed developments are situated in close proximity to existing WTWs and the Voëlvlei Dam is currently an existing dam and therefore the land use is favoured.
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	The impact of the proposed activity on sensitive features will be assessed in detail in the EIA Phase. For a desktop assessment, see compilation of significant environmental issues associated with the proposed developments in Section 14.2.
12.	How will the development impact on people's health and wellbeing (e.g. i.t.o. noise, odours, visual character and sense of place, etc)?	The only possible negative impact is noise and dust during the construction phase. The positive impact would be the better water security for domestic use. For a desktop assessment, see compilation of significant environmental issues associated with the proposed developments in Section 14.2.
13	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	There will be no change in land use as the weir will be located within the Berg River and the pump station does not require a change in land use. In addition, the pipeline will be an underground pipeline and the land use will not be impacted. Therefore, there will be no unacceptable opportunity costs.
14	Will the proposed land use result in unacceptable cumulative impacts?	As there will be no change in land use for the proposed developments. However, a servitude may be registered for the pipeline route which may have a cumulative impact. This will be further assessed in the EIA Phase.

8 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed as the independent EAP to undertake the environmental assessment for the proposed surface water developments for the augmentation of WCWSS. In accordance with Section 2(a) of Appendix 2 of GN 921 of 04 December 2014, this section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

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

The core members of Nemai Consulting that are involved with the Scoping and EIA process for the proposed development are provided in **Table 6**, and their respective Curricula Vitae are contained in to **Appendix A**.

Table 6: Scoping and EIA Core Team Members

Name	Qualifications	Duties
Ms D. Naidoo	BSc – Eng (Chem)	Project Manager and Environmental Engineering
Mr D. Henning	MSc – Aquatic Health Ecology	Environmental Assessment Practitioner/Study Leader
Mr C. Chidley	BSc – Eng (Civil) BA – Economics, Philosophy MBA	Project Leader: Specialists and WULA
Mrs V. Stippel	BSc. (Hons) – Zoology MSc. – Ecology, Environment and Conservation	Public Participation and Quality Control

9 PROJECT DESCRIPTION

The following Pre-Feasibility and Technical Feasibility Study reports compiled by the WCWC-JV in 2012 informed the project design for the augmentation of the Voëlvlei Dam:

- **Report Number 1**: **Ecological Water Requirements**. **Volume 1 –** Riverine Environmental Water Requirements
  - Appendix 3: EWR data for the Berg River
- **Report Number 1**: **Ecological Water Requirements**. **Volume 3** - Berg Estuary Environmental Water Requirements
  - Appendix C: Specialist Report – Physical dynamics and water quality
  - Appendix D: Specialist Report – Modelling
  - Appendix E: Specialist Report – Microalgae
  - Appendix F: Specialist Report – Invertebrates
  - Appendix G: Specialist Report – Fish
  - Appendix H: Specialist Report – Birds

- Appendix I: Specialist Report – The economic value of the Berg River Estuary

- **Report Number 2: Preliminary Assessment of Options**

  - Appendix 1: Scheme Yield Assessments and Diversion Functions
  - Appendix 2: Unit Reference Value Calculation Sheets
  - Appendix 3: Yield Analysis and Dam Size Optimization
  - Appendix 4: Dam Design Inputs
  - Appendix 5: Diversion Weir Layout Drawings
  - Appendix 6: Voëlvlei Dam Water Quality Assessment
  - Appendix 7: Botanical Considerations
  - Appendix 8: Heritage Considerations
  - Appendix 9: Agricultural Economic Considerations

- **Report Number 3: Feasibility Studies. Volume 1** - Berg River - Voëlvlei Augmentation Scheme

  - Appendix 1: Updating of the Western Cape Water Supply System Analysis for the Berg River-Voëlvlei Augmentation Scheme
  - Appendix 2: Configuration, Calibration and Application of the CEQUAL-W2 model to Voëlvlei Dam for the Berg River-Voëlvlei Augmentation Scheme
  - Appendix 3: Monitoring Water Quality During Flood Events in the Middle Berg River (Winter 2011), for the Berg River-Voëlvlei Augmentation Scheme
  - Appendix 4: Dispersion Modelling in Voëlvlei Dam from Berg River Water Transfers for the Berg River-Voëlvlei Augmentation Scheme
  - Appendix 5: Scheme Operation and Yield Analyses with Ecological Flow Requirements for the Breede-Berg (Michell's Pass) Water Transfer Scheme
  - Appendix 7: Ecological Water Requirements Assessment Summary for the Berg River-Voëlvlei Augmentation Scheme, and the Breede Berg (Michell's Pass) Water Transfer Scheme
  - Appendix 8: Geotechnical Investigations for the Berg River-Voëlvlei Augmentation Scheme, and the Breede-Berg (Michell's Pass) Water Transfer Scheme
  - Appendix 10: Conveyance Infrastructure Design Report, for the Berg River-Voëlvlei Augmentation Scheme, and the Breede-Berg (Michell's Pass) Water Transfer Scheme
  - Appendix 11: Diversion Weirs Design for the Berg River-Voëlvlei Augmentation Scheme, and the Breede-Berg (Michell's Pass) Water Transfer Scheme

9.1 Project Components

The project components are illustrated in **Figure 8** below and include the following:

- A low level weir, abstraction works and 4 m^3/s raw water pump station on the Berg River;
- A rising main pipeline from the Berg River to Voëlvlei Dam; and
- A potential new summer release connection at the existing Swartland WTW to facilitate summer releases into the Berg River for environmental requirements thus eliminating the need to utilize the existing canal from which water losses occur.

All the infrastructure and activities that require environmental authorisation need to be assessed as part of the EIA. In this regard, the following associated infrastructure was identified:

- Abstraction works;
- Rising main pipeline and pump station;
- Diversion weir;
- Access roads during construction;
- Access roads during operation;
- Powerlines for construction and operation; and
- Construction camp (footprint).

The major components of the project are discussed in the sub-sections to follow.

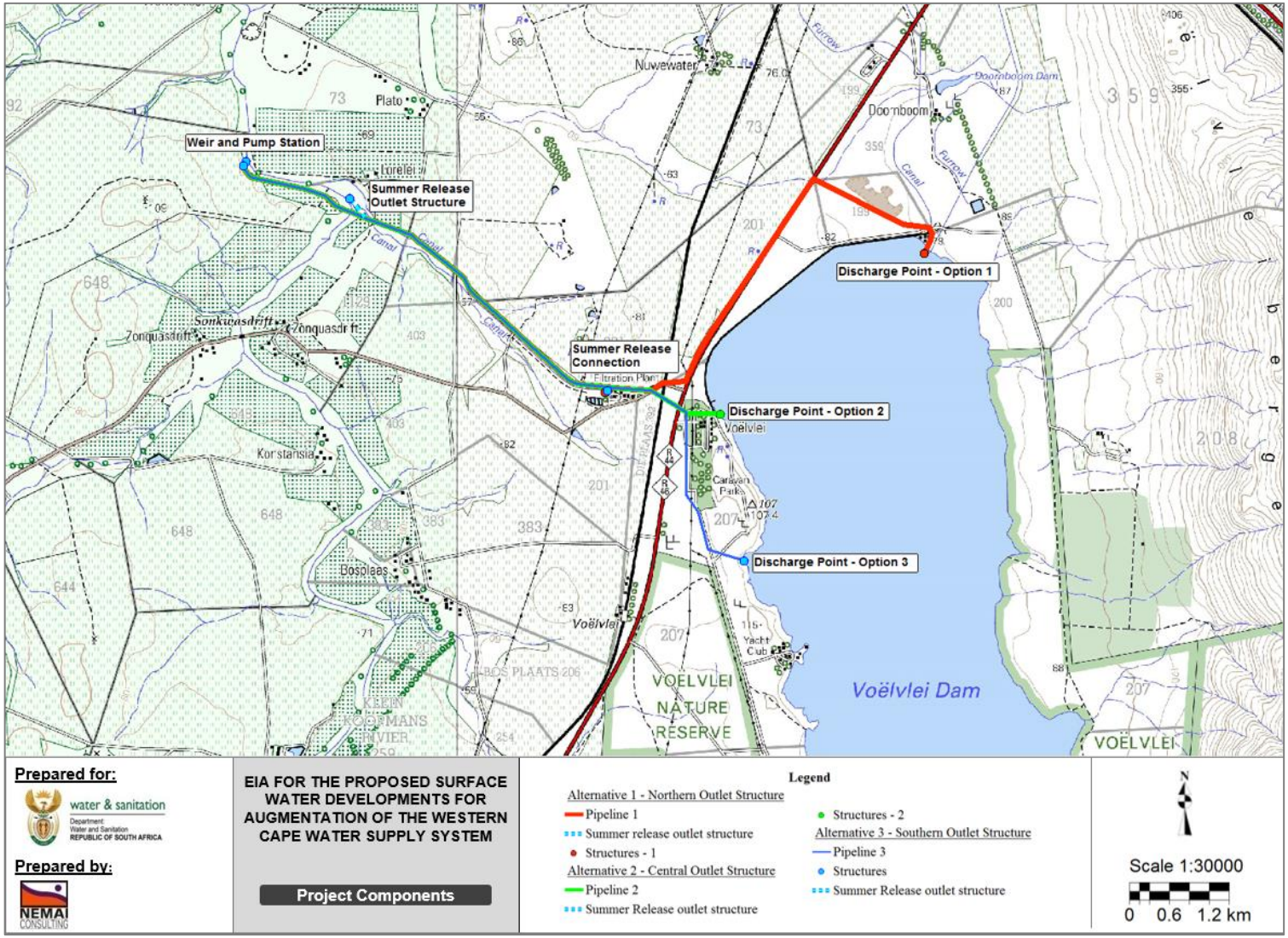


Figure 8: Project components

9.1.1 Diversion Weir and Abstraction Works

The proposed diversion weir will be located on the outer (western) bank of the Berg River (**Figure 9**).

Figure 9: Berg River at the Proposed Weir Site

The Technical Feasibility Study found that the flow depth would be about 10.4 m during the 1 in 100 year flood and the flow velocity about 2 m/s due to the wide floodplain (DWA, 2012a). The study also found that although the right bank floodplain would be inundated during floods, as the flow velocities would be low and the flow depth shallower, it would be possible to construct a weir/embankment on the floodplain without significantly increasing the flood levels upstream (DWA, 2012a). The proposed layout of the abstraction works is provided in **Figures 10** and **11**.

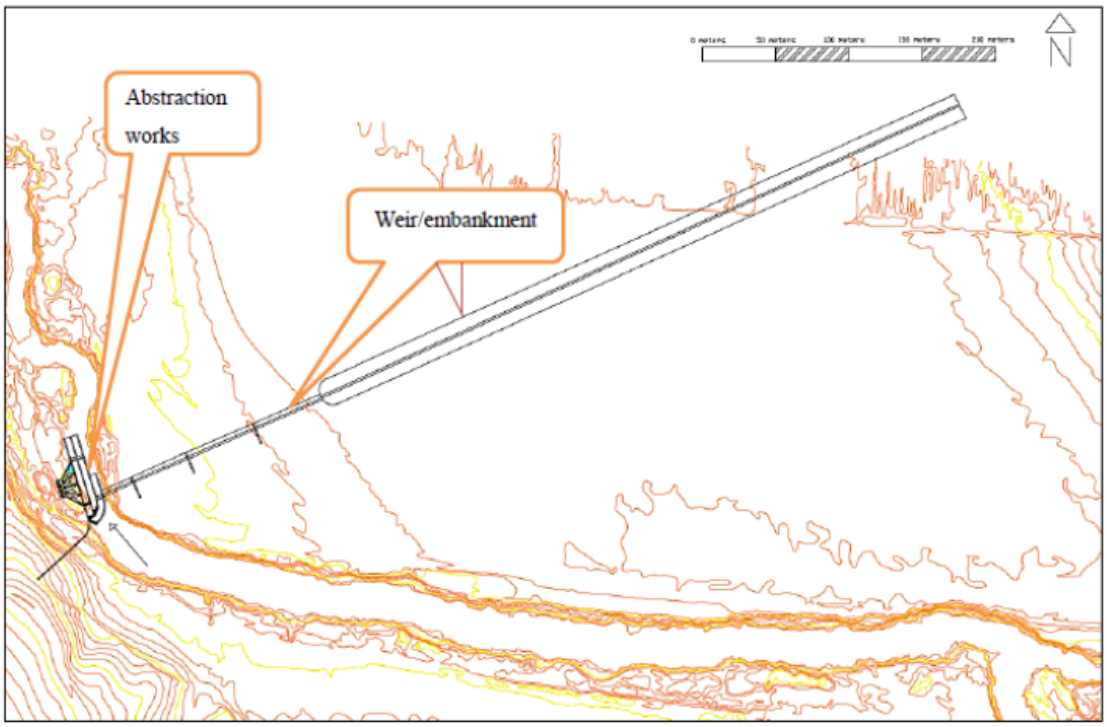


Figure 10: Layout of Abstraction Works, Weir and Embankment (DWA, 2012)

Figure 10 illustrates these works which would comprise the following components:

- An abstraction weir;
- A protected embankment on the right bank floodplain to be designed to be overtopped;
- A boulder trap with a radial gate to flush sediments;
- A gravel trap comprising two canals and a dividing wall, with radial gates downstream for flushing;
- An underwater opening would allow water to be diverted to supply the pumps, while keeping floating debris away from the trashracks; and
- The pumps would be located in a dry well and flushing durations are expected to be less than 30 minutes.

In order to minimise the increase in upstream water levels, the design would require the use of a hopper and jet pumps which would rely on the main pumps to provide a high head, whereas the preferred solution would be longer sand trap canals downstream of the trashracks that would be flushed by gravity and would also act as pump sumps.

A canoe chute may be required since the weir would be situated on the route of the annual Berg River Canoe Marathon. A fishway, comprising a vertical slotted fishway or a rock-ramp type, may also be required. The need for this will be assessed by the Aquatic Specialist as part of the EIA.

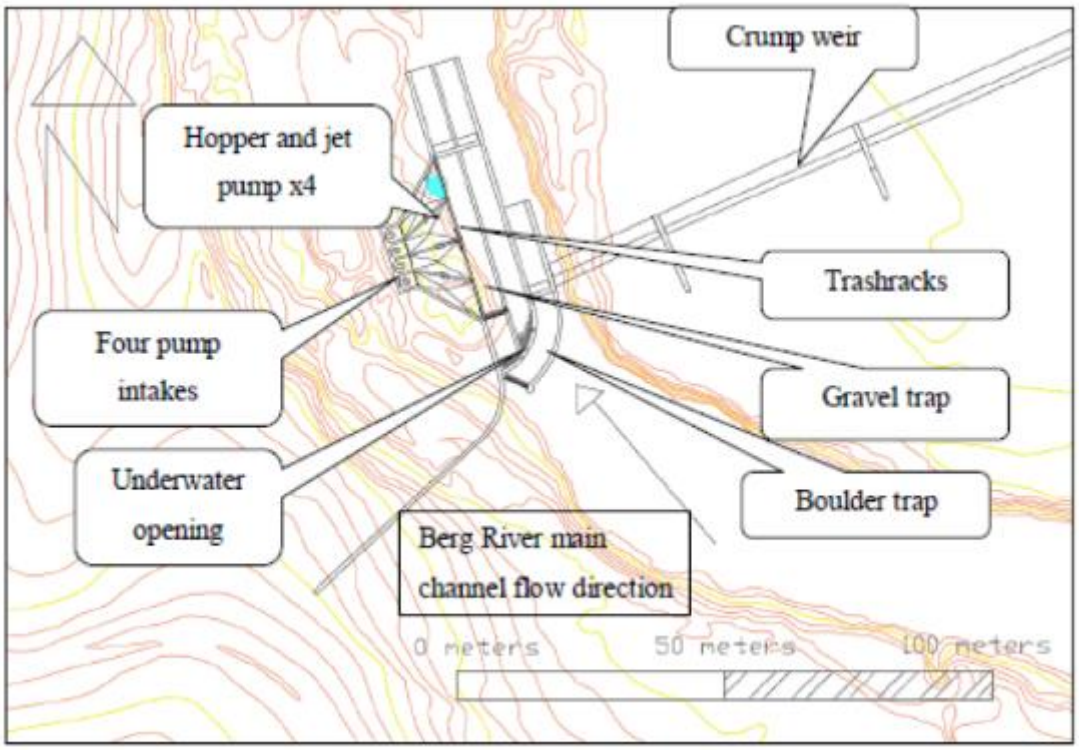


Figure 11: Components of the Proposed Abstraction Works (DWA, 2012)

In addition, the weir has been designed as a low structure with a series of notches in it to minimise the impact of inundation. **Figure 12** below shows that the upstream damming caused by the proposed abstraction works and weir is very limited (for example, for the 100 year flood, the upstream water level will only be approximately 0.6m higher with the weir in place, than would be the case if the weir were not there).

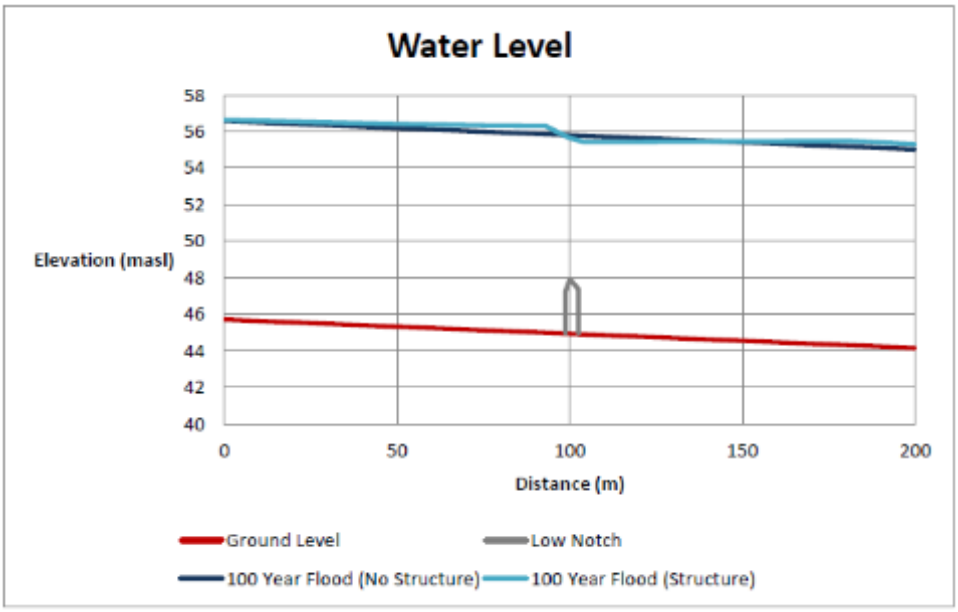


Figure 12: 100 year flood levels with the Weir in place (blue) and without the Weir in place (black)

9.1.2 Rising Main

As shown in **Figure 8,** three pipeline routes were investigated during the Technical Feasibility Study and will be assessed as part of the EIA. These routes are related to three potential discharge options into the dam from the diversion weir site. These routes are as follows:

- Pipeline route to Northern Discharge Point = 8 115 m;
- Pipeline route to Central Discharge Point = 5 000 m; and
- Pipeline route to Southern Discharge Point = 6 300 m.

Whilst design flows of 4 and 6 m^3/s were considered for the rising main during the Technical Feasibility Study, the EIA will only assess the 4 m^3/s option which was deemed most feasible during the Technical Feasibility Study.

The average pipe depths required for the pipeline are about 3.5 m with a minimum cover of 1 m. **Table 7** shows the design parameters adopted for the rising main between the diversion weir and Voëlvlei Dam.

Table 7: Design Parameters for the rising main between the Diversion Weir and Voëlvlei Dam

Design Parameter	4m^3/s Design Flow
Rising Main Properties	1700 mm diameter GRP
Static Head	28.0 m
Dynamic Head	35.8 m
Maximum Flow Velocity	1.762 m/s

9.1.3 Pump Station

The design parameters adopted for the 4m^3/s Pump Station are provided in **Table 8** below.

Table 8: Design Parameters for the 4m^3/s Pump Station

Design Parameter	4m^3/s Design Flow
Abstraction	Raw water from Berg River in Winter
Rising Main Static Pressure	28.0 m
Friction Losses	7.8 m
Inlet Static Pressure	1.8 m
Pump Duty	34.0 m

During the winter abstraction period, water from the Berg River will flow into the sump at the pump station. A level transmitter on the diversion weir will provide an input value for the flow calculation to determine the amount of water to be abstracted and pumped to the Voëlvlei Dam (DWA, 2012a).

At the commencement of pumping, the pipeline could be partially empty and as such the first pump will start by means of a variable speed drive and slowly fill the pipeline until water is discharged into the dam. Flow will be measured at the pump station in order to monitor the

volumes abstracted and the abstraction rates. The 4 m^3/s abstraction will be based on a step-pumping operating rule, allowing a minimum flow (spill) of 1 m^3/s past the abstraction point down the Berg River at all times, after abstraction. The pumps are in sets each with a 1 m^3/s capacity. Each pump starts up when the river inflow to the site exceeds the sum of the required environmental base flow of 1 m^3/s and the abstraction, in 1 m^3/s steps (DWA, 2012a).

A schematic diagram indicating the section through the abstraction point at the proposed pump station is shown in **Figure 13**.

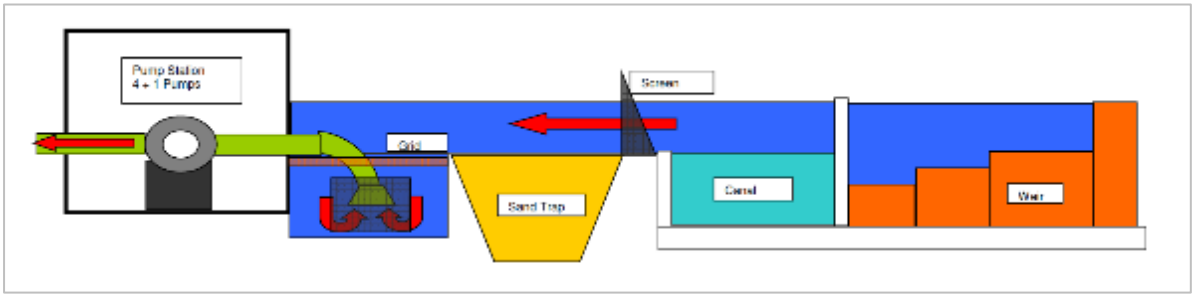


Figure 13: Abstraction point at the proposed pump station

The proposed location of the Pump Station is provided in **Figure 14** below.

Figure 14: Location of the Pump Station (DWA, 2012)

9.1.4 Access Roads

As most of the pipeline route follows an existing farm road, construction vehicles will be able to access the pipeline construction site from this road. Access roads to the weir and pump station site will be via existing unnamed farm roads in the study area (**Figures 15** and **16**). However, access road 3 will be constructed as a new access road to the weir and pump station. During flooding, these roads may not be accessible, therefore an unnamed farm road that runs southwards along the Berg River will be used (**Figure 16**).

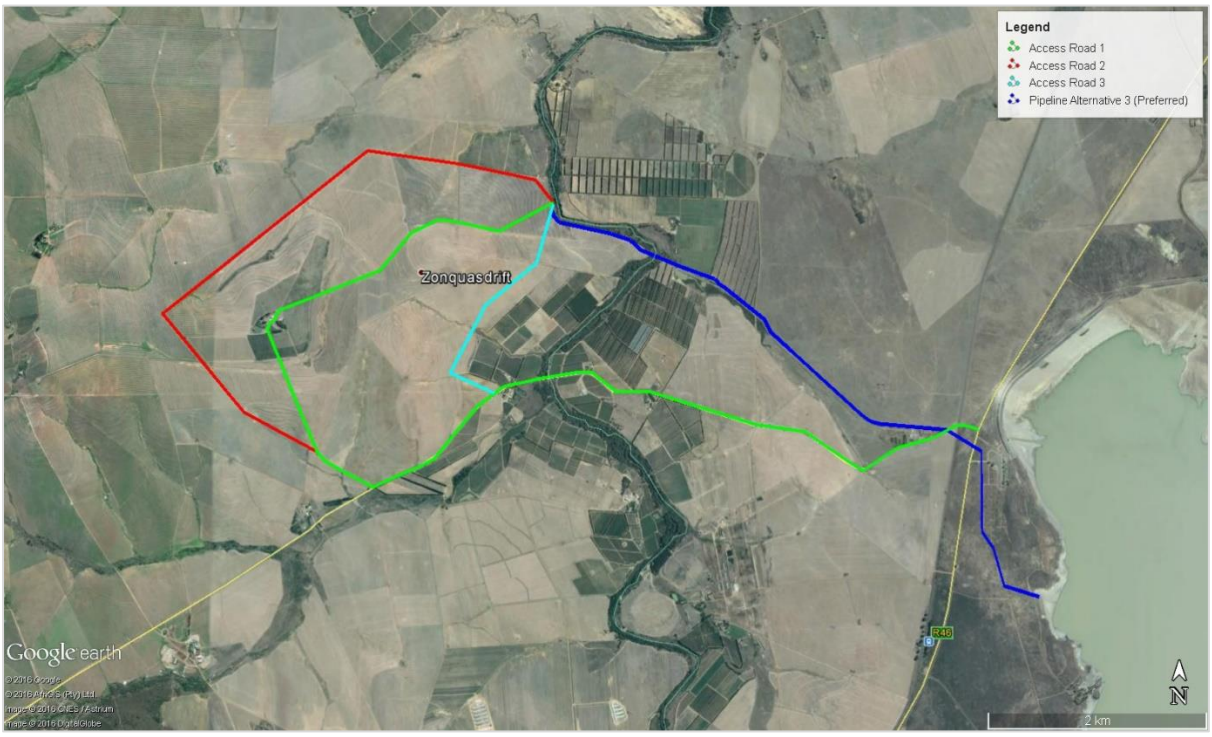


Figure 15: Proposed access to weir and pump station

Figure 16: Access road highlighted in yellow to be used during flooding.

9.1.5 Site Laydown Areas

Two site laydown areas are proposed at the discharge point of pipeline alternative 2, both approximately 0.4 hectares in size (**Figure 17**). Only one of these site laydown areas would be required. These site laydown areas would be accessible from the main road, R44 and are adjacent to the Voëlvlei Dam.

The main site laydown area is proposed at the pump station and weir site for purposes of construction (**Figure 18**). This laydown site is approximately 0.85 hectares in size and is adjacent to the Berg River. The site will be accessible from the existing unnamed farm roads.

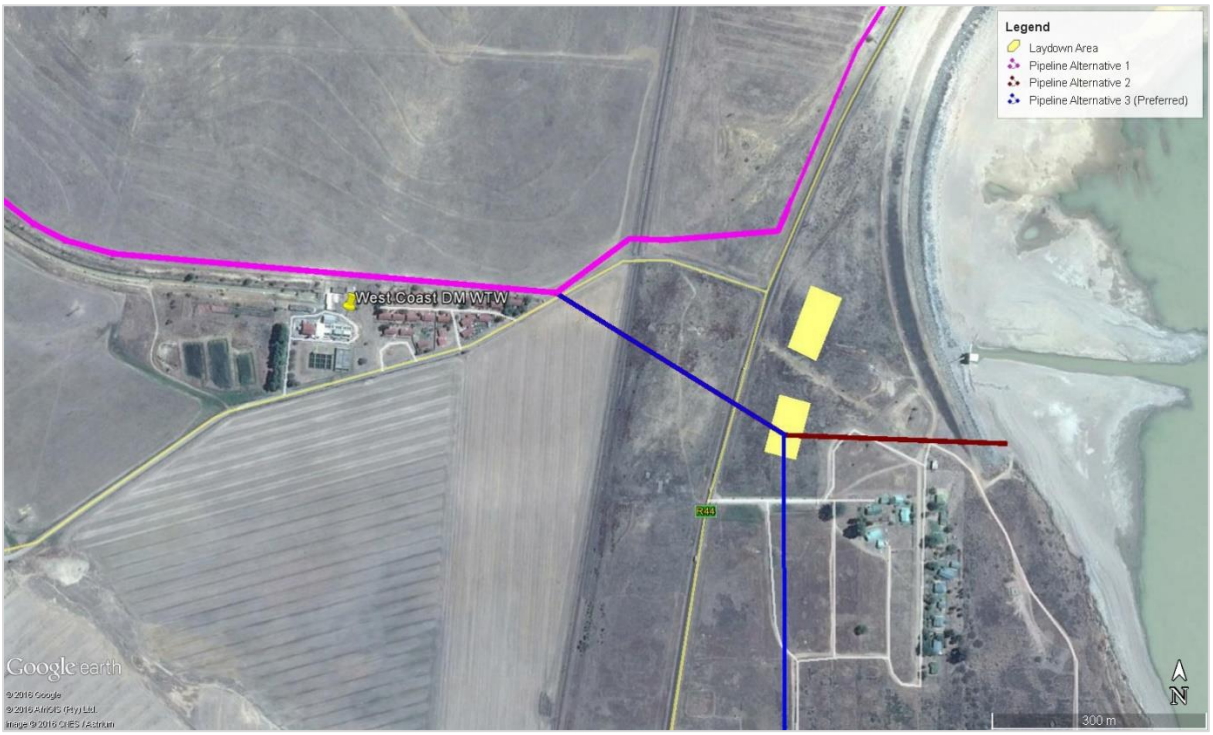


Figure 17: Location of the two proposed laydown areas adjacent to the Voëlvlei Dam

Figure 18: Proposed site laydown area at the pump station and weir site adjacent to the Berg River

9.2 Project Lifecycle

To adequately consider the impacts associated with the proposed surface water developments for the augmentation of the WCWSS, the major activities during each phase of the project lifecycle are listed in the sub-sections to follow.

9.2.1 Feasibility Studies

Major activities during the Feasibility Phase of the project included the following:

- Environmental screening of alternatives;
- Geotechnical investigations to confirm soil conditions (where needed);
- Technical and economic analysis; and
- Preliminary design.

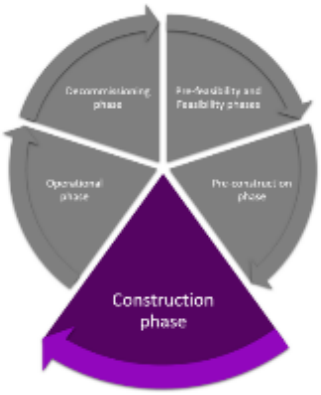
9.2.2 Pre-Construction Phase

Major activities during the Pre-construction Phase of the project include the following:

- Detailed layouts and services designs;
- Detailed geotechnical investigations;
- Obtain Environmental Authorisation and WULA;
- Tender for various construction works;
- Agreements with landowners regarding access; and
- Procurement of necessary materials.

9.2.3 Construction Phase

Major activities during the Construction Phase are as follows:



Appointments and site camp set up:

- Appoint Environmental Control Officer (ECO);
- Set up site camp with temporary offices and administrative facilities;
- Set up ablutions;
- Set up access control, security; signage and lighting;
- General materials storage and laydown areas
- Construction of chemicals storage facilities (oil, grease, solvents etc.) and associated infrastructure (bunds, secured / roofed areas etc.);
- Above ground fuel storage (e.g. gasoil/ petrol);
- Employment of construction labour;
- Workshops / areas (e.g. welding, mechanical repair, electrical etc.);
- Change-houses, chemical toilets and showering facilities (linked to conservancy tanks – removal of contents by exhauster vehicle and disposal at permitted facility); and
- Temporary waste storage areas; these shall be established and managed in accordance with EMPr requirements to be developed in the EIA phase.

Sourcing of construction materials and equipment:

- All bulk materials (aggregate, cement, steel etc.) will be sourced from existing lawful commercial sources; there will be no direct mining, harvesting or extraction of natural resources;

Excavation, earthworks and concreting

- Clearing of vegetation;
- Levelling and compaction using heavy machinery / earthmoving equipment;
- Potential for excavations and trenching in order to prepare foundations and laying of below ground level equipment (cables, pipes, sumps, drainage etc.);
- Potential for excavation dewatering in the event of water-table interception;
- Piling / drilling depending on the identified construction / founding technique;
- Use of general mechanical equipment within construction areas (generators, cutting and welding equipment, compressors etc.);

- Site establishment;
- Relocation of infrastructure;
- Prepare access roads;
- Establish construction laydown areas;
- Bulk fuel storage;
- Storage and handling of material;
- Employment of construction labour;
- Excavation;
- Blasting;
- Waste and wastewater management;
- Temporary river diversion for gauging weir and river crossings;
- Construction of embankment, outlet, and spillway;
- Concrete Works;
- Steel works;
- Mechanical and Electrical Works;
- Cut and cover activities;
- Stockpiling (sand, crushed stone, aggregate, etc.);
- Construction of gauging weir;
- Construction of pump station; and
- Construction of pipeline.

9.2.4 Operation Phase

Major activities during the Operation Phase of the project include the following:

- Operation of pump station and pipeline;
- Maintenance of infrastructure; and
- Ongoing consultation with directly affected parties.

9.2.5 Decommissioning Phase

Decommissioning of the proposed developments is not envisioned. However, should decommissioning be required the activity will need to comply with the appropriate environmental legislation and best practices at that time.

10 ALTERNATIVES

10.1 Introduction

The 2014 EIA Regulations require that feasible project specific alternatives are identified (including the "do nothing" option). Alternatives are defined as following:

Different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

- property on which or location where the activity is proposed to be undertaken;
- type of activity to be undertaken;
- design or layout of the activity;
- technology to be used in the activity; or
- operational aspects of the activity; and
- the option of not implementing the activity.

The sub-sections to follow discuss the project alternatives considered during the Scoping process. The EIA process will provide a detailed comparative analysis of feasible alternatives from environmental (including specialist input) and technical perspectives.

By conducting the comparative analysis, the BPEO can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative 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”.

10.2 Alternatives Considered

10.2.1 Alternatives screened during the Feasibility Phase

The WCRSS has reviewed the future water requirement scenarios and the reconciliation options for meeting these water requirements within a planning horizon to 2030. The WCRSS identified various alternative implementation options which can offer flexibility in planning, such that possible changes in the projected water requirement scenarios can be accommodated. One set of those implementation options is the potential to further develop the surface water resources of the Berg and Breede WMAs.

Therefore, the WCRSS identified the need for augmentation of the WCWSS by 2019. Based on this, the DWS appointed the WCWC JV to undertake pre-feasibility level investigations into six potential surface water development options (Phase 1). These options are detailed below:

1. Michell’s Pass Diversion Scheme

This scheme involves a low level intake structure on the left bank of the Upper Breede River at Michell's Pass, adjacent to the existing DWS streamflow gauge at which the current irrigation diversion (Artois canal) takes place (**Figure 19**). This is an inter-basin transfer from the Breede WMA into the Berg WMA.

Figure 19: The existing Artois canal irrigation diversion at Michell's Pass

Surplus winter water would be diverted via a low weir (up to 2.5 m high) into a GRP pipeline of up to 2.0 m dia. The weir dimensions and pipeline diameter would depend on the diversion capacity of the scheme. The pressure pipeline would transfer the water under gravity over approximately 7.3 km to discharge into the Boontjies River, a tributary of the Klein Berg River, from where the water would be diverted into the existing Voëlvlei Dam via the existing Klein Berg Diversion. The use of a low intake weir limits the upstream inundation impact and avoids impacting on the Witels tributary, the confluence of which lies approximately 2.3 km upstream of the proposed weir location. Provisional designs of the weir structure to enable downstream releases to be made and to ensure that sedimentation and boulder accumulation can be managed, have been undertaken.

Storage would be provided in the existing Voëlvlei Dam and the water could be used to supply Cape Town by means of the spare capacity (3.16 m^3/s) in the existing pipeline from the City's WTW. This spare conveyance capacity is however only available in winter when water requirements are lower than during the dry summer months. This equates to a potential volume of 20 million m^3/a. The scheme could also be used to supply water to the West Coast Regional Schemes, of which the Saldanha scheme is anticipated to experience significant growth in water requirements.

2. First Phase Augmentation of Voëlvlei Dam

This potential scheme involves the pumped abstraction of winter water from the Berg River, once the requirements of the Environmental Water Requirements (EWR) have been met. A number of diversion sites and scheme operational aspects have been previously investigated by DWS and by the CCT, at various levels of detail. Since those investigations, the water quality characteristics within the dam have changed.

For the option involving storing Berg River water in Voëlvlei Dam, the potential demand centres that could be supplied include the CCT, the growing West Coast region, and addressing any irrigation over-allocation from Voëlvlei Dam.

3. Further Phases of Voëlvlei Dam Augmentation

The Further Phases of the Voëlvlei Dam Augmentation Option would involve the abstraction of water as described in Phase 1, namely at 6 m^3/s, with additional storage being made available in Voëlvlei Dam by means of a low raising of the existing dam wall.

4. Molenaars River Diversion

This inter-basin transfer scheme involves the potential transfer of surplus winter water from the Upper Molenaars River in the vicinity of the Eastern Tunnel Portal (Huguenot Tunnel) to the Berg River Dam (Berg WMA). Two potential options have been investigated, namely:

- Pumping from the Molenaars River; and
- Gravity Supply from the Elandspad tributary of the Molenaars River.

The first option involves a low level intake structure in the Molenaars River downstream of the entrance to the tunnel (from the Worcester side) and located at an existing causeway (**Figure 20**). Water would be pumped during surplus winter flow periods into a balancing tank above the tunnel entrance, from where it would gravitate into and through the existing 1.3m diameter pipeline installed in the tunnel during its construction. From the tunnel portal on the Paarl side the water would be conveyed under gravity over a distance of approximately 30 km via a new GRP pipeline (1.1m diameter.) into the Berg River Dam.

Figure 20: Molenaars River

The second option is an alternative and it involves the potential construction of a low level weir on the Elandspad River (a tributary of the Molenaars) upstream of the existing DWS flow gauging station (**Figure 21**). This would negate the need for infrastructure to be developed in the Molenaars River itself and would require no pumping.

Figure 21: Elandspad River

Water becoming available in winter from the scheme would be stored in the Berg River Dam and in this way integrated into the Western Cape Water Supply System. The option of storing the abstracted water in Wemmershoek Dam was also considered but is less favorable due to the limited capacity of the existing pipeline from Wemmershoek Dam to Cape Town. On the other hand, water delivered to the Berg River Dam could be delivered via the Dasbos Pumpstation either into Theewaterskloof Dam, or to Cape Town via the existing tunnel. The proposed Muldersvlei pipeline would enable delivery directly to Cape Town. For these reasons, use of the Berg River Dam for storage purposes offers greater flexibility.

5. Upper Wit River Diversion

This scheme involves the potential inter-basin transfer of surplus winter water from the Upper Wit River (**Figure 22**), a tributary of the Breede River, in the vicinity of Eerste Toll (Bain's Kloof), into the Berg River catchment. This would be achieved by constructing a low level weir (2m high) and intake on the left bank (looking downstream). Once the winter EWR requirements have been met, water would be diverted into a drop structure connecting to a 3m diameter tunnel, of about 350m length, under Bain's Kloof.

Figure 22: The Upper Wit River

The water could either be released into the Krom River from the dam, through an exchange with the Berg River Irrigators, for water currently allocated to them from Theewaterskloof Dam. Alternatively the water could be piped under gravity to the Welvanpas WTW in Wellington during summer, via a 7,3km GRP pipeline of 600mm dia. The existing WTW would require upgrading. The water then could be used locally to supply Wellington, as well as Paarl via reverse pumping in the existing 450mm diameter pipeline between Paarl and Wellington.

6. Further Phases of the Palmiet Transfer Scheme

The potential of raising either the Upper or the Lower Steenbras Dam has been considered. However from an environmental, financial, technical and integration perspective, it became clear during initial assessments that raising the Lower Steenbras Dam was much more feasible.

The potential areas of supply would be the CCT. Water becoming available from this scheme would be transferred to the CCT's Faure WTW. The existing raw water pipeline to Faure has adequate spare capacity to deliver the water becoming available from this option.

The six possible options detailed above were then prioritised to identify the two most viable options for further investigation at the Feasibility Study level in Phase 2. The prioritisation indicated the following two priority schemes.

- BRVAS (also known as the First Phase Augmentation of Voëlvlei Dam); and
- BBTS (also known as the Michell's Pass Diversion Scheme).

Both schemes rely on the utilisation of the existing storage capacity in the Voëlvlei Dam, and on the existing capacity of the CCT's pipeline, from their WTWs at the dam, to their Plattekloof reservoir in Cape Town. It was found that the BRVAS option was the more favourable surface water intervention option.

Three potential diversion sites were considered for the BRVAS scheme namely:

- Spes Bona;
- Sonquasdrift, and
- Lorelei.

The Spes Bona and Lorelei sites were considered to be best suited for the proposed options. Zonquasdrift was also considered but the former two sites proved preferable for alignment of pipelines and limiting the impacts on the Voëlvlei Conservancy. The Lorelei site was found to be the most feasible of the options for the following reasons:

- It is close to a bend on the Berg River which is favourable from a sedimentation management perspective. Geologically this is the only location of those considered at which any rock outcrop is evident for suitable founding conditions. From a hydraulic and geotechnical perspective this site was therefore recommended as the preferred location for the abstraction weir.
- Geotechnical conditions are generally favourable, and the weir design can be suitably accommodated at the proposed site. Machine excavation is expected to be possible along the pipeline route. Although there is potential for the use of excavated materials for backfilling, the final pipe type selection will influence the extent of selected fill material available insitu.

According to the Reserve for the Berg River Estuary the required stream flow into the estuary during the summer months should vary between 0.6 and 0.9 m^3/s. As the present day inflows into the estuary are not gauged (although DWS has plans to install a gauge), the present day inflow of 0.3 m^3/s was estimated from the gauged flows below Misverstand Dam, and from the downstream irrigation allocations which will be metered in the near future. In order to provide the required Reserve inflows to the estuary would require that additional releases of between 0.3 m^3/s and 0.6 m^3/s be made from Voëlvlei Dam, particularly during the four summer months from December to March. Therefore, the conservative assumption has been made in the system modelling of the proposed scheme that an additional release of 0.5 m^3/s should be made from Voëlvlei Dam for the four summer months. Two scheme options have been investigated, namely:

- Option 1: a 4 m^3/s pump station with a stepped-pump operating rule that works in 1 m^3/s increments up to a pump station capacity of 4 m^3/s and which allows a base flow of 1 m^3/s to pass the site at all times.

- Option 2: a 6 m^3/s pump station with variable speed drives so that the EWR requirement can be allowed to pass the site at all times, exactly, while the balance will be abstracted up to the pump station capacity of 6 m^3/s.

Of the two potential abstraction approaches investigated, namely a 4 m^3/s pump station with a stepped-pump operating rule, or a 6 m^3/s pump station with variable speed drives, the former appears to be more easily implemented and operated, as well as offering a slightly higher resulting yield (23 versus 20 million m^3/a).

Therefore, from an operational perspective, Option 1: 4m^3/s abstraction via a stepped-pumping operating rule was selected as the optimal pumping scheme for the proposed pump station.

10.2.2 Alternatives to be assessed as part of EIA

Of the six alternatives previously assessed during the pre-feasibility level investigations, two priority schemes were identified as feasible:

- BRVAS (also known as the First Phase Augmentation of Voëlvlei Dam); and
- BBTS (also known as the Michell's Pass Diversion Scheme).

It was then found that the BRVAS option was the more favourable surface water intervention option of the two, primarily due to lower environmental impacts. Three alternative pipeline routes are considered as part of the BRVAS scheme (**Figure 8**). These routes are related to three potential discharge options into the dam from the diversion weir site. These alternative routes are as follows:

- Option 1 (**Figure 23**): Pipeline route to Northern Discharge Point = 8 115 m;
- Option 2 (**Figure 24**): Pipeline route to Central Discharge Point = 5 000 m; and
- Option 3 (**Figure 25**): Pipeline route to Southern Discharge Point = 6 300 m.

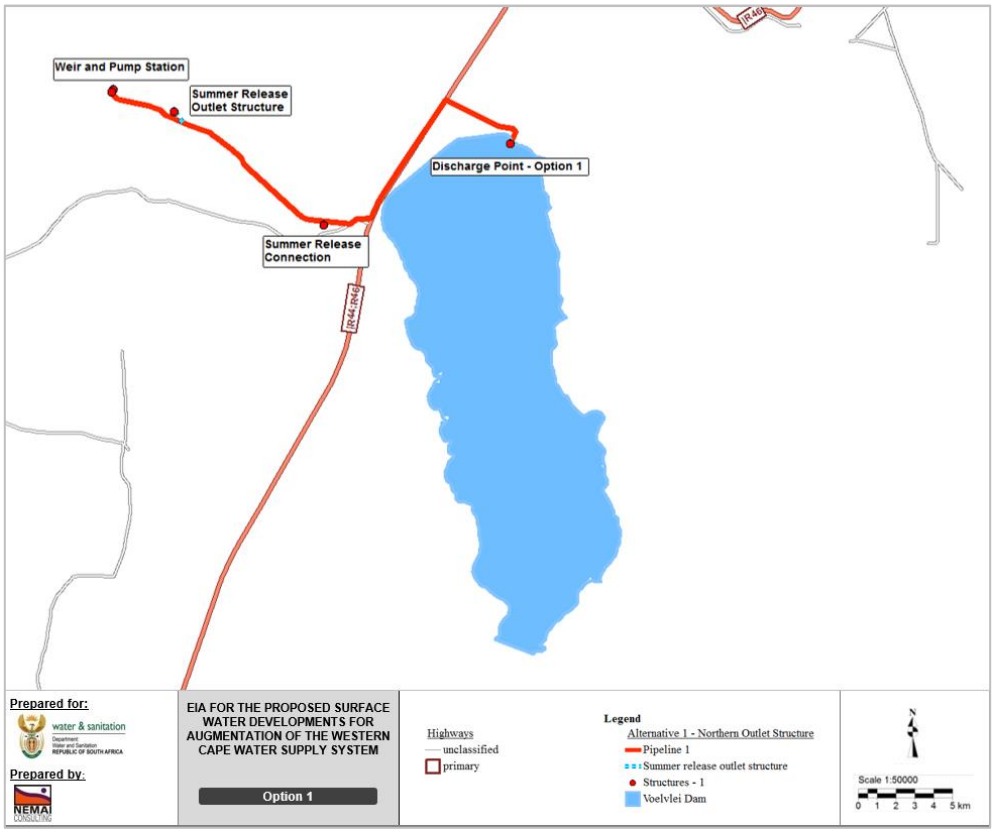


Figure 23: Option 1

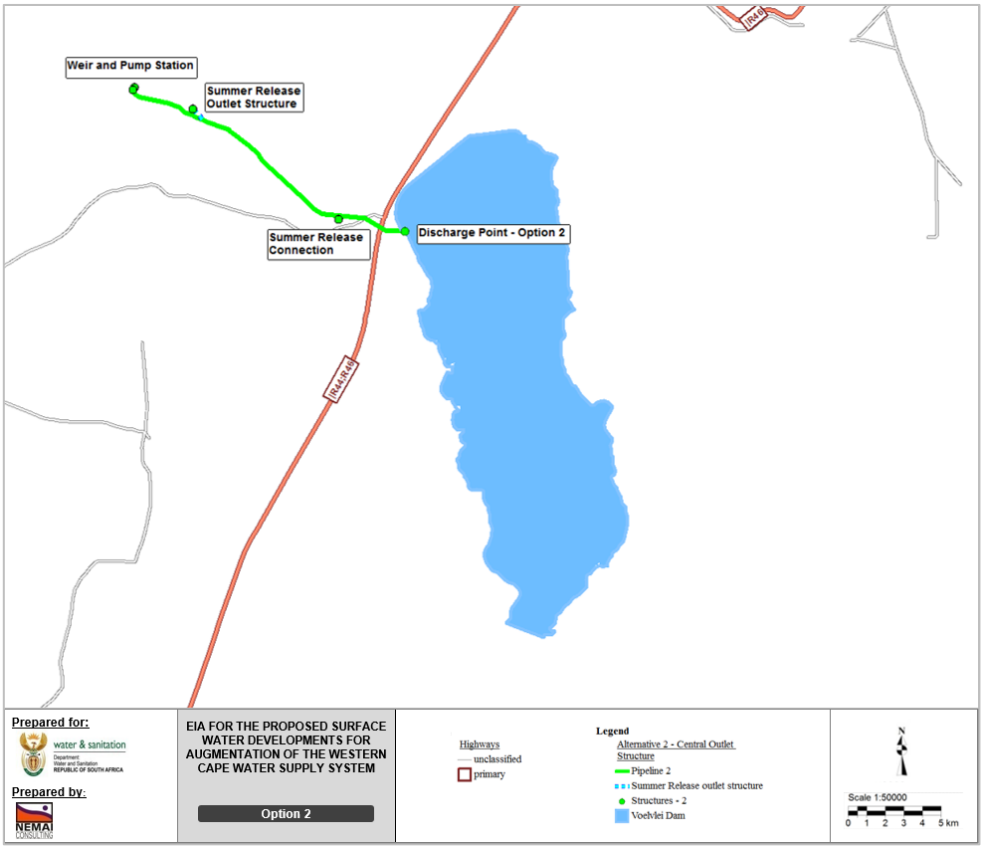


Figure 24: Option 2

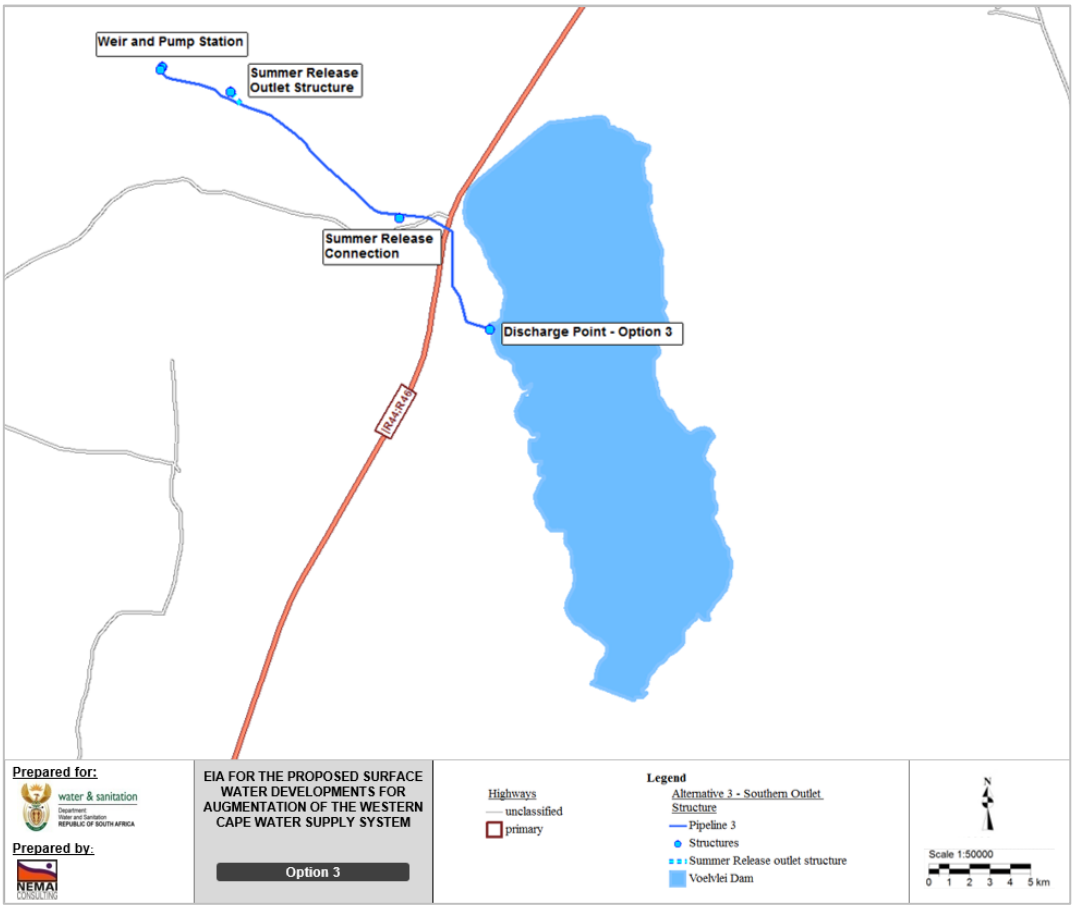


Figure 25: Option 3

10.3 No-go Alternative

The 'no-go' alternative refers to a situation where the proposed surface water development for augmentation of the WCWSS is not built. This would mean that there would not be the much needed increase in water supply to surrounding communities.

The future water requirement projections conducted in the WCWSS Reconciliation Strategy Study apply only to the CCT (including bulk water supplied by the CCT to Drakenstein and Stellenbosch Municipalities). The results of the future water requirements modelling indicate that the average growth in water demand for the high scenario is 3.09% per annum and for the low scenario is 1.43% per annum. The average of the two scenarios is approximately 2.26% per annum. In general, the average growth in water demand is lower than the economic growth rate and higher than the population growth rate.

Figure 26 shows the low water levels of the Voëlvlei Dam during the 2016 drought. If the augmentation of the WCWSS is not undertaken, these ow water levels will experienced frequently and the capacity of the dam will not be fully utilised and there would be no sufficient water to support the projected economic growth in the area. Future water requirements will not be met resulting in severe and frequent restrictions of supply. Even if the CCTs water conservation and water demand strategy remains successful, a severe

limitation will be evident in terms of the ability to support the projected growth and water requirements in the water supply area of the WCWSS.

Figure 26: Images of the low water levels of the Voëlvlei Dam

11 PROFILE OF THE RECEIVING ENVIRONMENT

This section provides a general description of the status quo of the receiving environment in the project area. This serves to provide the context within which the Scoping exercise was conducted. It also allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project.

The study area includes the entire footprint of the project components. Where necessary, the regional context of the environmental features is also explained, with an ensuing focus on the local surrounding environment. More in-depth discussions on the receiving environment will be provided in the EIA Report, where the findings of the requisite specialist studies will be incorporated into the document.

A brief overview is also provided of the manner in which the environmental features may be affected (positively or negatively) by the proposed surface water developments during the project lifecycle. Key environmental issues are discussed further in **Section 14**. These preliminary effects are only discussed concisely on a qualitative level, as part of the Scoping phase. The EIA Report will provide a comprehensive evaluation of the potential impacts, and will quantify the effects to the environment based on the methodology presented in **Section 15**.

As previously mentioned, Pre-Feasibility and Technical Feasibility Study reports were compiled by WCWC-JV in 2012 and these reports were used to assess the profile of the receiving environment for the augmentation of the Voëlvlei Dam.

11.1 Climate

11.1.1 Status Quo

According to the Department of Environmental Affairs and Development Planning (DEA&DP) the key climate change considerations for the Western Cape relates specifically to the following trends:

- Warmer temperatures (max and min) everywhere, but more so in the interior;
- Drier conditions in the shoulder seasons, especially away from mountains, weaker cold fronts, longer fire season, decreased crop yield, reduced economic activity;
- Increased humidity and greater persistence of stronger southerly winds;
- Increased rainfall intensity and extreme events (flooding), which leads to increased soil erosion, coastal and riverine erosion as well as damage to infrastructure;
- Rising sea levels that will lead to increased salt water intrusion into aquifers and wetlands as well as increased coastal floodings.

11.1.1.1 Temperature and Precipitation

As the nearest meteorological station is located in Paarl, Western Cape, the information to follow was obtained from the South African Weather Services (SAWS) for this station.

The climate of the Berg River catchment differs extensively with the season. The winters are typically wet and cold (17°C average) with occasional frost and snow, while the summers are very hot and dry (37°C average daily maximum) (**Figures 27** and **28**).

Rainfall patterns also differ markedly from up to 3000 mm/a in the western mountains, to as low as 150 mm/a in the southern-central valleys. Average annual rainfall the Gouda/Hermon Farming Area decreases rapidly from moderate along the slopes of the mountains forming the eastern boundary to poor in the west.

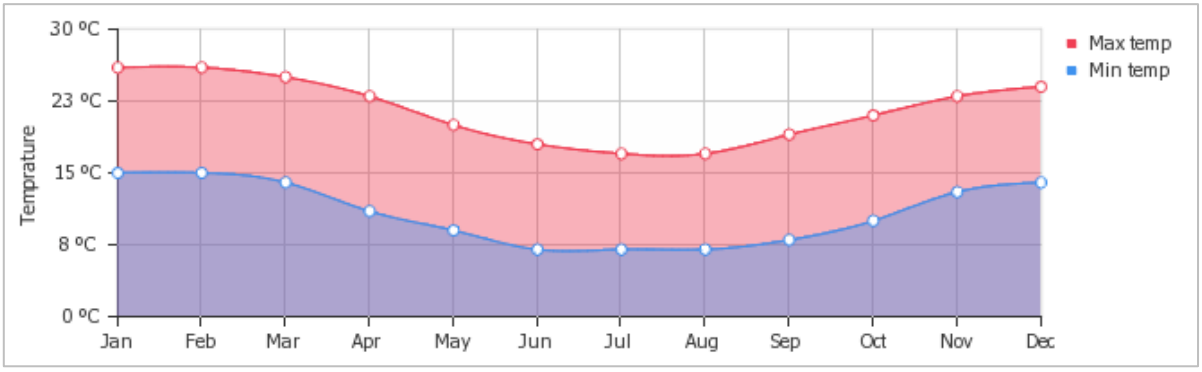


Figure 27: Average minimum and maximum temperatures in Paarl (Copyright© 2015 www.weather-and-climate.com)

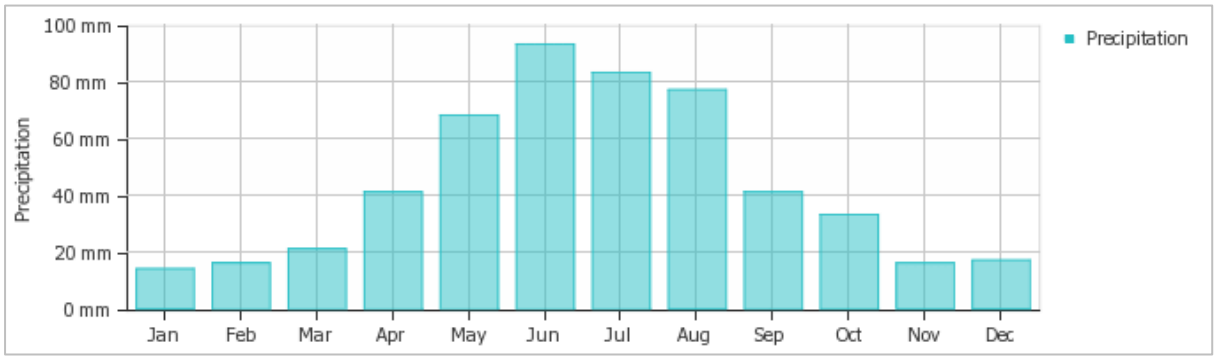


Figure 28: Average precipitation in Paarl (Copyright© 2015 www.weather-and-climate.com)

11.1.1.2 Wind

Voëlvlei Dam is located to the north west of Voëlvlei Nature Reserve and Waterval Nature Reserve which includes the DuToitskloof Mountains. This mountain range channels winds across the Dam. This results strong winds spraying water across the Dam wall and onto the R44. The wind also sprays across the WCDM WTWs which is located to the north west of the Dam. Lastly, the strong winds can create large waves on the Dam. The wind rose from Porterville (which is about 30-40km from the Dam) shows there are also strong northerly and southerly winds (**Figure 29**).

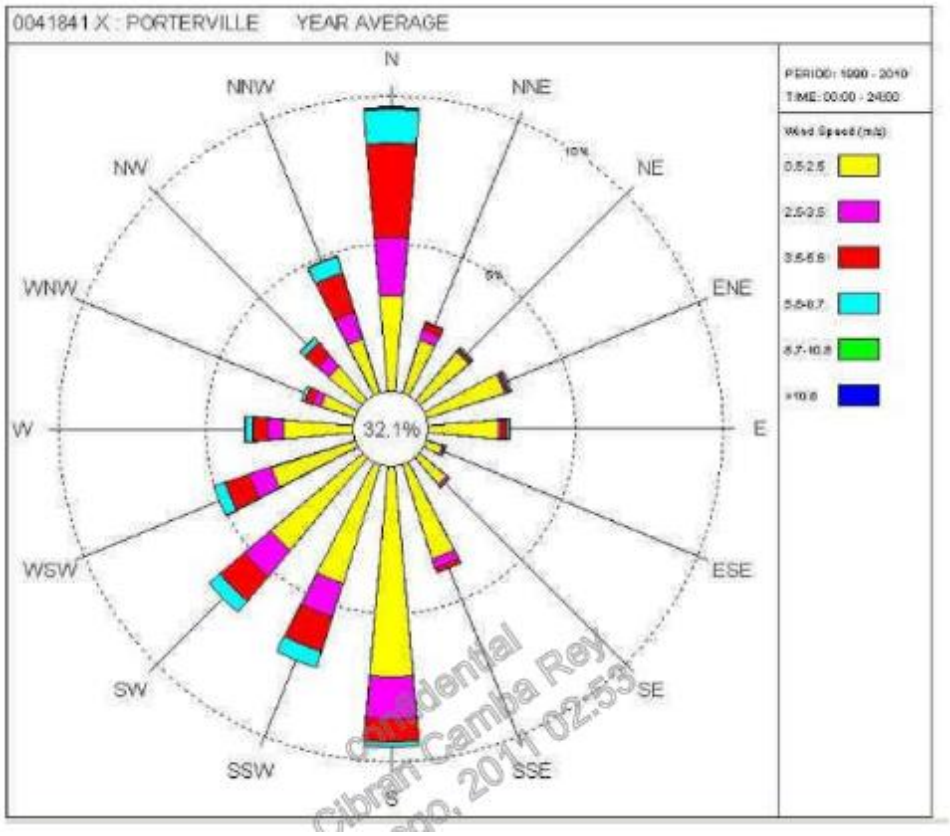


Figure 29: Porterville wind

11.1.2 Potential Impacts/Implications

There are no issues to the project with regards to climate. Voëlvlei Dam is an existing dam and the proposed developments will allow the existing capacity of the dam to be utilised and therefore there are no expected impacts to the climate.

Energy efficiency improvement in the operation phase of the developments is to be considered and best practices to be included in the EMPr.

11.2 Geology and Soils

11.2.1 Status Quo

Geotechnical investigations were carried out as part of the Technical Feasibility Study to determine if there were any fatal flaws with the proposed developments. The investigations were generally conceptualised by the WCWC-JV and undertaken under contract by Fairbrother Geotechnical Engineering cc with R.A. Bradshaw & Associates cc, Consulting Engineering Geologists, acting as the independent Professional Service Provider.

The feasibility level investigations were conducted in May, June and July 2011. They comprised mapping of the bedrock and the exploratory drilling of eight boreholes at the Berg River weir site, and the excavation of nine trial pits along the proposed pipeline route from the Lorelei abstraction site to the Voëlvlei Dam. Laboratory testing of soils and groundwater from the trial pits supplemented the field investigations.

Some of the key findings were as follows:

11.2.1.1 Geology and Geomorphology

The area investigated is underlain by the shales and siltstones of the Porterville Formation of the Malmesbury Group that are masked by alluvial deposits of Quaternary Age.

The Berg River has strongly influenced the geomorphological development of the area. The river has meandered over a wide swath which extends as far west as the weir site and possibly as far east as Voëlvlei Dam. This process has been accompanied by erosion and, in some areas, peneplanation of the bedrock and deposition of alluvium.

A combination of higher ground to the west of the left bank at the weir site and the occurrence of more extensive outcrop indicates that the river is probably at the westward limit of its meandering at the weir site.

Several possible phases of erosion and their position have probably occurred across the broad alluvial plane between the site and Voëlvlei Dam. The possibility therefore exists that buried river channels also occur locally. However no such channel has been discovered at the weir site, but a step occurs in the bedrock at the eastern edge of outcrop.

11.2.1.2 Assessment of weir site

The weir would be partly located directly on bedrock, which would provide good founding. However, the founding level steps approximately 4 m at the eastern edge of the existing outcrop, which will probably require a subsidiary embankment structure on the right flank.

The bedrock geology at the weir site comprises the regionally metamorphosed rocks of the Porterville Formation of the Malmesbury Group which are entirely masked on the right bank and right (eastern) part of the river channel. Scattered areas of outcrop and alluvium occur in the western part of the river channel and weathered outcrop generally occurs on the lower left flank.

Geotechnical conditions at the site are generally favourable, particularly if an adequate length of spillway can be provided in the general area of the rock exposures on the west side of the river channel.

11.2.1.3 Assessment of pipeline route

The significant geotechnical factors to consider when assessing construction conditions and costs for the pipeline include:

- Excavation conditions,
- Stability of the sidewalls of the pipe trenches,
- Groundwater conditions,
- Use of excavated material for pipe bedding and backfill, and
- Engineering properties of the backfill.

The pipeline route was sub-divided into eight regions or sections of similar soil profile, and therefore similar geotechnical conditions (**Figure 30**). The anticipated soil and rock profiles along the route can be summarised as follows:

- Section 1 (pump station to 0.05km): Thin transported soils mask relatively unweathered Malmesbury bedrock.
- Section 2 (0.05km to 0.1km): Clayey soils overlying weathered Malmesbury rock.
- Section 3 (0.1km to 1km): The alluvial plain of the Berg River extends into a broad strip along the left bank and the soil profile comprises mainly alluvial, slightly silty sands and minor clayey sands and local gravel lenses or layers. Bedrock generally occurs below 3m depth except possible in the extreme western end of this section.
- Section 4 (1km to 1.15km - the Berg River crossing): The soil profile and depth to bedrock where the pipeline passes below the Berg River are unknown. Sandy alluvium is expected, but the depth of bedrock is critical because it would affect excavation conditions and program.

- Section 5 (1.15km to 1.8km): Aluvium associated with the Berg River and alluvial wash associated with the drainage course/seasonal stream, which extends from southwest of TP VV 5 to near the crossing point, extends to the east of the river. The existing canal and the seasonal stream must be crossed. Bedrock might be encountered at depths where the stream has eroded the alluvium and locally lowered ground levels.
- Section 6 (1.8km to 2.6km): The weathered bedrock apparently occurs at shallow depth and the route re-crosses the seasonal stream and an associated seepage area in the vicinity of 1.9km and 2.5km.
- Section 7 (2.6km to 4.2km): Clay and gravelly alluvium occurs with highly to moderately weathered Malmesbury bedrock towards 3m depth. Rapid transition to less weathered, more massive bedrock might occur, in places.
- Section 8 (4.2km to Voëlvlei dam): The final section of the route apparently traverses deeply developed alluvial clayey silty sand with more clayey and locally gravelly soils at depth. Bedrock might occur at shallow depth in close vicinity to the Voëlvlei Dam wall.

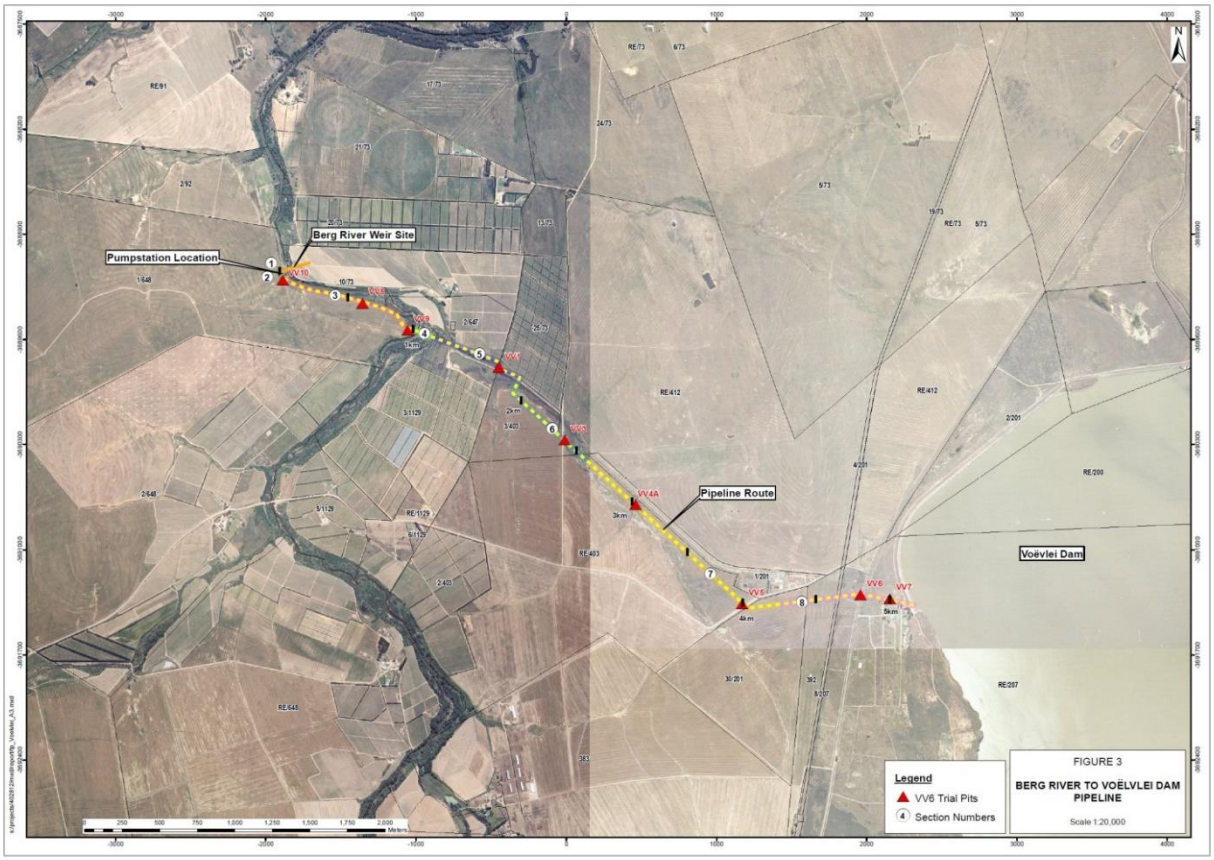


Figure 30: Pipeline sections

11.2.2 Potential Impacts/Implications

There are potential impacts on the surrounding environment during the construction phase in terms of the necessity of bringing in heavy equipment to undertake the required excavations including the creation of access roads to the proposed weir. This could lead to the loss of vegetation and the movement of fauna away from the area.

The proposed developments do not have an impact on the geology of the study area. The geology was found to be suitable for the construction of the pump station, weir, and pipeline. However, during the construction phase, there is a possibility of soil erosion which will be addressed during the EIA phase.

11.3 Geohydrology

11.3.1 Status Quo

Groundwater in the Berg River catchment is stored mainly in the Table Mountain Group and Malmesbury Group aquifers. The Table Mountain Group Aquifer is the dominant aquifer in the upper catchment and along the eastern and northern fringes of the catchment, while the Malmesbury Group Aquifer underlies most of the central and lower catchment. This groundwater does not exist in isolation and plays a vital role in ensuring the baseflow of rivers during the dry season. The total harvest potential for the Berg River basin is about 325 million cubic metres per annum. High yielding aquifers are the Table Mountain Group Aquifer and one near Langebaan. Aquifers associated with the Malmesbury Group, Cape Granite Suite and Klipheuwel Group are considered to be of low harvesting potential. Total groundwater use in the catchment is about 8.5% of the harvest potential, with agriculture being the largest user. Most of the groundwater in the catchment is used in the western and southern parts, with little being used in the central region where dryland crops predominate. Poor groundwater quality, particularly in the Malmesbury Group Aquifer, and the availability of surface water supplies have limited the use of groundwater as a resource. It is essential that groundwater use does not result in the ecological collapse of surface waters, such as wetlands and rivers. The Table Mountain Group Aquifer contains substantial supplies of groundwater. The CCT is investigating this groundwater resource for additional water supply in certain areas, for example the Watervalsberge near Voëlvlei Dam.

From the Technical Feasibility Study conducted, seasonal or local occurrences of groundwater might occur throughout the sections of pipeline east of the river. Groundwater will adversely affect excavation conditions, stability of the excavated slopes in the trenches, and pumping and possibly local de-watering will be required.

11.3.2 Potential Impacts/Implications

The project is unlikely to have an impact on groundwater as raw water is transported in the pipeline. However, construction related activities may have the following impacts:

- Contamination of groundwater resulting from incorrect storage/handling and disposal of hazardous waste materials.
- Contamination of groundwater through spillages from equipment, machinery and vehicle storage or from the batching plant.
- Contamination of surface water resources through runoff containing suspended solids, sediments and fuel residue.
- Appropriate management of shallow groundwater at river crossings and waterlogged areas.

Mitigation measures for managing potential contamination of groundwater during construction will be proposed in the EMPr.

11.4 Topography

11.4.1 Status Quo

The terrain morphology of the project area slopes upwards towards the dam and is dominated by undulating terrain with moderate relief. The elevation ranges from 54m to 76m above sea level (**Figures 31** and **32**).

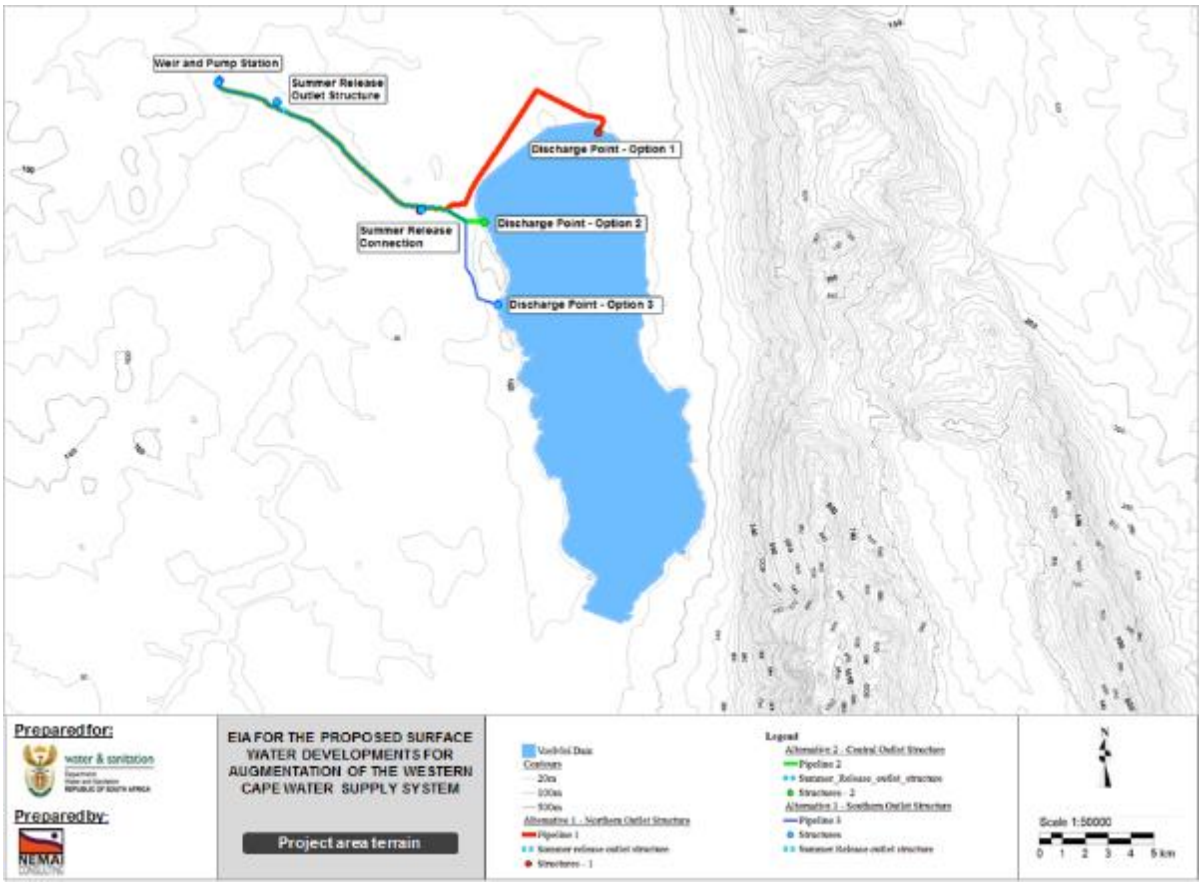


Figure 31: 20m contour map (An A3 copy of this map is contained in Appendix B)

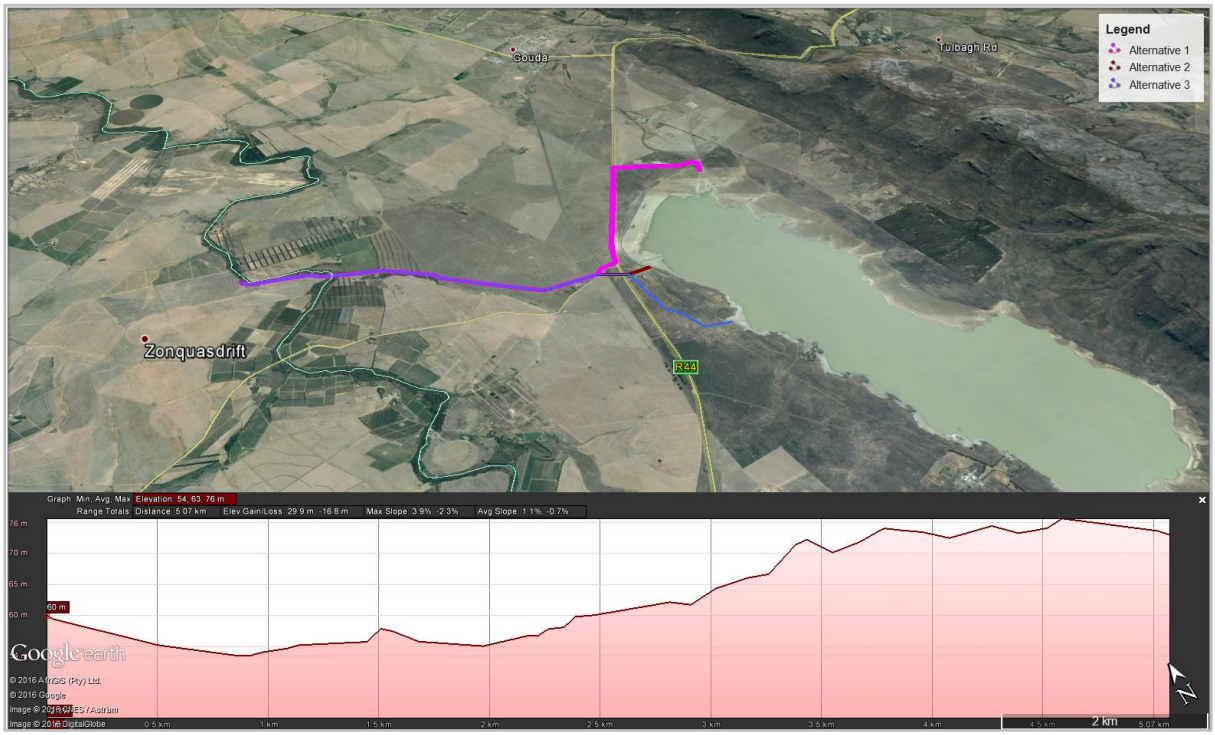


Figure 32: Elevation and topography of the project area

11.4.2 Potential Impacts/Implications

The proposed pipeline will be underground. There is no potential impact on the topography of the area to the project.

11.5 Surface Water

11.5.1 Hydrology

11.5.1.1 Status Quo

Voëlvlei Dam falls within the Berg River Catchment which is approximately 9 000 km^2 in size (DWAF, 2007). The catchment also falls within the Berg WMA within the Quaternary Catchment G10F (**Figures 33** and **34**).

The Berg River is a naturally perennial system, which rises near Dwarsberg in the Franschoek and Drakenstein mountains at an altitude of 1 500 m. It drains an area of approximately 8 980 km² (DWAF 2004), before passing into the Atlantic Ocean via the Berg River Estuary, near Veldrif, some 285 km away, on the West Coast (RHP, 2004) (DLM, 2009). The Berg River has 19 major tributaries, with a total natural runoff from its catchment amounting to ca. 931 Mm^3/a (DWA, 2007).

The major perennial tributaries of the Berg River include the Franschoek, Wemmershoek, Dwars, Matjies, Klein Berg and Twenty Four Rivers/Leeu Rivers (DLM, 2009). Total natural

runoff from the Berg River Catchment amounts to 931 million m^3/a, 45% of which is generated in quaternary catchments G10A, G10B and G10C (DWAF, 2007).

Three major dams have been built in the catchment (DLM, 2009). The Wemmershoek Dam south east of Paarl has a surface area of 3 km^2 and a storage capacity of 66 Mm^3. The Berg River Dam in close proximity to the Wemmershoek Dam covers an area of 5 km^2 and has a storage capacity of 130 Mm^3. The Vöelvlei Dam west of Tulbagh covers an area of 15 km^2 and has a storage capacity of 170 Mm^3. Numerous smaller farm dams are found throughout the eastern part of the catchment. Despite all the dams, which have controlled natural flood regimes in the downstream catchment, the Berg River in the Drakenstein region has a very high energy potential and regularly overflows its banks. In certain areas the banks are eroded causing damage to farmlands (DLM, 2009).

DWAF (1993) estimated present-day annual runoff of the Berg River amounted to 682 million m^3/a, with the modified flow attributed to direct abstraction from the river for irrigation, storage and abstraction for urban water supply, development of forestry within the basin, irrigation return flow, and releases from the Voëlvlei, Wemmershoek and Theewaterskloof Dams (the latter via the Berg River Syphon).

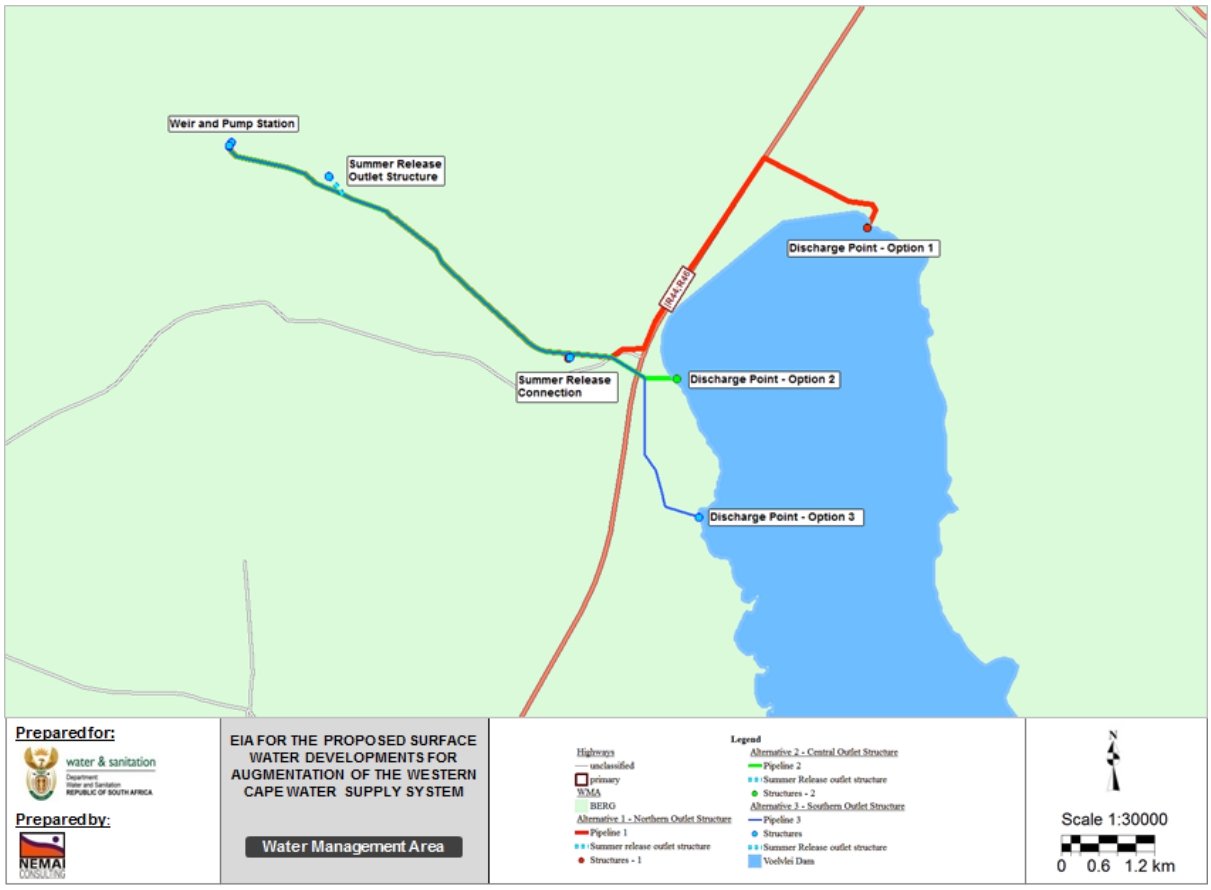


Figure 33: WMA Map (An A3 copy of this map is contained in Appendix B)

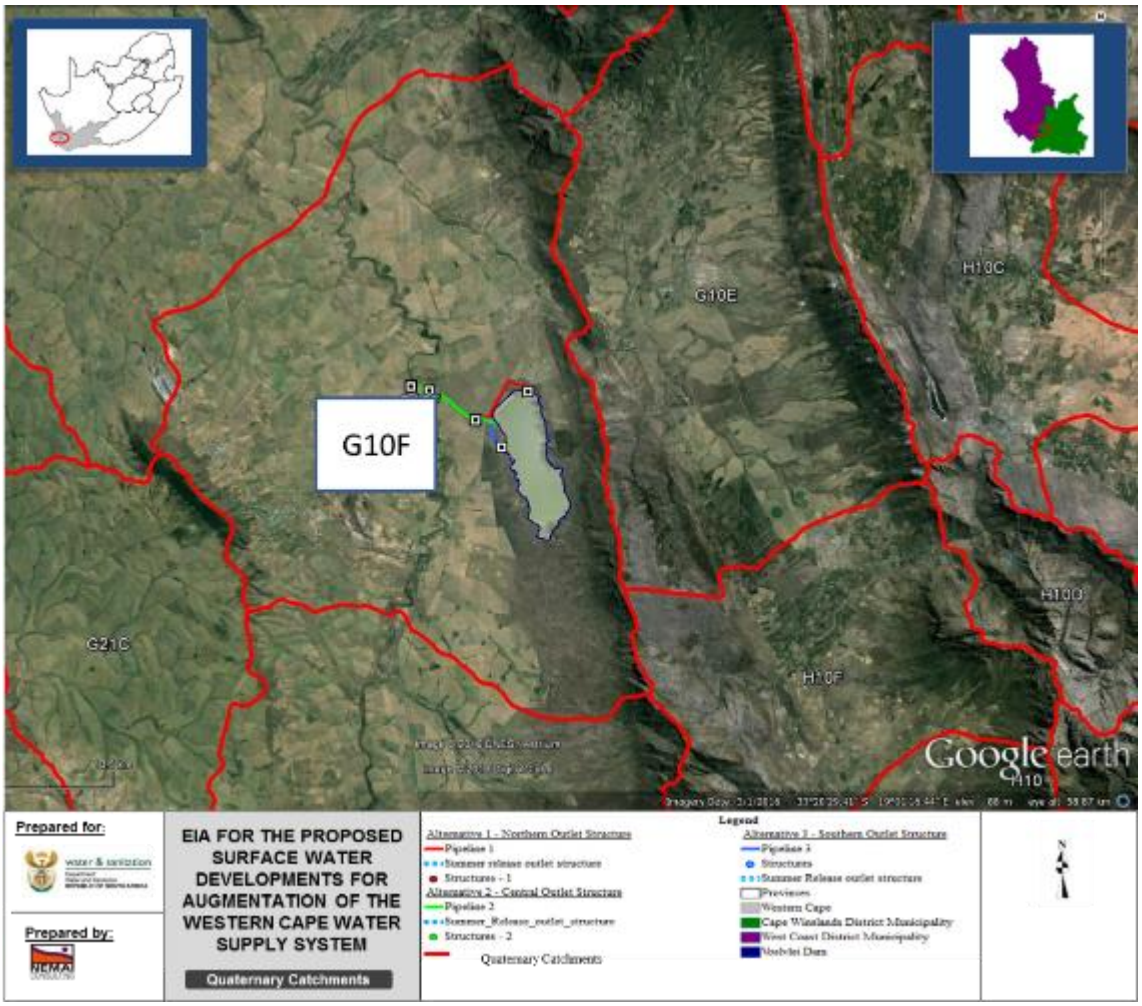


Figure 34: Quaternary Catchment (An A3 copy of this map is contained in Appendix B)

As discussed in **Section 10**, a number of Pre-Feasibility and Technical Feasibility studies were conducted for the augmentation of the Voëlvlei Dam. The hydrology of the Berg River system and Berg WMA was assessed in these studies and it was found that the proposed developments would not have an impact on the hydrology in the study area. Flooding may have occurred at the proposed weir location, however, the weir has been designed to be notched in order to prevent flooding of the Berg River at the weir location.

11.5.1.2 Potential Impacts/Implications

No further hydrological studies will be conducted as hydrology was adequately assessed during the Feasibility phase and it was determined that there the project would not have an impact on hydrology.

11.6 Water Users

11.6.1.1 Status Quo

Water users and uses of the Voëlvlei Dam are as follows:

- Domestic Use

The primary purpose of Voëlvlei Dam is to provide domestic water to WCDM and CCT. There is a planned augmentation scheme to increase the capacity of the Dam. This would be done as two phases. The second phase would involve the raising of the Dam wall.

- Irrigation

The Dam also provides some water for irrigation to farmers in the Lower Berg River. Water is released for irrigation up to the Estuary.

- Recreational Use

The main recreational clubs that make use of the Dam are the Vogelvlei Yacht Club (VYC), Western Province Artificial Lure Angling Society (WPALAS), Western Province Freshwater Angler's Association (WPFAA), Tulbagh Angling Club (TAC); Witzenberg Angling Club (WAC) and the Cape Piscatorial Society (CPS).

The following recreational activities commonly take place at the Voëlvlei Dam:

- Bird-watching;
- Fishing from shore;
- Boardsailing/windsurfing;
- Fishing from boats;
- Swimming;
- Yachting; and
- Picnicking and sunbathing.

A number of events are held at the Dam including various angling competitions (for Bass and Carp) as well as a number of Regattas. VYC has also organised a triathlon at the Dam in recent years. The Stanford Bird Club has also visited the dam for their bird fairs in the past.

The Dam is located in close proximity to Du Toits Kloof Mountain Range. There are a number of cycling and hiking trails which are run in the area as well as adventure races such Western Cape Adventure (WCAD) cycling race.

11.6.1.2 Potential Impacts/Implications

Positive impacts associated with the proposed developments is the increase of water supply and services to the area.

The Feasibility Studies have shown that there will be no flooding at the weir, hence there is limited impact on the water users,

There may have been a negative impact on the water quality of the Berg River, however, water quality modelling was conducted as part of the Feasibility Studies and it was determined that there would be no impact of the Berg River on the Dam.

11.6.2 Affected Watercourses

11.6.2.1 Status Quo

The proposed developments will be located along the Berg River (**Figure 35**) and associated tributaries, as well as be discharging into the Voëlvlei Dam (**Figure 36**). There are also a number of National Freshwater Ecosystem Priority Areas (NFEPA) wetlands identified within the vicinity of the Voëlvlei Dam.

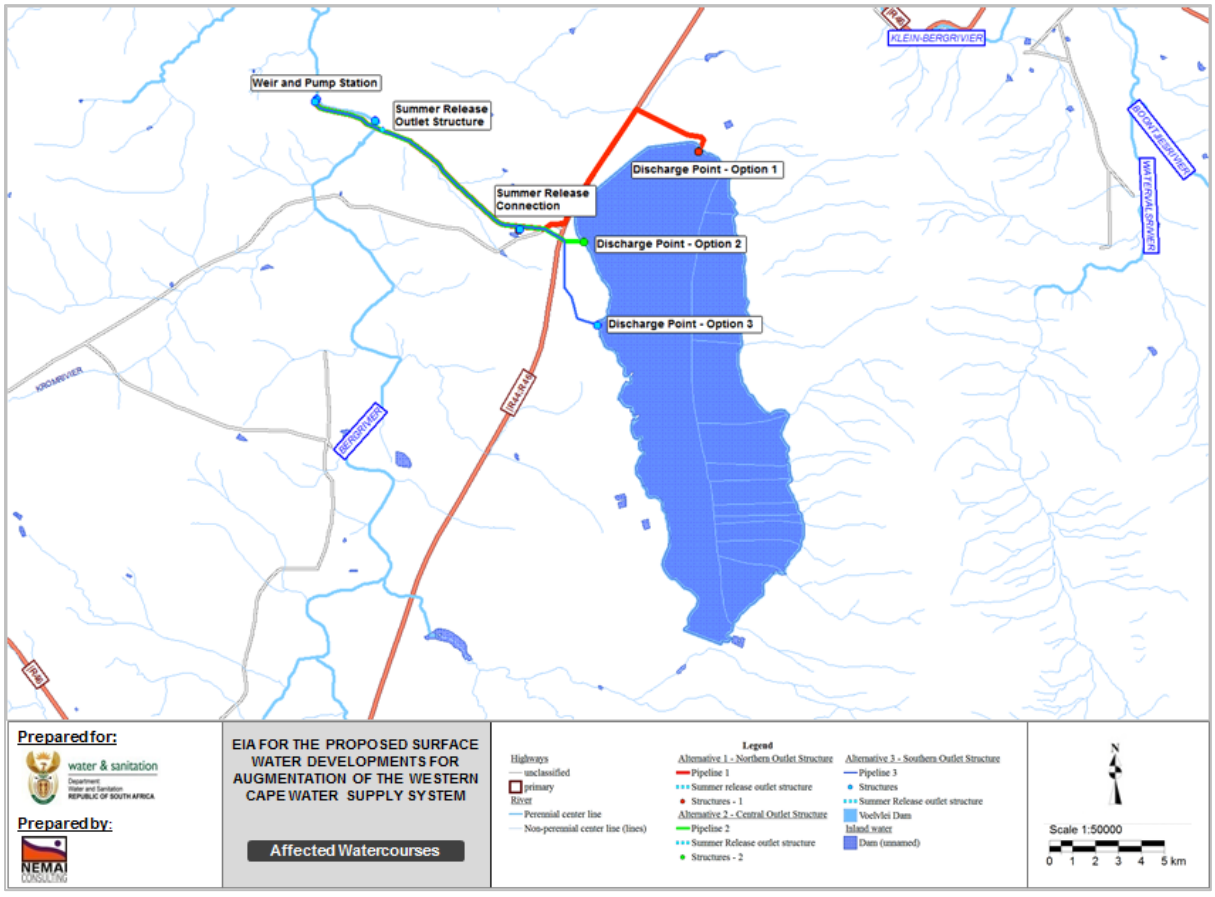


Figure 35: Affected Watercourses according to the NFEPA database (An A3 copy of this map is contained in Appendix B)

Figure 36: Berg River

The NFEPA data does not identify any wetlands occurring along the pipeline route. However, during a site assessment, a wetland was identified along the route that may be affected by the proposed developments (**Figure 37**). This wetland will need to be delineated and impacts assessed during the EIA phase.

Figure 37: Wetland identified along the pipeline route

11.6.2.2 Potential Impacts/Implications

Activities linked with the construction and operational phases can cause adverse impacts to the affected watercourses.

11.6.2.3 Specialist Studies Triggered

An **Aquatic Assessment and Wetland Delineation** will be undertaken to determine the impacts on the resource quality of the affected watercourses, including the wetland and its source. Best practices to mitigate impacts will be included in the EMPr.

11.6.3 Water Quality

11.6.3.1 Status Quo

The water quality at Voëlvlei Dam has been monitored by DWS since 1969. However sampling has not occurred since 2011. The average values during the period between 1969 and 2011 are provided in **Table 9**. It should also be noted that both City of Cape Town Metropolitan Municipality (CCTMM) and WCDM undertake water quality monitoring at the Dam as part of their water treatment process.

In general, poor quality effluent discharged from the Tulbagh Waste Water Treatment Works (WWTW), winery effluent discharged into the Klein Berg River, and pollution from informal settlements contributes to the poor water quality in the river and therefore at the Dam. The extent of the direct discharge from the wineries into the river is not well established but may have a considerable cumulative effect. Similarly, the impact on water quality of the return flows arising from over-irrigation (with winery effluent) in close proximity to the river, is also of concern. The Tulbagh WWTW is designed for domestic effluent, however traces of fruit waste are common. Vandalism and pipe blockages in the reticulation system cause spills from manholes into the stormwater system. In addition, the water quality problem in the Klein Berg River is exacerbated at the start of winter due to diffuse pollution being washed into the river from adjacent informal settlements. As a result it is desirable that the runoff from the first winter rains is not diverted into Voëlvlei Dam (DWAF, 2004).

Turbidity is also an issue at the Dam and may be due to a number of issues including the proliferation of the illegally introduced alien sharptooth catfish (*Clarias gariepinus*). In addition, carp are known to increase turbidity as they are bottom feeders and stir up the sediment.

Table 9: Water Quality at Voëlvlei Dam

Variable	Average (1976-2013)
Calcium (Ca)	3.71
Chloride (Cl)	20.19
Dimethyl sulphide (DMS)	63.93
Electrical Conductivity (EC)	11.72
Fluoride (F)	0.12
Potassium (K)	1.02
KJEL_N_Tot_Water	0.38
Magnesium (Mg)	2.94
Sodium (Na)	11.51
Amonia (NH4_N)	0.05
Nitrates (NO3_NO2)	0.07
Phosphorous (P)	0.32
pH	7.21
Phosphates (PO4_P)	0.17
Silicon (Si)	0.79

Variable	Average (1976-2013)
Sulphates (SO4)	6.41
Total Alkalinity (TAL)	14.64

De Villiers (2007) investigated the long term trends of the nutrient status of the Berg River and found that inorganic nitrogen and phosphorus levels increase downstream by a factor of more than 10, in response to anthropogenic inputs. Similarly, nutrient levels fluctuate seasonally by more than an order of magnitude, in response to input from diffuse and point sources of pollution. These changes of more than 1 000% far exceed the 15% maximum change stipulated by the South African water quality guidelines for aquatic ecosystems.

Further, total phosphorus levels indicate that hypertrophic conditions prevail at least episodically at all of the Berg River monitoring stations and most of the time at some of them. Additionally, river water phosphate levels show a dramatic increase over the past 20 years. There is also strong evidence that the trophic status of the Berg River is very sensitive to reduced river runoff and thus the construction of Dams such as the Berg River Dam can act to exacerbate the trophic status (De Villiers, 2007).

Evidence for increased NOx levels during low runoff conditions suggests an increased number of point-sources of pollution. It is also suggested that overloading of water treatment plants during high runoff conditions or flooding of informal human settlements during winter storm events may result in nutrient enrichment during high runoff, related to these ‘point sources’.

The two most likely anthropogenic sources of nutrients along the Berg River are agricultural runoff and effluent from overloaded municipal sewage works and un-serviced communities. Both sources are expected to peak in magnitude along the middle section of the Berg River, between Paarl and Hermon, the most heavily cultivated and most populated area along the river. This includes informal human settlements that have developed along the banks of the river.

Diffuse nutrient sources, such as agricultural runoff, produce seasonal concentration profiles coincident with river runoff, i.e. concentrations that peak during high runoff conditions. In contrast, point sources such as sewage effluent from municipal WWTW generally result in seasonal concentration profiles that have no relation to runoff, i.e. relatively constant input throughout the year, or an inverse relation to river runoff (De Villiers, 2007).

Further, according to the Western Cape Integrated Water Resource Management (IWRM) Action Plan (DEA&DP, 2011), the following water quality issues occur in the Berg WMA:

- A significant water quality problem in the Berg River catchment is salinization in the middle and lower reaches. This is caused by leaching from the natural geology, which extends from the north of Paarl to the Berg River mouth, consists of Malmesbury shale, as well as agricultural practices and the wash-off of salts from irrigated and dryland

agricultural lands. The problem is exacerbated during the first winter rains, when accumulated salts are washed into the river resulting in elevated salinity in Misverstand Dam;

- A further concern in the Berg River is nutrient enrichment as a result of the discharge of treated sewage effluent from WWTWs, irrigation with winery effluent, and the discharge of some winery effluent that may not have been adequately pre-treated. Diffuse pollution which includes runoff from informal settlements, for example in the Klein Berg catchment (Tulbagh) impacts on the quality of water diverted into Voëlvlei Dam. This has led to increasing problems with nuisance algae in the middle and lower Berg River reaches and in Voëlvlei Dam. This has led to higher domestic water treatment costs;
- Concerns have been expressed about the microbial quality of rivers affected by treated wastewater effluent discharges and runoff from informal settlements. Rivers such as the Plankenberg and Eerste River near Stellenbosch, Stiebeul River near Franschhoek, and the Kuils River in Bellville are affected by poor quality effluents and runoff from informal settlements and high density settlements with poor sanitation services. Aging sewerage infrastructure and pump station breakdowns contribute to these problems. Some improvements in microbial water quality have in recent times been achieved in areas such as Stellenbosch and Paarl and Wellington due to interventions by the relevant Local Municipalities. Concerns have also been expressed about the management and impacts of many small package plants that fall outside local authorities such as on golf estates and wineries;
- Many of the urban river systems in the Berg WMA serve as conduits for treated effluent discharged to the sea. The Bellville, Scottsdene, Kraaifontein, Zandvliet, Stellenbosch, and Macassar WWTWs discharge treated effluent into the Kuils/Eerste River system. Borcherds Quarry and Athlone WWTWs discharge into the Black/Salt River and the Potsdam WWTW discharges into the Diep River, which feeds into the ecologically sensitive Rietvlei wetland system. The Cape Flats WWTW discharges into the canal downstream of the Zeekoevlei outlet control weir. These rivers no longer display seasonal flow patterns, and some, notably the Black/Salt and Kuils Rivers have become severely modified. High residual nutrients can lead to eutrophication related problems such as nuisance algal growth and excessive growth of aquatic weeds. Other problems associated with urban rivers include leaking sewers, contaminated storm water runoff, litter, oil, and toxic spills. The constant and high base flows in these rivers also impact on the estuaries and many have lost their tidal variation;

- There are concerns about the accumulation of pesticide and herbicide residues in the surface waters, biota and sediments downstream of intensive irrigation areas. Concerns have also been expressed about the presence of Endocrine Disrupting Compounds (EDCs) in surface waters near intensive irrigation systems. Persistent Organic Pollutants (POPs) and EDCs are not monitored routinely in the Berg River WMA.
- Concerns have been expressed about the impacts of many piggeries in the WMA on the organic loads to rivers. Organic compounds consume oxygen when they decompose in rivers thereby reducing the dissolved oxygen concentrations and negatively impacting aquatic organisms. Discharges not complying with Chemical Oxygen Demand standards and irrigated effluents high in organic content that are washed into rivers have similar impacts on aquatic ecosystems (DEA&DP, 2011).

The water quality in the Berg River has changed considerably over time, with the major impactors being agricultural return flows, irrigation releases, urban and industrial runoff and wastewater discharges.

A Baseline Water Quality Study was conducted at the Berg River as part of the Feasibility Studies conducted for the project and is contained in **Appendix G**. The study explored two aspects of the behaviour of water quality in the Berg River during the rainfall season:

- Change in quality during a flood to determine if there was a peak in pollution that should be avoided when transferring water to Voëlvlei Dam; and
- Changes in quality over the winter rainfall season to determine if the early season runoff should be avoided because the quality may be poorer than later in the season.

Conservative substances (constituents such as sodium and chloride) were found to increase from low concentrations early in the rainfall season to higher concentrations later in the rainfall season. This is a well-known phenomenon in the middle and lower Berg River. The reason for this is that Malmesbury shales dominate in the catchment downstream from about Wellington. These soils leach salts during the rainfall season resulting in an increase in concentrations as the rainfall season progresses. The same trend is true for nitrogen. Non-conservative substances and nitrogen concentrations are controlled by non-point source, catchment processes during the winter rainfall season.

Phosphates concentrations and E.coli counts on the other hand decrease during the rainfall season, following a pattern that is typically associated with point source processes. Phosphates from upstream WWTW's are high at the end of the dry season when there is little dilution of the wastewater effluent. The same true for E.coli from dry-weather storm water inflows into the Berg River. An increase in flow dilutes the phosphate concentrations and E.coli counts, resulting in lower concentrations as the rainy season progresses.

It is not clear whether there is a first flush effect that should be avoided. It is clear that phosphates and bacterial are high early in the season due to point source inputs but the concentrations are quickly halved during a flood event. At this stage there is probably not sufficient evidence of a particular period during which water transfers should be avoided.

11.6.3.2 Potential Impacts/Implications

During storm flow conditions, the Berg River water will be more turbid than during normal flows. Algal blooms is a possibility, but considered unlikely due to the lack of commercial farming activities in the catchment. Moderate algal counts are unlikely to cause major water treatment problems.

During the construction phase, potential contamination of surface water could occur through sedimentation from instream works, silt-laden runoff from disturbed areas, and improper practices (e.g. poor management of waste water and disposal of solid waste) which will be addressed in the EMPr.

However, the outcomes of the water quality assessment conducted during the Feasibility Phase indicate that the extent of the impact is not yet significant enough to foreclose storing Berg River water in the dam and therefore the water quality should not be impacted.

11.6.4 Aquatic Biota

11.6.4.1 Status Quo

The health of the Berg River system was investigated in the State of Rivers Report: Berg River System conducted in 2004.

The proposed study area is located in the Lower Middle Berg River section of the Berg River. The present state of the Lower Middle Berg River and its tributaries are presented in **Figure 38**. Overall, the present state of the study area is poor to fair.

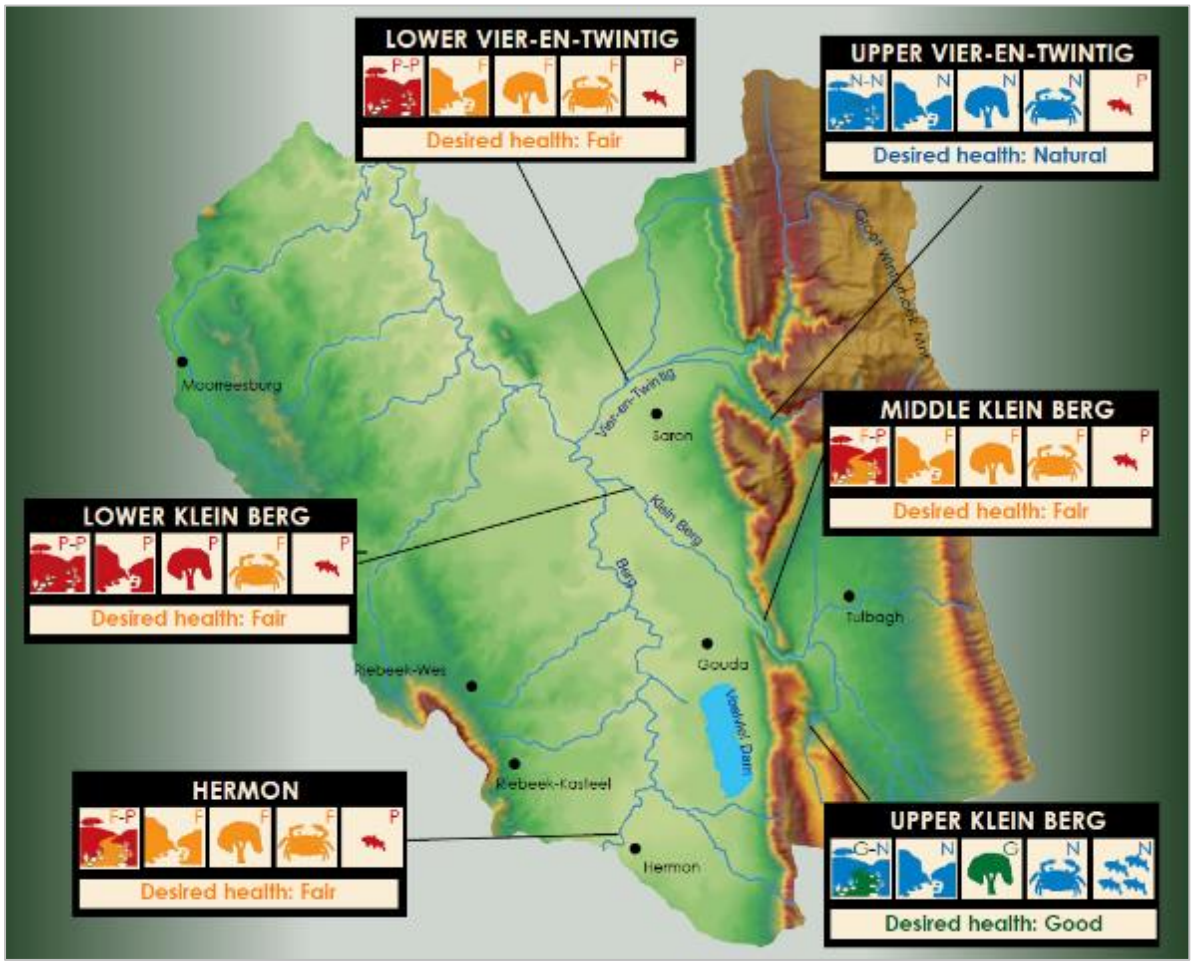


Figure 38: The present state of the Lower Middle Berg River and tributaries

Diversion weirs in the Klein Berg and Twenty Four rivers have altered flow patterns. Alien fish (bass and banded tilapia) are widespread and have led to the disappearance of indigenous fish (Berg River redfin and whitefish). River health is also reduced by the effects of agriculture (levees and pesticide residues). Water quality and habitat integrity near Tulbagh are poor.

The present water quality is indicated according to its suitability for aquatic biota. This assessment is based on the phosphate, nitrate, nitrite, ammonia, suspended solids, dissolved oxygen, pH and conductivity measured in water samples from each sampling site.

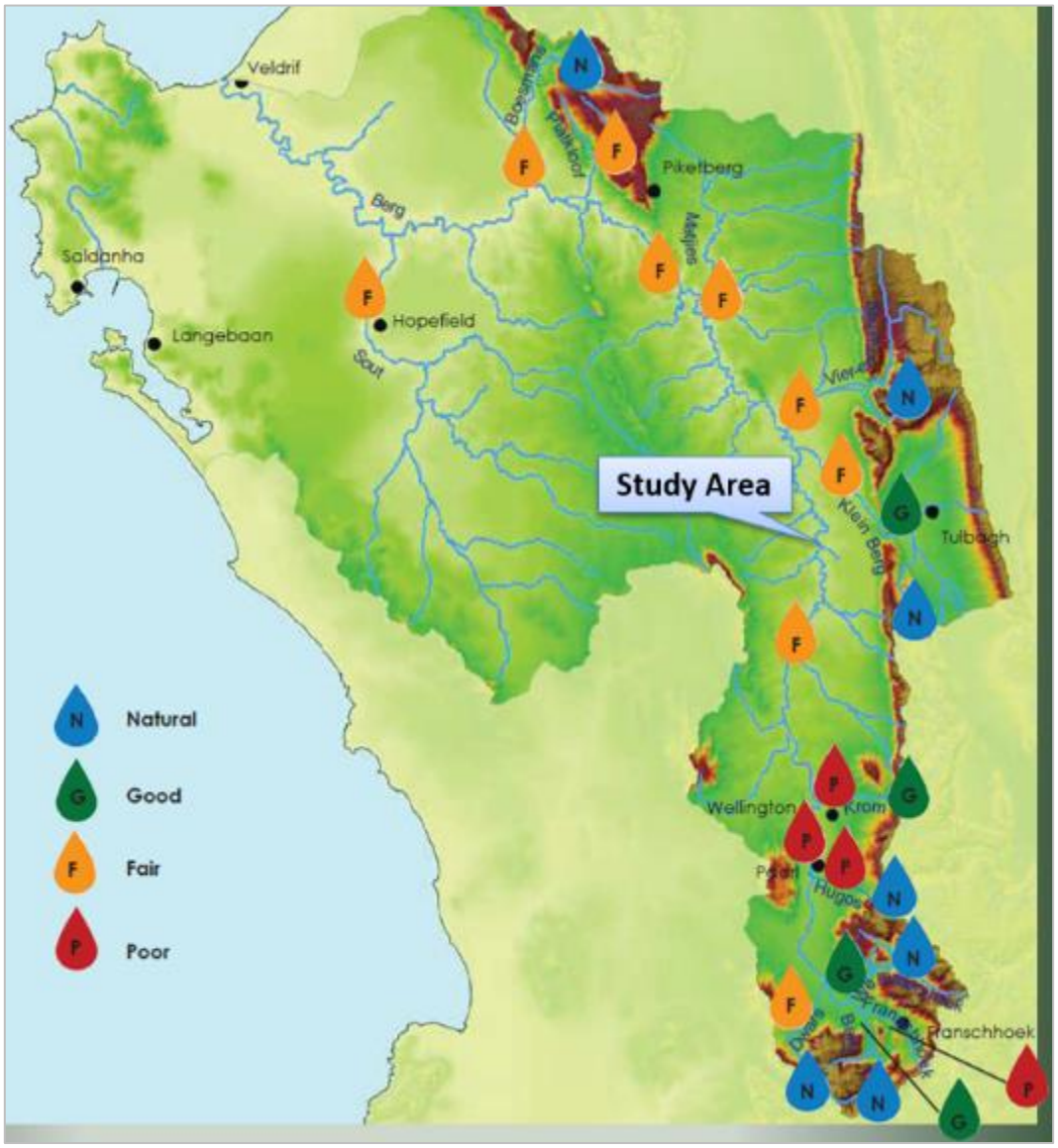


Figure 39: Present water quality

11.6.4.2 Potential Impacts/Implications

The proposed weir may transform the watercourse from a free-flowing river ecosystem to a reservoir habitat, with accompanying changes in temperature, chemical composition, dissolved oxygen levels and the physical properties.

The flow patterns resulting from the weir structure in the Berg River may influence the current biophysical functioning of the watercourse. The influence to the natural cycles in the river (e.g. elimination of natural flooding) will also impact on the downstream ecosystem.

The potential changes to flow patterns may influence the current biophysical functioning of the watercourse.

Most indigenous fish species in this country undertake annual migrations within river systems for a number of reasons, such as feeding, dispersal, refuge areas during

unfavourable conditions and reproductive success. The proposed weir structure will act as barriers that will prevent the up- and downstream movement of aquatic biota.

The harmful effect of barriers to migration is particularly severe in coastal rivers, where catadromous species, which need to migrate from their marine or estuarine spawning grounds into freshwater reaches of rivers for feeding purposes. As these fish migrate upstream as small juveniles, even low barriers of less than a metre can be impassable.

During construction, the instream works (i.e. at the gauging weir, river crossings) will increase the turbidity in the affected watercourses, which could lead to the clogging of gills of aquatic fauna from increased silt loads and the alteration of micro-habitats.

11.6.4.3 Specialist Studies Triggered

An **Aquatic Assessment and Wetland Delineation** is to be conducted. Suitable mitigation measures will be included in the EMPr, which will form part of the EIA Report, to ensure the safeguarding of the aquatic biota.

11.6.5 Riparian Habitat

11.6.5.1 Status Quo

The riparian area provides habitat for aquatic and terrestrial species, contributes towards maintaining the form of the river channel and serves as filters for sediment, nutrients and light.

As shown in **Figure 40**, the riparian habitat of the Berg River is relatively intact, but has however been disturbed and reduced due to adjacent agricultural activities.

Figure 40: Riparian habitat of the Berg River

11.6.5.2 Potential Impacts/Implications

Sections of the riparian zone on the Berg River will be lost due to the construction of the pump station.

During construction, the riparian habitat will be damaged at the proposed developments sites for the pipeline and pump station.

11.6.5.3 Specialist Studies Triggered

An **Aquatic Assessment and Wetland Delineation** to be conducted, which will include an appraisal of the riparian habitat. Uniqueness of the portion of riparian vegetation to be lost to be evaluated in terms of the extent of this vegetation type in the region.

Mitigation measures will be established during the EIA phase to manage the potential impacts to riparian vegetation and to address the overall reinstatement and rehabilitation of the area outside of the construction footprint.

11.6.6 Estuary

11.6.6.1 Status Quo

By definition, an estuary constitutes a partly enclosed coastal body of water with one or more rivers or streams flowing into it, and with a free connection to the open sea. These systems

form a transition zone between river and ocean environments and are subject to both marine influences (e.g. tides, waves, and the influx of saline water) and riverine influences (e.g. flows of fresh water and sediment). The high productivity in estuaries stems from the inflow of both seawater and freshwater, which provide high levels of nutrients in both the water column and sediment.

The Berg River Estuary is located approximately 130 km north of Cape Town on the West Coast of South Africa (**Figure 41**). The main channel of the estuary is about 100-200 m wide near the mouth, becoming progressively narrower and shallower upstream. Depth is about 3-5 m on average, but extends up to 9 m in places. The total volume of the estuary is estimated to be about 12 Mm^3. The catchment lies entirely within the Western Cape Province, which receives most precipitation during the winter rainfall season. Four major dams have been built in the catchment, including the Voëlvlei Dam (surface area = 15 km^2, storage capacity = 170 Mm^3/a).

The estuary reflects strong seasonal patterns. River inflow during winter creates more turbid, freshwater dominated conditions, with limited saline intrusion near the mouth. During summer, the estuary becomes marine-dominated with less turbid saline waters penetrating up to about 40 km from the mouth. Upwelling during these summer months is a typical feature along the West Coast when colder, nutrient-rich seawater is introduced into the estuary. This seasonal variability drives the ecology of the estuary.

Figure 41: Geographical boundaries of the Berg River Estuary

The Present Ecological Status (PES) of the estuary is a C. Major drivers of change in the system were a significant reduction in river inflow (floods and baseflows), but it is likely that the estuary is on a negative trajectory of change, because of the extremely low lowflows under the present state (< 1 m^3s-1), particularly during the summer months. Maintaining the status quo would therefore likely result in a decline in condition. The estuary is considered highly important. The Estuarine Health Index scores allocated to the Berg River Estuary were:

Table 10: PES of the Berg River Estuary

VARIABLE	WEIGHT	Score	WEIGHTED score
Hydrology	25	72	18
Hydrodynamics and mouth condition	25	90	23
Water quality	25	40	10
Physical habitat alteration	25	59	15
Habitat health score			**65**
Microalgae	20	75	15
Macrophytes	20	54	11
Invertebrates	20	50	10
Fish	20	56	11
Birds	20	78	16
Biotic health score			**63**
ESTUARINE HEALTH SCORE			**64**

Storage and abstraction of water in the catchment have reduced freshwater inflow to the Berg River Estuary by 30%. This results in:

- extensive upstream intrusion of seawater into the estuary, particularly during summer;
- reduction in frequency and extent of floodplain inundation; and
- a decrease in the scouring of sediment within the estuary.

The extensive upstream intrusion is also exacerbated by the stabilisation of the mouth which keeps it permanently open via a constructed channel.

Livestock grazing and the construction of salt works and Port Owen Marina have resulted in extensive loss of natural habitat, mainly saltmarsh. Although the salt works has destroyed this habitat, the area now provides rich feeding grounds for flamingos and waders. Power boating activities, as well as the stabilisation and regular dredging of the mouth have resulted in increased bank erosion in the estuary, with the associated loss of saltmarsh habitat and a decline in floodplain vegetation.

Potential threats to water quality include wastewater discharges from a fish processing plant, seepage from the salt works, harbour activities (e.g. dumping of fish offal and petroleum oils). Agricultural return flow is another potential source of pollutants (nutrients and pesticides) to the system.

11.6.6.2 Potential Impacts/Implications

The proposed developments can have an impact on the Berg River Estuary. If the abstraction of water is too much, the flow of the river will decrease. The water requirements for the Berg River Estuary were assessed as part of the Feasibility Studies conducted for the project. It was found that the project will not have an impact on the estuary and the weir and pump station were designed in order to meet the water requirements of the estuary.

11.7 Flora

11.7.1 Status Quo

11.7.1.1 Biome and Vegetation

The proposed developments fall within the Fynbos Biome (**Figure 42**). The Fynbos Biome extends across the southern corner of South Africa in a 100-200km wide coastal belt in the Western Cape Province. Fynbos is characterised as schlerophyllous shrub-land and this biome is comprised of two major vegetation types, the Fynbos and the Renosterveld. The Fynbos Biome forms the main part of the Cape Floristic Region (CFR), which is recognised globally as a biodiversity hotspot, due to the high numbers of endemic plant and invertebrate taxa.

The CFR covers approximately 87 892 km^2 within the Western Cape and slightly into the Eastern Cape Province of South Africa. This region is extremely rich in plant species, with approximately 9 600 different species of plants having been documented with at least 70% of these endemic to this region. The diversity of plant taxa arises from the diversity of soil types, topography and climatic conditions across the region.

The chain of large mountain ranges within the region are viewed as essential water catchment areas, and as such have historically received the focus of conservation action in the region. This has unfortunately neglected the low lying Fynbos areas which hold high levels of biodiversity. Much of the vegetation types of the lowlands have been converted into agricultural fields or rangelands, or succumbed to the expansion of infrastructure

development. The disruption of the natural fire regimes has impacted negatively on many of the Fynbos plant species as these species utilise specific fire frequencies to set seed and germinate. Infestation by alien invasive plant species, such as certain Australian Acacia and Eucalyptus species, has also converted much of the natural habitat areas into alien "forests", devoid of the natural biodiversity of the region. The Fynbos Biome is predicted to be severely impacted upon by climate change, with estimates of as high as a 50% loss of the Fynbos Biome. The drastic climatic changes predicted could alter the conditions required for the persistence of the biome, such as changes in rainfall patterns and temperature, which in turn lead to changes in the plant communities which are able to persist in the area.

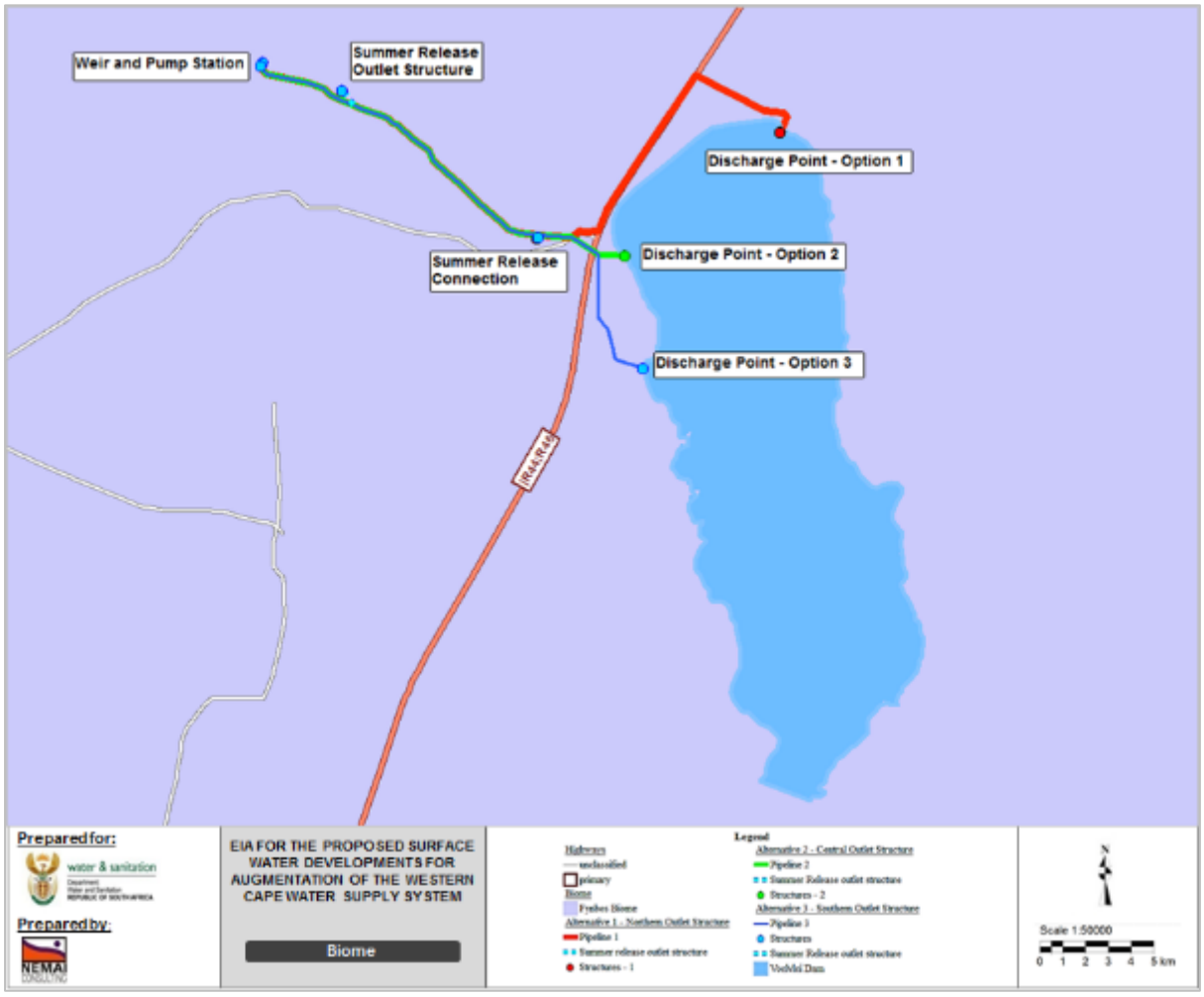


Figure 42: Biome (An A3 copy of this map is contained in Appendix B)

11.7.1.2 Western Cape Biodiversity Framework

The Western Cape Biodiversity Framework is a type of conservation plan aimed at a broader range of sectors than just conservation authorities and institutions. It is a tool for supporting and streamlining land-use planning and environmental decision-making across all sectors and tiers of government, with an emphasis on the spatial implications for development and conservation.

The 2010 Western Cape Biodiversity Framework (WCBF2010; Kirkwood *et al.,* 2010) was the first integration of biodiversity planning products into a common, user-friendly framework to guide land-use decision making in the Western Cape. Importantly, it provided a clear indication of all Critical Biodiversity Areas (CBAs) identified across the province. These are the areas crucial for conserving a representative sample of biodiversity and maintaining ecosystem functioning.

Approximately 28 200 hectares of CBAs have been added to the provincial conservation estate since the WCBF2010 was completed. This equates to 37% of total protected area gains (77 500ha), up from 21% for the period going back to 2007. CBAs from 64 different vegetation types are represented. In terms of habitat loss to agricultural expansion (between 2006 and 2011), about 53 600ha have been converted across the province (over 10 700ha per year) and, surprisingly given the degree to which CBAs have been promoted in environmental decision-making, 31% of that expansion was into CBAs (16 800ha). On the other hand, areas known to have been under agriculture but which were intentionally selected as CBAs total about 78 000ha, or 2% of the total CBA network.

In cases where a CBA has been converted to field agriculture subsequent to having been identified as a CBA, the management objective is to either maintain natural land or rehabilitate degraded land and manage for no further degradation. However, this has not been met and must be reassessed. For Ecological Support Areas (ESA), the management objective is to maintain ecological processes.

The proposed developments fall within both CBA and ESA regions (**Figure 43**).

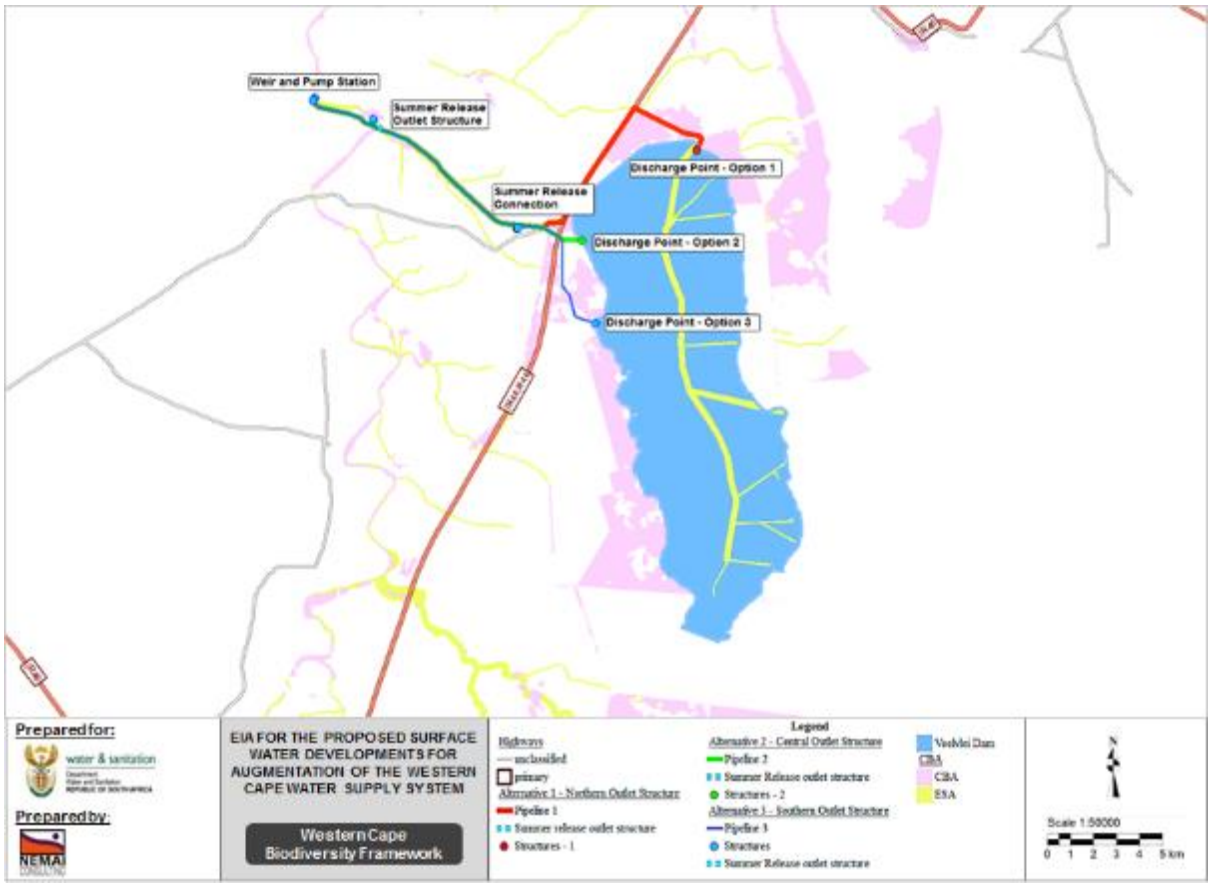


Figure 43: CBA and ESA regions (An A3 copy of this map is contained in Appendix B)

11.7.1.3 Terrestrial Threatened Ecosystems

The South African National Biodiversity Institute (SANBI), in conjunction with the Department of Environmental Affairs and Tourism (DEAT), released a draft report in 2009 entitled "Threatened Ecosystems in South Africa: Descriptions and Maps" to provide background information on the abovementioned List of Threatened Ecosystems (SANBI, 2009). The purpose of this report was to present a detailed descry`iption of each of South Africa¡¦s ecosystems and to determine their status using a credible and practical set of criteria. The following criteria were used in determining the status of threatened ecosystems:

- Irreversible loss of natural habitat;
- Ecosystem degradation and loss of integrity;
- Limited extent and imminent threat;
- Threatened plant species associations;
- Threatened animal species associations; and
- Priority areas for meeting explicit biodiversity targets as defined in a systematic conservation plan.

In terms of section 52(1) (a), of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004), a national list of ecosystems that are threatened and in need of

protection was gazetted on 9 December 2011 (GN 1002 (http://bgis.sanbi.org/ecosystems/project.asp). The list classified all threatened or protected ecosystems in South Africa in terms of four categories; *Critically Endangered* (CR), *Endangered* (EN), *Vulnerable* (VU) or *Protected*. The purpose of categorising these ecosystems is to prioritise conservation areas in order to reduce the rates of ecosystem and species extinction, as well as preventing further degradation and loss of structure, function, and composition of these ecosystems. It is estimated that threatened ecosystems make up 9.5% of the land in South Africa, with critically endangered and endangered ecosystems accounting for 2.7%, and vulnerable ecosystems 6.8% of the land area. It is therefore vital that Threatened Terrestrial Ecosystems inform proactive and reactive conservation and planning tools, such as Environmental Impact Assessments and other environmental applications (Mucina *et al.*, 2006*)*.

The proposed developments fall within the Swartland Shale Renosterveld, and the Swartland Alluvium Fynbos, both of which are categorised as CR, according to data sourced from SANBI. (**Figure 44**).

The Swartland Shale Renosterveld originally covered 495 000 hectares and now approximately 8% of natural area remains. Less than 1% of its original area is protected. This ecosystem is characterised by moderately undulating plains and valleys supporting low to moderately tall leptophyllous shrubland of varying canopy cover as well as low, open shrubland dominated by renosterbos. Heuweltjies are a very prominent local feature of the environment, forming 'hummockveld' near Piketberg and giving the Tygerberg Hills their name. Stunted trees and thicket are often associated with the heuweltjies. Disturbed areas are dominated by *Athanasia trifurcata* and *Otholobium hirtum*. Patches of *Cynodon dactylon* 'grazing lawns' also occur in abundance within this ecosystem. Boundaries are edaphically determined; and within west coast renosterveld are delimited by endemic species. At least 35 endemic plant species and 151 Red Data List plant species occur in the ecosystem.

The Swartland Alluvium Fynbos originally covered 47 000 hectares and now approximately 27% of natural area remains. Approximately 2% of the ecosystem is protected in the Waterval Nature Reserve, Winterhoek (mountain catchment area) with a further 7% is found in private reserves such as Elandskloof, Langerug and Wiesenhof Wildpark. This ecosystem is characterised by moderately undulating plains, adjacent mountains and in river basins. The vegetation is a matrix of low, evergreen shrubland with emergent sparse, moderately tall shrubs and a conspicuous graminoid layer. Proteoid, restioid and asteraceous fynbos types are dominant, with closed-scrub fynbos common along the river courses. Ericaceous and restioid fynbos found in seeps. Boundaries are edaphically determined. At least 13 endemic plant species and 57 Red Data List plant species occur in the ecosystem.

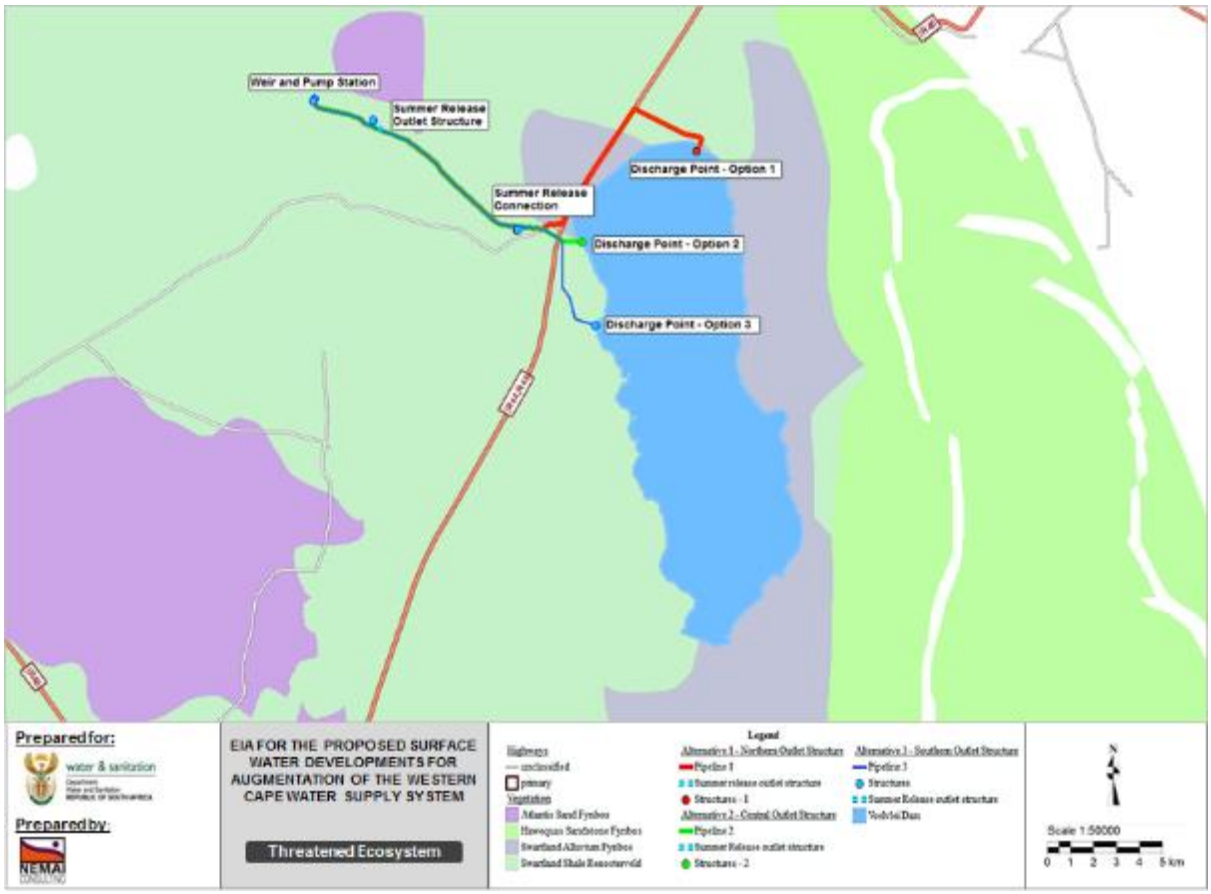


Figure 44: Threatened Ecosystem (An A3 copy of this map is contained in Appendix B)

Although the proposed developments fall within two threatened ecosystems, the area is quite disturbed and transformed as a result of farming activities (**Figure 45**).

Figure 45: Transformed land next to the Berg River

11.7.1.4 Plant Species

The proposed developments is located within the 3319AC and 3318BD Quarter Degree Squares (QDS) in terms of the 1:50 000 grid of South Africa. The Pretoria Computerised Information System (PRECIS) list of Red Data plants was obtained from SANBI (http://posa.sanbi.org/searchspp.php).

The list was consulted to verify the record of occurrence of the plant species seen in the vicinity of the proposed development. The site sampled is also only a very small portion of the whole grid and so habitats suitable for certain species in the PRECIS list may not be present at the areas sampled.

A list of threatened plant species that occur in the grid is provided in **Table 11**. Conservation status and definitions of each status is listed in **Table 12**.

Table 11: Red Data Plant species recorded in grid cell 3319AC and 3318BD which could potentially occur in the study area (SANBI data)

Family	Species	Threat Status	SA Endemic
AMARYLLIDACEAE	Brunsvigia elandsmontana	CR	No
APONOGETONACEAE	Aponogeton angustifolius	VU	No
AQUIFOLIACEAE	Ilex mitis	Declining	No
ASPHODELACEAE	Bulbine monophylla	CR	No
ASPHODELACEAE	Trachyandra chlamydophylla	VU	No
ASPHODELACEAE	Trachyandra filiformis	NT	No
ASPHODELACEAE	Trachyandra paniculata	Threatened	No
ASTERACEAE	Arctotis angustifolia	CR	No
ASTERACEAE	Athanasia adenantha	EN	No
ASTERACEAE	Athanasia crenata	EN	No
ASTERACEAE	Cotula filifolia	CR	No
ASTERACEAE	Cotula pusilla	NT	No
ASTERACEAE	Marasmodes oligocephala	CR	No
ASTERACEAE	Marasmodes spinosa	EN	No
ASTERACEAE	Marasmodes undulata	CR	No
ASTERACEAE	Metalasia octoflora	VU	No
ASTERACEAE	Oedera viscosa	NT	No
ASTERACEAE	Othonna ciliata	VU	No
ASTERACEAE	Relhania fruticosa	NT	No
ASTERACEAE	Steirodiscus gamolepis	EN	No
BORAGINACEAE	*Echiostachys ecklonianus*	EN	No
BORAGINACEAE	*Lobostemon capitatus*	VU	No
CAMPANULACEAE	*Merciera tetraloba*	EN	No
COLCHICACEAE	*Wurmbea inusta*	VU	No
CRASSULACEAE	*Crassula bergioides*	NT	No
ERICACEAE	*Erica capitata*	NT	No
ERICACEAE	*Erica oxysepala*	VU	No
ERICACEAE	*Erica rehmii*	VU	No
FABACEAE	*Indigofera psoraloides*	EN	No
FABACEAE	*Lebeckia plukenetiana*	EN	No
FABACEAE	*Lotononis complanata*	EN	No
FABACEAE	*Lotononis prostrata*	NT	No
FABACEAE	*Lotononis rigida*	VU	No
FABACEAE	*Otholobium bolusii*	NT	No
FABACEAE	*Otholobium uncinatum*	NT	No
FABACEAE	*Podalyria cordata*	VU	No

Family	Species	Threat Status	SA Endemic
FABACEAE	*Podalyria sericea*	VU	No
FABACEAE	*Rafnia crispa*	CR	No
FABACEAE	*Rafnia lancea*	EN	No
FABACEAE	*Wiborgia tenuifolia*	NT	No
GERANIACEAE	*Monsonia speciosa*	EN	No
GERANIACEAE	*Pelargonium asarifolium*	VU	No
GERANIACEAE	*Pelargonium chelidonium*	EN	No
GERANIACEAE	*Pelargonium reflexum*	EN	No
GUNNERACEAE	*Gunnera perpensa*	Declining	No
HAEMODORACEAE	*Wachendorfia brachyandra*	VU	No
HYACINTHACEAE	*Albuca albucoides*	EN	No
HYACINTHACEAE	*Lachenalia contaminata*	NT	No
HYACINTHACEAE	*Lachenalia longibracteata*	Declining	No
HYACINTHACEAE	*Lachenalia mediana*	EN	No
HYACINTHACEAE	*Lachenalia pallida*	Declining	No
HYACINTHACEAE	*Lachenalia polyphylla*	EN	No
HYACINTHACEAE	*Lachenalia purpureo-caerulea*	CR	No
HYACINTHACEAE	*Lachenalia pustulata*	NT	No
HYPOXIDACEAE	*Pauridia minuta*	NT	No
HYPOXIDACEAE	*Spiloxene alba*	VU	No
HYPOXIDACEAE	*Spiloxene minuta*	EN	No
IRIDACEAE	*Aristea lugens*	EN	No
IRIDACEAE	*Aristea nigrescens*	EN	No
IRIDACEAE	*Babiana angustifolia*	NT	No
IRIDACEAE	*Babiana melanops*	VU	No
IRIDACEAE	*Babiana odorata*	EN	No
IRIDACEAE	*Babiana patula*	Declining	No
IRIDACEAE	*Babiana rubrocyanea*	VU	No
IRIDACEAE	*Babiana secunda*	CR	No
IRIDACEAE	*Babiana stricta*	NT	No
IRIDACEAE	*Babiana villosa*	NT	No
IRIDACEAE	*Babiana villosula*	EN	No
IRIDACEAE	*Bobartia fasciculata*	NT	No
IRIDACEAE	*Geissorhiza erosa*	EN	No
IRIDACEAE	*Geissorhiza furva*	EN	No
IRIDACEAE	*Geissorhiza imbricata*	NT	No
IRIDACEAE	*Geissorhiza imbricata*	NT	No
IRIDACEAE	*Geissorhiza purpureolutea*	NT	No
IRIDACEAE	*Geissorhiza setacea*	EN	No
IRIDACEAE	*Geissorhiza tulbaghensis*	EN	No
IRIDACEAE	*Gladiolus exilis*	NT	No
IRIDACEAE	*Gladiolus recurvus*	VU	No
IRIDACEAE	*Gladiolus watsonius*	NT	No
IRIDACEAE	*Gladiolus meliusculus*	NT	No
IRIDACEAE	*Hesperantha spicata*	VU	No
IRIDACEAE	*Ixia abbreviata*	NT	No
IRIDACEAE	*Ixia campanulata*	EN	No
IRIDACEAE	*Ixia dubia*	Declining	No
IRIDACEAE	*Ixia monadelpha*	EN	No
IRIDACEAE	*Ixia mostertii*	EN	No
IRIDACEAE	*Ixia polystachya*	EN	No
IRIDACEAE	*Ixia rouxii*	CR	No
IRIDACEAE	*Ixia vinacea*	EN	No
IRIDACEAE	*Ixia viridiflora*	CR	No
IRIDACEAE	*Ixia viridiflora*	EN	No
IRIDACEAE	*Lapeirousia azurea*	EN	No
IRIDACEAE	*Lapeirousia corymbosa*	Declining	No
IRIDACEAE	*Moraea angulata*	CR	No

Family	Species	Threat Status	SA Endemic
IRIDACEAE	*Moraea cooperi*	VU	No
IRIDACEAE	*Moraea punctata*	EN	No
IRIDACEAE	*Moraea tricolor*	EN	No
IRIDACEAE	*Moraea tulbaghensis*	EN	No
IRIDACEAE	*Moraea versicolor*	VU	No
IRIDACEAE	*Moraea villosa*	VU	No
IRIDACEAE	*Moraea villosa*	VU	No
IRIDACEAE	*Sparaxis grandiflora*	EN	No
IRIDACEAE	*Sparaxis tricolor*	VU	No
IRIDACEAE	*Tritoniopsis elongata*	EN	No
IRIDACEAE	*Watsonia dubia*	EN	No
IRIDACEAE	*Watsonia humilis*	CR	No
ISOETACEAE	*Isoetes capensis*	EN	No
ISOETACEAE	*Isoetes stellenbossiensis*	NT	No
ISOETACEAE	*Isoetes stephansenii*	CR	No
LOBELIACEAE	*Monopsis variifolia*	EN	No
MESEMBRYANTHEMACEAE	*Antimima mucronata*	VU	No
MESEMBRYANTHEMACEAE	*Drosanthemum calycinum*	NT	No
MESEMBRYANTHEMACEAE	*Drosanthemum hispifolium*	VU	No
MESEMBRYANTHEMACEAE	*Drosanthemum worcesterense*	Threatened	No
MESEMBRYANTHEMACEAE	*Erepsia ramosa*	VU	No
MESEMBRYANTHEMACEAE	*Lampranthus coccineus*	CR	No
MESEMBRYANTHEMACEAE	*Lampranthus dilutus*	EN	No
MESEMBRYANTHEMACEAE	*Lampranthus filicaulis*	VU	No
MESEMBRYANTHEMACEAE	*Lampranthus leptaleon*	EN	No
MESEMBRYANTHEMACEAE	*Lampranthus peacockiae*	VU	No
MESEMBRYANTHEMACEAE	*Lampranthus reptans*	NT	No
MESEMBRYANTHEMACEAE	*Lampranthus scaber*	EN	No
MESEMBRYANTHEMACEAE	*Phyllobolus suffruticosus*	EN	No
ORCHIDACEAE	*Ceratandra venosa*	NT	No
ORCHIDACEAE	*Disa atrorubens*	NT	No
ORCHIDACEAE	*Disa flexuosa*	NT	No
ORCHIDACEAE	*Disa physodes*	CR	No
ORCHIDACEAE	*Disa tenella*	EN	No
ORCHIDACEAE	*Pterygodium inversum*	EN	No
OXALIDACEAE	*Oxalis droseroides*	EN	No
OXALIDACEAE	*Oxalis meisneri*	VU	No
OXALIDACEAE	*Oxalis natans*	CR	No
POLYGALACEAE	*Muraltia spicata*	VU	No
POLYGALACEAE	*Muraltia trinervia*	NT	No
PRIONIACEAE	*Prionium serratum*	Declining	No
PROTEACEAE	*Aulax pallasia*	NT	No
PROTEACEAE	*Diastella myrtifolia*	CR	No
PROTEACEAE	*Diastella parilis*	CR	No
PROTEACEAE	*Diastella thymelaeoides*	VU	No
PROTEACEAE	*Leucadendron argenteum*	EN	No
PROTEACEAE	*Leucadendron chamelaea*	CR	No
PROTEACEAE	*Leucadendron corymbosum*	VU	No
PROTEACEAE	*Leucadendron daphnoides*	EN	No
PROTEACEAE	*Leucadendron gydoense*	EN	No
PROTEACEAE	*Leucadendron lanigerum*	EN	No
PROTEACEAE	*Leucadendron sessile*	NT	No
PROTEACEAE	*Leucadendron stellare*	CR	No
PROTEACEAE	*Leucospermum cordifolium*	NT	No
PROTEACEAE	*Leucospermum hypophyllocarpodendron*	VU	No
PROTEACEAE	*Leucospermum innovans*	EN	No
PROTEACEAE	*Leucospermum lineare*	VU	No

Family	Species	Threat Status	SA Endemic
PROTEACEAE	*Leucospermum tomentosum*	VU	No
PROTEACEAE	*Leucospermum tottum*	NT	No
PROTEACEAE	*Leucospermum vestitum*	NT	No
PROTEACEAE	*Protea angustata*	EN	No
PROTEACEAE	*Protea burchellii*	VU	No
PROTEACEAE	*Protea coronata*	NT	No
PROTEACEAE	*Protea effusa*	NT	No
PROTEACEAE	*Protea grandiceps*	NT	No
PROTEACEAE	*Protea lorea*	NT	No
PROTEACEAE	*Protea mucronifolia*	CR	No
PROTEACEAE	*Protea recondita*	NT	No
PROTEACEAE	*Protea scabra*	NT	No
PROTEACEAE	*Protea scolymocephala*	VU	No
PROTEACEAE	*Protea scorzonerifolia*	VU	No
PROTEACEAE	*Serruria candicans*	EN	No
PROTEACEAE	*Serruria fasciflora*	NT	No
PROTEACEAE	*Serruria furcellata*	CR	No
PROTEACEAE	*Serruria rosea*	NT	No
PROTEACEAE	*Serruria roxburghii*	EN	No
PROTEACEAE	*Serruria rubricaulis*	NT	No
PROTEACEAE	*Serruria triternata*	NT	No
PROTEACEAE	*Sorocephalus imbricatus*	CR	No
PROTEACEAE	*Spatalla caudata*	EN	No
RESTIONACEAE	*Elegia extensa*	EN	No
RESTIONACEAE	*Elegia recta*	NT	No
RESTIONACEAE	*Restio coactilis*	VU	No
RHAMNACEAE	*Phylica plumosa*	VU	No
RHAMNACEAE	*Phylica plumosa*	Declining	No
RHAMNACEAE	*Phylica stenopetala*	VU	No
RHAMNACEAE	*Phylica strigulosa*	VU	No
RHAMNACEAE	*Phylica thunbergiana*	EN	No
RUTACEAE	*Acmadenia macradenia*	NT	No
RUTACEAE	*Agathosma betulina*	Declining	No
RUTACEAE	*Agathosma corymbosa*	EN	No
RUTACEAE	*Agathosma crenulata*	Declining	No
RUTACEAE	*Agathosma marifolia*	NT	No
RUTACEAE	*Agathosma pulchella*	VU	No
RUTACEAE	*Diosma aspalathoides*	NT	No
RUTACEAE	*Diosma pedicellata*	NT	No
RUTACEAE	*Euchaetis pungens*	VU	No
SCROPHULARIACEAE	*Polycarena capensis*	NT	No
THYMELAEACEAE	*Gnidia humilis*	EN	No
THYMELAEACEAE	*Lachnaea grandiflora*	VU	No
THYMELAEACEAE	*Lachnaea pusilla*	VU	No
THYMELAEACEAE	*Lachnaea uniflora*	VU	No

Note: VU=Vulnerable; NT=Near Threatened; EN=Endangered; CR=Critically Endangered

Table 12: Definitions of Red Data plant status (Raimondo et al., 1999)

Symbol	Status	Description
CR	Critically Endangered	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five International Union for Conservation of Nature (IUCN) criteria for Endangered, and is therefore facing a very high risk of extinction in the wild.
EN	Endangered	A taxon is Endangered when the best available evidence indicates that it meets any of the five International Union for Conservation of Nature

Symbol	Status	Description
		(IUCN) criteria for Endangered, and is therefore facing a very high risk of extinction in the wild.
VU	Vulnerable	A taxon is Vulnerable when the best available evidence indicates that it meets any of the five) an IUCN criterion for Vulnerable and it is therefore considered to be facing a high risk of extinction in the wild.
NT	Near Threatened	A taxon is Near Threatened when available evidence indicates that it is close to meeting any of the five IUCN criteria for Vulnerable, and is therefore likely to qualify for a threatened category in the near future.
	Declining	A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population.

11.7.1.5 Terrestrial Invasive Plant Species

Invasive alien plants are widely regarded as the single greatest threat to South Africa's biological diversity. The water taken up by alien plants affects not only the water supply, but can also have negative impacts on water quality.

A large number of alien species occur in the 3318BD and 3319AC QDS surrounding the Voëlvlei Dam. This has potential negative implications for the management of the Dam as terrestrial invasive plant species are known to result:

- Loss of indigenous species as a result of competition for space and resources with alien species;
- Disruption of aquatic and riparian ecosystems;
- Erosion of river banks and riparian areas;
- Alterations in environmental flows as a result of water use by invasive alien plants; and
- An increased fire risk, which destroys indigenous habitats.

11.7.1.6 Aquatic Invasive Plant Species

Another key biophysical encumbrance is the presence of aquatic invasive species. Currently 14 alien aquatic and wetland plant species are declared weeds or invader plants in South Africa and their control is subject to the Conservation of Agricultural Resources Act (CARA), Act 43 of 1983, and amended in 2001. Another 13 species have been proposed for listing under CARA and the NEMBA. There are also a number of indigenous or cosmopolitan (worldwide) species that can flourish and become troublesome in disturbed aquatic habitats.

No aquatic invasive plant species have been noted as a problem at the Dam, however, according to the Agricultural Geographic Information System (AGIS) Weeds and Invasive Plants (WIP) Database, there are three known aquatic invasive species in the 3319AC QDS around the Dam. These include:

- *Arundo donax*;

- *Eichhornia crassipes*; and
- *Myriophyllum aquaticum.*

Water Hyacinth is known to cause major ecological and socio-economic impacts. According to Villamagna and Murphy (2010), these impacts include:

- Altering of water clarity and decrease in phytoplankton production, dissolved oxygen, nitrogen, phosphorous, heavy metals and concentrations of other contaminants;
- Decreasing abundance and diversity of aquatic invertebrates through decreased phytoplankton (food) availability;
- Decreased dissolved oxygen concentrations and decreased phytoplankton negatively impact fish species.
- Increasing of sedimentation rates within the plant's complex root structure; and
- Increased evapotranspiration rates from water hyacinth leaves when compared to evaporation rates from open water.

Myriophyllum aquaticum is a spirally leafed, aquatic plant capable of forming dense infestations in waterways with pale green, finely divided, feather-like leaves arranged in whorls. Tiny, solitary, inconspicuous cream flowers forming in the axils of the leaves from May-September. It invades still or slow-moving water on the banks of rivers, lakes and ponds. The species is known to be a problem in the Western Cape.

The species forms dense rooted mats which disrupt recreational activities, threaten aquatic ecosystems and irrigation schemes. Dense mats clog waterways, reduce water flow and block irrigation equipment. The mats provide ideal breeding conditions for mosquitoes and bilharzia-carrying snails.

Further, invasive aquatic plants are known to disrupt navigation, fishing and other recreational activities, adversely affect waterflow, increase the loss of water from storage dams and pose a threat to hydro-electric installations. High densities of the plants degrade aquatic ecosystems and are a threat to biodiversity. They can also result in the deaths of cattle and livestock, walking on 'beds' of aquatic weeds often results in drowning.

11.7.2 Potential Impacts/Implications

Vegetation will be lost within areas that are to be cleared for the project infrastructure such as the pump station. The potential loss of significant flora species may occur, which needs to be investigated further.

Clearing of vegetation for construction purposes may result in the proliferation of exotic vegetation, which could spread beyond the construction domain. This potential impact will need to be managed.

The potential establishment of alien vegetation in the Dam from the Berg River may occur due to the transfer of water between the Dam and the River.

The establishment of trees within the pipeline servitude will not be allowed as roots may compromise the stability of the pipeline.

11.7.3 Specialist Studies Triggered

An **Ecological Impact Study** will be conducted in the EIA phase to assess the status of the sensitive ecological features. Areas to be affected by project activities and infrastructure will be surveyed to identify sensitive and significant floral species. Suitable mitigation measures will be identified and recommendations will be made to address any potential impacts.

Mitigation measures will be provided during the EIA phase to manage the potential impacts to vegetation, removal of protected trees and medicinal plants, encroachment by exotic species and to address the overall reinstatement and rehabilitation of the area where the dam wall will be built.

Permit(s) will be obtained under the National Forests Act (No. 84 of 1998) if protected trees are to be cut, disturbed, damaged, destroyed or removed. The final alignment of linear infrastructure will attempt to avoid protected trees, where possible.

11.8 Fauna

11.8.1 Status Quo

11.8.1.1 Freshwater Fish

Voëlvlei Dam, from its establishment until around 2005, was one of the prime smallmouth bass Dams in South Africa. The Dam mainly contained bass, but also other alien species such as some rainbow trout (*Oncorhynchus mykiss*), bluegill (*Lepomis macrochirus*) and very large carp (*Cyprinus carpio*). The Dam used to contain small numbers of Endangered Berg-Breede whitefish (*Barbus andrewi)*, which never became abundant due to bass predation in the Dam. Rivers which feed the dam contain Endangered Berg River redfin (*Pseudobarbus burgi)*, Cape kurper (*Sandelia capensis*) and Cape Galaxias (*Galaxias zebratus*) in river areas which lack alien fish. The last 15 years has seen the proliferation of the illegally introduced alien sharptooth catfish (*Clarias gariepinus*), and collapse of bass numbers, which has also resulted in carp numbers exploding, and contributing to water quality problems. Recent fish surveys show that alien Mozambique tilapia (*Oreochromis mossambicus*) is also now present in the Dam. Large numbers of carp and catfish present subsistence fishing opportunities to poor communities using legal angling methods, and harvesting of these problem fishes should be encouraged.

11.8.1.2 Mammals

According to the Animal Demography Unit (http://vmus.adu.org.za/vm_sp_list.php), three sensitive mammal species are known to occur in the grid 3319AC and 3318BD around the site (**Table 13**).

Table 13: Mammal species recorded in grid cell 3319AC and 3318BD which could occur in the area

Species	Common Name	Threat Status	No. Records
Damaliscus pygargus pygargus	Bontebok	VU	6
Equus zebra zebra	Cape Mountain Zebra	VU	3
Mellivora capensis	Honey Badger	NT	17
Mystromys albicaudatus	African White-tailed Rat	EN	3

Note: NT=Near Threatened; VU=Vulnerable

11.8.1.3 Avifauna

Important Bird and Biodiversity Areas (IBAs) form a network of sites, at a bio-geographic scale, which are crucial for the long-term viability of naturally occurring bird populations (Barnes, 2000). IBAs are classified on the basis of the following criteria:

- The site regularly holds significant numbers of a globally threatened species;
- The site is thought to hold, a significant component of a group of species whose breeding distributions define an Endemic Bird Area (EBA) or Secondary Area; and
- The site is known or thought to hold a significant component of a group of species whose distributions are largely or wholly confined to one biome.

Conservation and planning tools were consulted for relevancy for this project, and found that one IBA falls within the study area. The proposed developments fall within the Boland Mountains IBA (**Figure 46**).

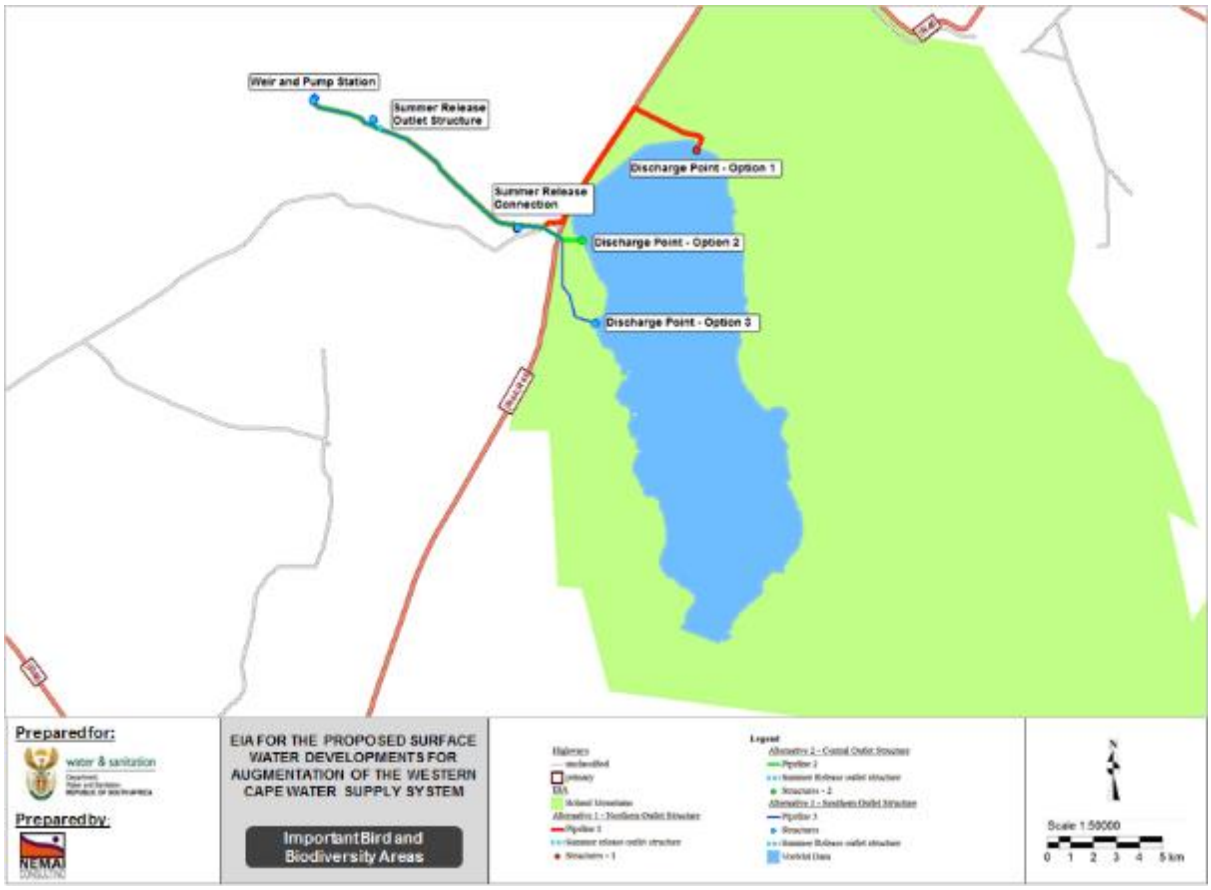


Figure 46: IBA (An A3 copy of this map is contained in Appendix B)

According to the Southern African Bird Atlas Project (SABAP) 2, a number of sensitive bird species have been noted in grid cell 3319AC and 3318BD which might occur on site (**Table 14**).

Table 14: Bird species recorded in cell 3319AC and 3318BD which could occur in the area

Species	Common Name	Threat Status
Pelecanus onocrotalus	Great White Pelican	NT
Ciconia nigra	Black Stork	NT
Phoenicopterus roseus	Greater Flamingo	NT
Phoeniconaias minor	Lesser Flamingo	NT
Sagittarius serpentarius	Secretary bird	NT
Polemaetus bellicosus	Martial Eagle	VU
Circus ranivorus	African Marsh-Harrier	VU
Circus maurus	Black Harrier	NT
Falco biarmicus	Lanner Falcon	NT
Falco naumanni	Lesser Kestrel	VU
Anthropoides paradiseus	Blue Crane	VU
Gyps coprotheres	Cape Vulture (Griffon)	VU
Falco peregrinus	Peregrine Falcon	NT
Sterna caspia	Caspian Tern	NT
Alcedo semitorquata	Half-collared Kingfisher	NT

Note: NT=Near Threatened; VU=Vulnerable

Species such as the Blue Crane is also of concern and is listed as vulnerable in the Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Barnes, 2000). The species has declined in much of its former stronghold mostly due to habitat loss, but has adapted well to the artificial habitat of the wheat producing areas of the WCP (Shaw, 2003) to such a degree that it is estimated that about 50% of the total population now occurs in the WCP (McCann, 2001) (Shaw and Waller, 2012).

11.8.1.4 Reptiles

According to the Reptile Atlas of Southern African (http://vmus.adu.org.za/vm_sp_list.php), the reptile species that were recorded in grid cell 3319AC and 3318BD are shown in **Table 15**.

Table 15: Amphibian species recorded in grid cell 3319AC and 3318BD which could occur in the area

Species	Common name	Red List Category	No. Records
Cordylus oelofseni	Oelofsen's Girdled Lizard	NT	9
Psammobates geometricus	Geometric Tortoise	CR	3

Note: NT=Near Threatened; CR=Critically Endangered

The Geometric Tortoise, which is listed as Critically Endangered, is protected under the Nature Conservation Ordinance of the Western Cape Province and Schedule I of the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) (**Figure 47**). It is also listed as one of the top 25 most endangered tortoises and turtles in the world. One of the main conservation priorities of the Voëlvlei Nature Reserve is the conservation and protection of this species. According to Cape Nature the following conservation actions are required in the area:

- The establishment of additional statutory conservation areas; private landowners with geometric tortoise populations on their properties can establish conservation stewardship sites and conservancies;
- A Biodiversity Management Plan for this species must be developed; and
- Funding for further conservation actions and awareness programmes must be sourced.

Figure 47: Example of a road sign warning of the geometric tortoises

The geometric tortoise occurs only in the low-lying renosterveld shrublands of the Swartland, Upper Breede River Valley and Ceres Valley, where wheat and wine farming, as well as urban development have led to the destruction of more than 90% of its habitat. The main threats to the species include:

- Urban and agricultural expansion (wheat, other crop farming and vineyards) threatens remaining habitats;
- Severe fragmentation of remaining habitat puts pressure on small and isolated populations;
- Invasive alien vegetation and animals, such as feral pigs, lead to further habitat degradation;
- Too frequent fires in small, isolated habitats will destroy these populations, however, the absence of fire may also negatively affect the quality of these isolated habitat patches; and
- The poaching of specimens from the wild remains a significant potential threat.

11.8.1.5 Amphibians

Amphibians are an important component of South Africa's exceptional biodiversity and are such worthy of both research and conservation effort.

Frogs are useful environmental bio-monitors (bio-indicators) and may acts as an early warning system for the quality of the environment. Frogs and tadpoles are good species indicator on water quality, because they have permeable, exposed skins that readily absorb

toxic substances. The presence of amphibians is also generally regarded as an indication of intact ecological functionality and therefore construction activities within these habitat units should be undertaken in an ecologically-sensitive manner.

According to the Frog Atlas of Southern African (http://vmus.adu.org.za/vm_sp_list.php), the frog species that were recorded in grid cell 3319AC and 3318BD are shown in **Table 16**.

Table 16: Amphibian species recorded in grid cell 3319AC and 3318BD which could occur in the area

Species	Common name	Red List Category	No. Records
Breviceps gibbosus	Cape Rain Frog	VU	2
Cacosternum capense	Cape Caco	VU	3

Note: VU=Vulnerable

11.8.2 Potential Impacts/Implications

Vulnerable species could occur within the study area and the construction of the proposed dam will have a negative impact on the habitats of such species. Fauna could be adversely affected through construction-related activities (noise, illegal poaching, and habitat loss).

Potential impacts which could occur during the operational phase include:

- The loss of habitat for various species of fauna due to increased levels at the weir; and
- The transfer and release of water may have an impact the faunal species.

11.8.3 Specialist Studies Triggered

An **Ecological Impact Study** is to be undertaken. Suitable mitigation measures to be identified and recommendations to be made to address impacts especially in terms of the search, rescue and relocation plan (if necessary) of various species prior to the inundation of the area behind the dam wall.

11.9 Land Capability

11.9.1 Status Quo

According to the Agricultural Geo-Referenced Information System (AGIS), the site is located on an area that is considered to have moderate potential arable land and non-arable, moderate potential in terms of grazing land.

11.9.2 Potential Impacts/Implications

The construction of the pump station may result in the loss of arable land for grazing and agriculture. In addition, the construction of the pipeline may disturb the surrounding agricultural land which may decrease its arability.

Based on the Agricultural Economic Considerations compiled as part of the Feasibility Studies for the project, the construction of a new pipeline Voëlvlei Dam may impact on farming activities on the pipeline route. In addition, if the abstraction of surplus winter water from the Berg River does not impede irrigation activities downstream, the project would be acceptable due to its low-cost nature. If the additional water to Voëlvlei Dam is transferred from other areas (i.e Breede River system), it may impede irrigation activities in those areas.

11.9.3 Specialist Studies Triggered

An **Agricultural Impact Assessment** will be conducted in order to determine the impacts to the surrounding agricultural land, as well as to make recommendations and mitigation measures to be included in the EMPr to minimise these impacts.

11.10 Land Use

11.10.1 Status Quo

Voëlvlei Dam falls within the Berg River Catchment which is approximately 9 000 km^2 in size (DWAF, 2007). Land use within the catchment comprises mainly of dryland wheat farming, livestock farming, forestry, industry, fruit farming, urban areas and nature conservation (**Figure 48**).

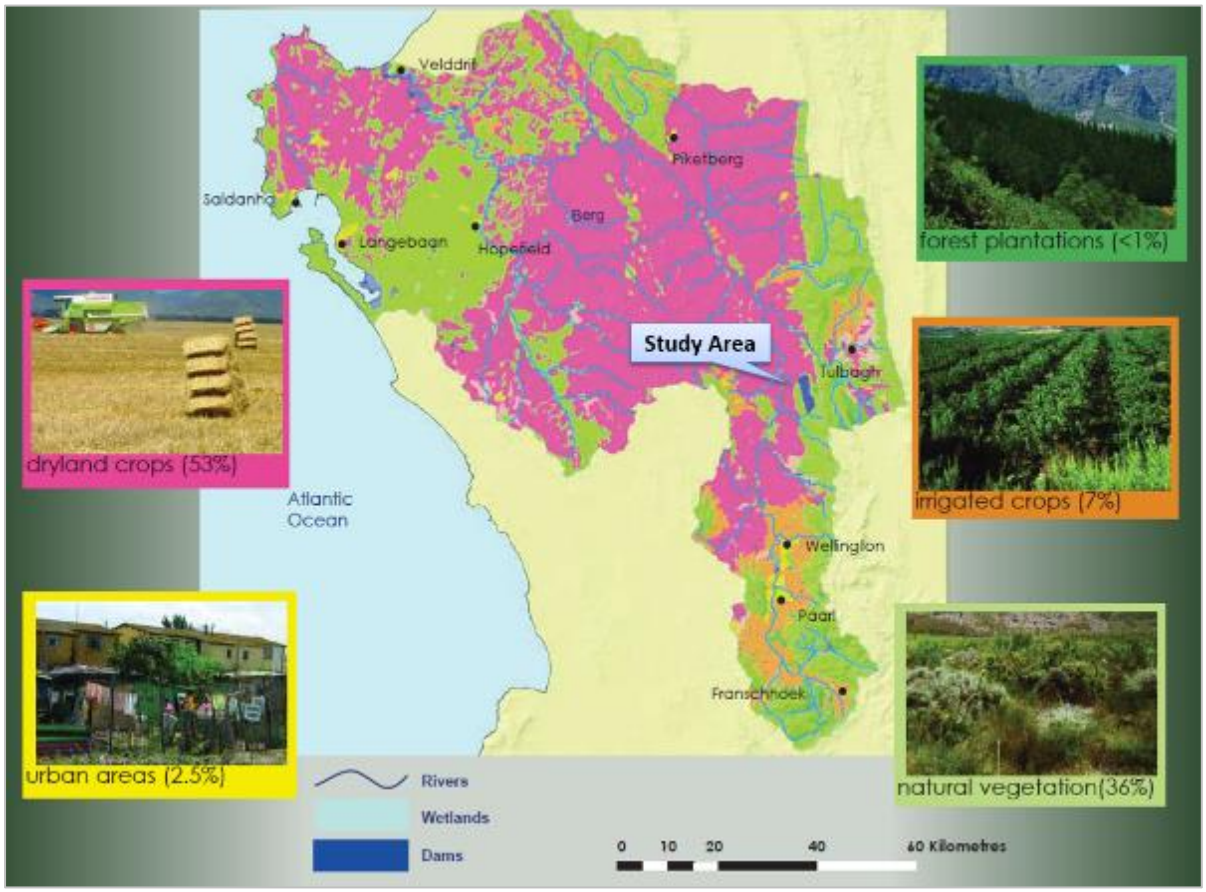


Figure 48: Land use in the Berg River Catchment

The Berg River traverses both urbanised areas (24%) and areas developed for agricultural purposes (60%) (DWAF, 2007). Main land use within the catchment consists of agriculture, livestock farming, plantation forestry, commercial industries, fruit farming, residential areas and nature conservation (DWAF, 2007). **Figures 49** and **50** show examples of the types of farming found within the vicinity of the proposed developments. The major industries are agriculturally based (grapes and deciduous fruits) and includes wineries, canneries and other food processing factories (DWAF, 2007). Grain farming is also a dominant land use in the Catchment. The Voëlvlei Nature Reserve is located on the Dam but is not impacted on by the proposed developments.

Land use in the catchment, especially agricultural use has impact on the water quality of the Dam. This is further impacted by WWTWs in the catchment which are sources of pollution.

Figure 49: Image of crop farming and surrounding mountainous area

Figure 50: Example of livestock farming

11.10.2 Potential Impacts/Implications

The land use in the immediate study area is characterised by agricultural land, as well as recreational activities. However, the proposed project will not change the land use in the area.

11.11 Heritage

11.11.1 Status Quo

The Voëlvlei Dam is a very large earth walled structure built in the late 20th century. It does not occupy any particular river valley; however it is fed through a system of canals and diversions. Augmentation will involve increasing the capacity of these facilities to optimise water resources that can be obtained from winter flooding. Since the Voëlvlei Dam is a recent structure (less than 60 years of age), it and its associated infrastructure are not

protected by heritage legislation, however some of the proposed augmentation measures involve land and areas that could be sensitive in heritage terms.

The archaeological heritage of the Berg River has been described by a number of researchers; however formal publications on the built environment of the area are rather scarce.

The Berg River runs mainly through the Swartland – an area of high agricultural potential was likely to have been frequented by Khoekhoen pastoral communities since 2000 years ago. The soils of the Swartland have a far better carrying capacity than those of the Cape Fold Belt Mountains which means that early stock farmers would have enjoyed better success raising herd of domestic cattle and fat tailed sheep (Hart 1987, Smith *et al.* 1991). The first formal archaeological surveys of the Berg River Valley in the Gouda-Porterville area were carried out in 1983 and found that the ploughed fields contained numerous archaeological sites relating to the Early and Middle Stone Age, but found very few sites that could relate to the Khoekhoen herders who were historically known to frequent the area. It was concluded to be likely that herder sites were very ephemeral as these groups of people were highly mobile and that sheet erosion and deep ploughing had destroyed much of the evidence. Various archaeologists have found evidence of large but highly ephemeral archaeological sites on the Vredenberg Pensinsula and Swartland.

In terms of Pre-colonial Archaeology, only two archaeological research projects have been carried out in the nearby vicinity. One involved a survey of the Swartland area around Porterville (Hart 1984, 1987), while the second saw two small rock shelters being excavated near Voëlvlei Dam (Smith *et al.* 1991) with a view to exploring the relationship between hunter-gatherers and herders in the south-western Cape. A few impact assessments have also been conducted (Orton, 2008a, 2008b, 2010; Webley & Hart, 2010). These studies inform the following archaeological review:

- The earliest period of pre-colonial archaeology present in the region is the Early Stone Age (ESAge) which occurred until about 200 000 years ago. Artefacts pertaining to this period of prehistory are commonly encountered all along the western edge of the Cape Fold Belt Mountains. Most often they are associated with river terraces where the cobbles served as a source of stone material for making artefacts. Such artefacts have been recorded in the vicinity of the study area where Hart (1984, 1987) found ESAge artefacts to be closely associated with rivers and focused on stony hills and ridges. Orton (2008b, 2010) found ESAge artefacts scattered in farmland on the lower mountain slopes north of Saron as well as on the farm immediately east of the present study area. Webley and Hart (2010) found no archaeology in an area to the southwest of Gouda;
- After 200 000 years ago and extending up until some 40 000 to 20 000 years ago is the Middle Stone Age (MSA). Hart (1984, 1987) records the occurrence of MSA artefacts in

similar contexts to ESAge ones throughout his study area. No other reports of MSA artefacts are known in the vicinity;

- The Later Stone Age (LSA) extends from the end of the MSA until the arrival of European colonists some 350 years ago. The two small rock shelter excavations conducted by Smith et al. (1991) yielded material demonstrating that the area was certainly used by the San and the Khoekhoen. The Voëlvlei rock shelter had three radiocarbon dates conducted with the upper two being in the 15th and 16th centuries and the oldest one, from the base of the site, falling within the 2nd century AD. The Driebos deposits were never dated but the finds suggest material of a similar age (Smith et al. 1991);
- The rock shelter excavations were conducted as part of Smith's wider interest in the origins of the herding economy in the Western Cape. He proposed that the Khoekhoen moved between winter pastures at the coast (specifically the Vredenburg Peninsula) to summer pastures inland (Smith 1983, 1984). The latter would have been on the Malmesbury shales where the nutritious Renosterveld vegetation grew. His cycle of transhumance passed through the Gouda area, following the course of the Great Berg River; and
- Rock art is present in the area with both the shelters documented by Smith *et al.* (1991) containing art. Several rock art sites are reported to occur in the region around Porterville (SA-Venues 2012) with the famous European galleon being a notable inclusion (Parkington 2003). The precise age of rock paintings is unknown but those with European content, such as the galleon, clearly indicate that the tradition of painting on the walls of rock shelters and boulders continued into the colonial period.

Therefore, the possibility of finding intact heritage resources in the study area is high due to the history of the surrounding towns and structures.

11.11.2 Potential Impacts/Implications

Heritage resources such as archaeological and cultural-historical sites or artefacts may be found in or near the dam sites that could be destroyed during construction. Such heritage resources will need to be identified (if any) and protected (if required).

11.11.3 Specialist Study Triggered

Due to the size of the development and the area that will be transformed, a **Phase 1 Heritage Impact Assessment** will required as the development triggers Section 38 (1)(a)(c)(i). These relate to developments that include:

- The construction of a pipeline that will exceed 300m in length; and

- A development that will exceed 5000 m² in extent.

11.12 Socio-Economic Environment

11.12.1 Status Quo

Voëlvlei Dam occurs in Drakenstein Local Municipality, a Category B municipality which forms part of the larger Cape Winelands District. The proposed developments occur in the Drakenstein Local Municipality of the Cape Winelands District as well as the Swartland Local Municipality of the WCDM.

Unless otherwise indicated, all information in the section was obtained from the Census 2011 (Statistics South Africa, 2011) data.

11.12.1.1 Drakenstein Local Municipality

The Drakenstein Local Municipality has a total population size of approximately 251 262 people with an average population growth rate of 2.56%.

The population of 15–34 age groups and the 35-64 age group account for 36% and 33% of the population respectively. This means that 69% of the population are of working age.

Youth in total account for 35% of the population indicating that youth are expected to contribute towards the households bearing more responsibility than what is normal. Only 5% of the population are over 65 years of age.

There are 59 774 households in the municipality, with an average household size of 3.9 persons per household. Almost 93.8% of households have access to piped water either in their dwelling or in the yard. Only 0.6% of households do not have access to piped water and 95.0% of households have access to electricity for lighting.

Of those aged 20 years and older, 6.5% have completed primary school, 37.7% have some secondary education, 27.9% have completed matric and 11.9% have some form of higher education. Approximately 3.3% of those aged 20 years and older have no form of schooling (**Figure 51**).

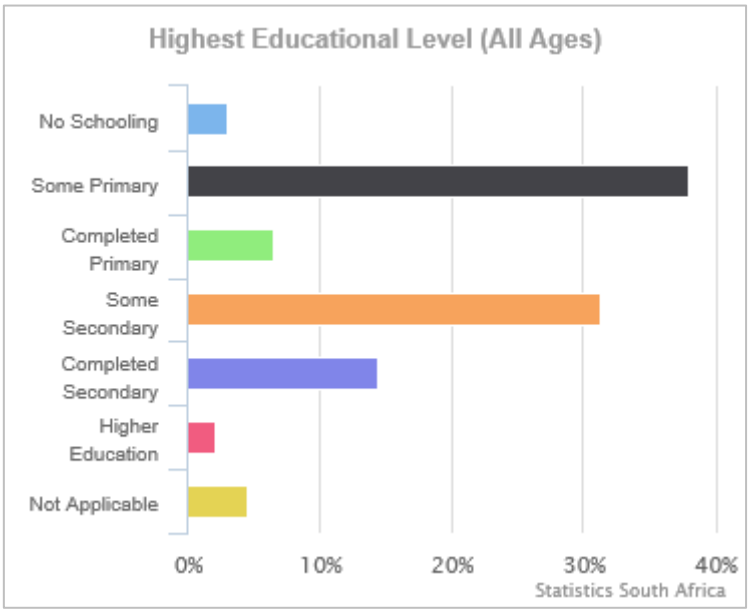


Figure 51: Education Level

There are 106 030 economically active (employed or unemployed but looking for work) people in the municipality, and of these 17.6% are unemployed (**Figure 52**). Of the 50 279 economically active youth (aged 15–34) in the municipality, 24.6% are unemployed.

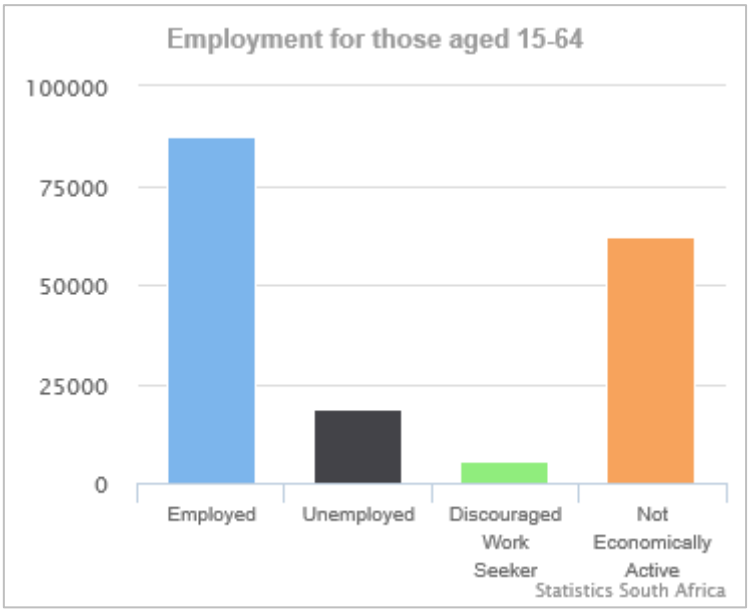


Figure 52: Employment status

Table 18 shows the average household income.13% of households earn no income at all.

Table 17: Average Household Income for Drakenstein (Census 2011)

Income	Percentage
No income	13%

Income	Percentage
R1 - R4,800	1,7%
R4,801 - R9,600	3,1%
R9,601 - R19,600	10,7%
R19,601 - R38,200	17,2%
R38,201 - R76,4000	18,4%
R76,401 - R153,800	13,9%
R153,801 - R307,600	11%
R307,601 - R614,400	7,4%
R614,001 - R1,228,800	2,5%
R1,228,801 - R2,457,600	0,7%
R2,457,601+	0,4%

11.12.1.2 Swartland Local Municipality

The Swartland Local Municipality has a total population size of approximately 113 762 people with an average population growth rate of 4.56%.

Youth in total account for 25% of the population indicating that youth are expected to contribute towards the households bearing more responsibility than what is normal. Only 6% of the population are over 65 years of age.

There are 29 324 households in the municipality with an average household size of 3.5 persons per household. Of these households, 80.6% have access to piped water inside their dwelling, and 16.9% have access to water in their yard. Only 0.5% of households do not have access to piped water, and 97.8% of households have access to electricity.

Of those aged 20 years and older, 7.8% have completed primary school, 35.4% have some secondary education, 24.2% have completed matric, and 9.6% have some form of higher education (**Figure 53**).

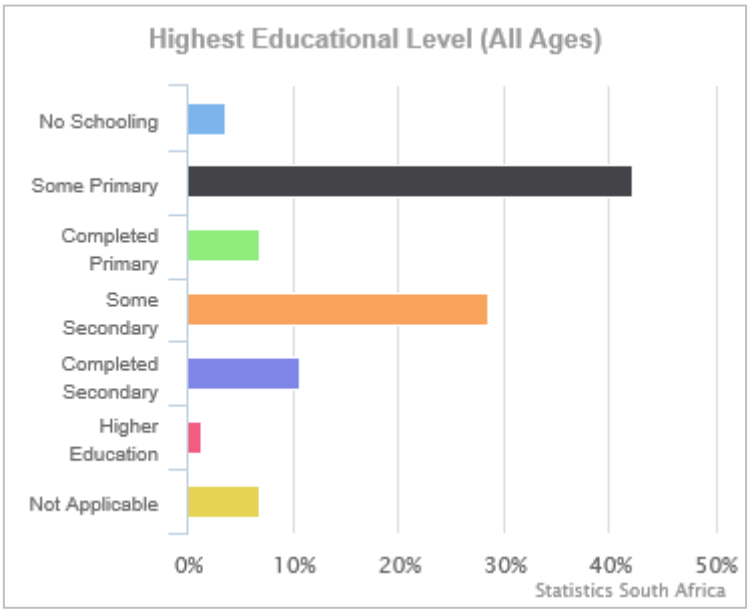


Figure 53: Education level

A total of 40 651 people are economically active (employed or unemployed but looking for work), and of these, 12.7% are unemployed (**Figure 54**). The economically active youth (15–34 years) in the area total 18 248, of which 17.9% are unemployed.

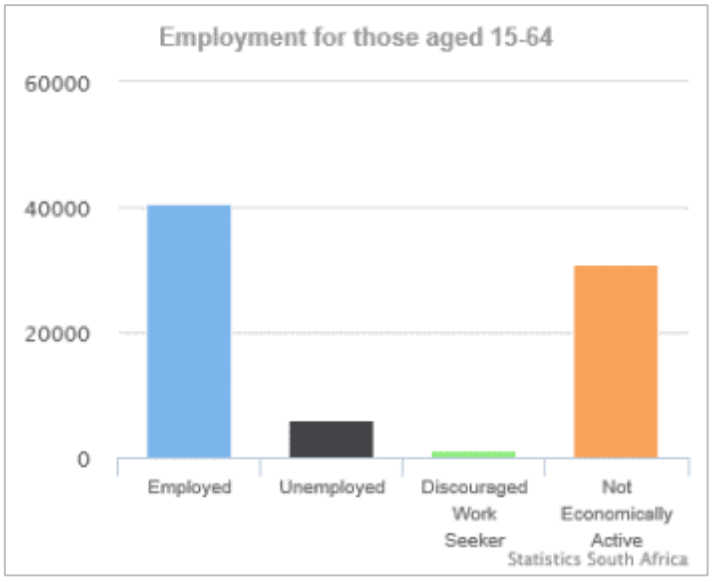


Figure 54: Employment status

Table 18 shows the average household income.10.5% of households earn no income at all.

Table 18: Average Household Income for Swartland (Census 2011)

Income	Percentage
No income	10,5%
R1 - R4,800	1,7%

Income	Percentage
R4,801 - R9,600	2,6%
R9,601 - R19,600	13,4%
R19,601 - R38,200	21,7%
R38,201 - R76,4000	20,1%
R76,401 - R153,800	13%
R153,801 - R307,600	9,5%
R307,601 - R614,400	5,5%
R614,001 - R1,228,800	1,5%
R1,228,801 - R2,457,600	0,4%
R2,457,601+	0,2%

11.12.1.3 Social Environment

In 1997 2.5% of the National Gross Domestic Product (GDP) originated from the Berg WMA with the main drivers of local economy including:

- Agriculture;
- Trade;
- Manufacturing;
- Finance; and
- Government.

Agriculture is the only sector in which the economy of the Berg WMA is competitive in the South African interior. This is largely due to the Mediterranean climate. Most of the economic production is from the areas where irrigation is practised and where processing and packaging plants are located (DWA, 2004).

11.12.2 Potential Impacts/Implications

A positive impact could be the creation of short-term work opportunities for local residents during construction, as well as long-term work during the operation of the pump station and maintenance of the pipeline.

There could be an influx of job seekers during the construction phase that could lead to tensions between local residents wanting to find employment and those coming from outside the area to do the same.

The influx of construction workers could also have a similar effect especially if the workers are not respectful of local customs and traditions.

11.12.3 Specialist Studies Triggered

A **Socio-Economic Study** will be undertaken to assess the impact of the proposed developments and their effects on surrounding communities along the pipeline, at the pump station and on the Dam.

11.13 Planning

11.13.1 Status Quo

The following provides a literature overview of the planning with regards to water supply infrastructure in the study area:

11.13.1.1 Western Cape Provincial SDF

Water will be the key determinant of future Provincial economic growth and development. Key agricultural water users are located in the Breede agricultural valley areas and Oliphants - Doorn agricultural corridor. Key industrial water users are located in the Cape metro, greater Saldanha and Southern Cape regions. Key urban and industrial water users are located in the Cape Town functional region.

Competition for water derived from the Berg River WMA exists between the Cape Town and Saldanha functional regions. There is a present and growing competing tension between the agricultural and industrial sectors and settlements in accessing water, and therefore water demand management efficiency measures must be put in place in these strategic water use sectors.

An overarching approach to water demand management to be adopted – firstly efficiencies must be maximised, storage capacity sustainably optimised and ground water extraction sustainably optimised, with the last resort option of desalination being explored, if necessary.

11.13.1.2 West Coast District IDP

The provision of potable water within the West Coast District is becoming more challenging as the population growth, urbanisation and migration lead to higher demand for water, especially in the Saldanha Bay – Vredenburg areas. The West Coast District Municipality is the supplier of bulk water in the Swartland and Saldanha Bay Municipalities, which include water resources such as the Misverstand Dam, Voëlvlei Dam and the Langebaan Aquifer. To the north of the district, in the Matzikama and Cederberg Municipalities, the Olifantsriver Water Scheme is the primary water distribution network. The anticipated upgrading/ extension of the Clanwilliam Dam, by the Department of Water Affairs and Forestry, will in future increase the capacity of water supply in these municipalities for domestic use and also for agricultural irrigation purposes.

The key spatial challenges identified are as follows:

- Growing demand for potable water supply;

- Limited availability of additional water allocation from the Voëlvlei Dam, as the Cape Town Metropole is the primary beneficiary of the Voëlvlei Dam water supply;
- Identification and implementation of new bulk water sources; and
- Pollution of the Berg River, which affects water quality downstream and limits the potential use of water from the river.

One of the proposals within the West Coast SDF involves the improvement of the water quality of the Berg River. According to the Western Cape Provincial Government, three primary issues have been identified as having the biggest impact on the health of the Berg River system:

1. Pollution from existing wastewater treatment plants;
2. Pollution from informal settlements. Grey and black wastewater that bypass the formal system directly into streams, as well as domestic household pollution (papers, plastic, etc.);
3. The loss of indigenous vegetation along the river, which would act as a buffer to naturally filter certain excess pollutants.

In this regard, it is proposed that the improvement and preservation of the water quality of the Berg River be prioritised by:

- ensuring well-managed and operationally sound waste water treatment works along feeder streams and the Berg River,
- minimising pollution from informal areas; and
- protecting natural vegetation in river corridors and along river embankments.

11.13.1.3 Cape Winelands SDF

Priority should be given to the supply of irrigation water to as yet undeveloped, medium and high potential areas. This would require the construction of reservoirs and dams and water supply schemes. It is not suggested that the already stressed rivers be put under further pressure. The existing dams in the area, especially those not beneficially used for irrigation purposes, should be considered for use.

11.13.1.4 Voëlvlei RMP

The Voëlvlei RMP was compiled based on detailed stakeholder input and engagement. This formed the cornerstone of the RMP through the establishment of a Vision for the Dam with a number of Key Objectives. The RMP lays the foundation required to consolidate objectives for the resource, within the framework of existing policy priorities. The key recommendations of the Voëlvlei Dam Resource Management Plan are as follows:

- Implementation of the Institutional Plan including the formation of a Dam Management Committee, Operations Management Committee and RMP Steering

Committee. As part of this Institutional Plan, it is vital that all agreements are updated to take into account the findings of the RMP;

- Implementation of standardised and harmonised Aids to Navigation and Demarcation Markers and Unique Positioning Number System and the Wash Bay System at the Dam;
- Resolution of all land matters including putting in place new agreements;
- Public day visitors and fishing area to be created and the feasibility of a community access card to be assessed. Further, information brochures to be developed to inform communities about the potential uses of the Dam and how to join recreational clubs;
- Land matters to be resolved and new agreements with adjacent landowners to be drawn up;
- The potential for nature sensitive overnight facilities to be assessed. Dark sky principles should be incorporated into all development planning;
- Potential of creating an overall “Back to Basics” hiking trail which includes astronomy, Rock Art, plant and animal biodiversity. This could be linked to skills development and job creation initiatives in the area. . Dark sky principles should be incorporated into all development planning;
- Potential cycling trails to be assessed.
- Containment Plan for invasive fish species;
- Expansion of the Working for Water Programme to remove alien plant species in the area;
- Potential for commercial fishing or small scale fisheries programme to be assessed;
- Heritage assessment/study of the state of the Rock Art site and to determine methods of preservation;
- Wash bay system to be implemented to prevent alien invasive species infestations;
- Coordination between Yacht Club, local schools and South African Sailing to introduce youth sailing programme at the Dam.;
- The potential for School science education programmes including elements of botany, zoology, geology, meteorology, astronomy to be assessed; and
- Skills training programmes including life guard training, first aid training, astronomy, rock art, and biodiversity to be developed as part of eco-tourism development and community skills training.

11.13.1.5 Conclusion

Based on the literature review of the documents mentioned above for the study area, there is a strategic need for the provision of increased basic water services to the surrounding communities and agricultural holdings within the municipalities. As one of the main aims is to use existing dams rather than construct new ones, the augmentation of the existing Voëlvlei Dam is supported. In addition, there is a need to improve the water quality of the Berg River which is a component of the proposed project.

11.13.2 Potential Impacts/Implications

The proposed development is not in conflict with the planning frameworks of the affected municipalities. It is not anticipated that the project will adversely affect the nature of the study area. The aim of the project is to increase the amount of water supplied to agricultural irrigation areas and to the surrounding municipalities.

11.14 Existing Infrastructure

11.14.1 Status Quo

The main infrastructure at the Dam includes (**Figures 55** and **56**):

- The intake tower;
- The CCTMM WTW and intake tower;
- Housing and offices for DWS, CCTMM and WCDM;
- VYC club house and camping facilities;
- WPALAS facilities including accommodation; and
- Two Dam walls.

Figure 55: One of the intake towers located on the Dam

Figure 56: DWS site houses

11.14.2 Potential Impacts/Implications

The existing infrastructure should not be impacted on as they should benefit from the proposed developments. No infrastructure will be relocated as a result of the proposed developments. Mitigation measures to be identified during the EIA phase to safeguard existing infrastructure.

11.15 Air Quality

11.15.1 Status Quo

Due to the predominantly agricultural nature of the study area, as well as the presence of the Voëlvlei Nature Reserve, the air quality is regarded to be good. Localised impacts to air quality include burning of emissions from vehicles travelling on the surrounding road network, dust from un-vegetated areas and dirt roads, smoke (veld fires), agricultural activities, and methane release from cattle. Dust generated along the access roads may potentially damage existing crops grown in the area (**Figure 57**).

Figure 57: Warning sign located along the potential access roads

Anthropogenic activities such as the recreational activities on the Dam, the Swartland WTW, WCDM WTW, and CCTMM WTW contribute to the air quality in the area.

Sensitive receptors to dust and other air quality impacts in the study area include farm dwellings, and the recreational clubs on the Dam.

11.15.2 Potential Impacts/Implications

Potential impacts during the construction phase include:

- Dust will be generated during the construction period from various sources, including blasting, earthworks, stockpiles, use of access roads, transportation of spoil material and general construction activities on site; and
- Exhaust emissions from vehicles and equipment.

No specialist air quality study will be undertaken as it is not deemed necessary for the type of activities associated with the project. Mitigation measures will be included in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored (dust fallout and particulate matter) and managed and that regulated thresholds are not exceeded.

11.16 Noise

11.16.1 Status Quo

The natural state of the study area affords it tranquillity. Large open agricultural holdings are situated within the study area. Recreational activities on the Dam, the Swartland WTW, WCDM WTW, and CCTMM WTW add to the noise levels within the area but the noise increases are minimal.

Noise in the region emanates primarily from households, farming operations (e.g. use of farming equipment), vehicles on the road network, activities on the Dam and operational activities of the Swartland WTW, WCDM WTW, and CCTMM WTW. The undulating hills and lowlands serves as noise attenuation features, although the ambient noise levels are regarded as insignificant.

The following were identified as sensitive noise receptors in the study area:

- Dwellings on surrounding farms may be exposed to construction-related noise;
- Recreational clubs located on the Dam;
- Gouda is located approximately 5km from the dam wall; and
- The Voëlvlei Nature Reserve is located on the Dam.

11.16.2 Potential Impacts/Implications

During construction, localised increases in noise will be caused by blasting, earthworks, vehicles on access roads, and general construction activities on site. Vibration would be felt close to construction equipment.

The operation of the pump station may increase the noise levels in the study area but minimally.

Noise that emanates from construction activities will be addressed through targeted best practices for noise monitoring and management in the EMPr. It is assumed that the pump station will comply with best practices to limit any noise impacts. Therefore, no Noise Impact Assessment will be undertaken.

11.17 Visual

11.17.1 Status Quo

The study area is afforded aesthetic appeal through topographical features such as undulating hills, mountains, valleys, and watercourses (**Figures 58** and **59**). The openness of the area and the presence of the Voëlvlei Dam and Berg River, as well as the Voëlvlei Nature Reserve on the banks of the Dam, contribute to the visual qualities.

Figure 58: View of Berg River and surrounding open farmlands

Figure 59: View of mountains surrounding the Voëlvlei Dam

11.17.2 Potential Impacts/Implications

The pipeline will be buried while the pump station will be located in a valley next to the Berg River at the weir location which is not visible to the surrounding landowners. Therefore, there is minimal visual impact.

11.18 Access Roads

11.18.1 Status Quo

There is no formal access area at Voëlvlei Dam. For safety and security reasons, the whole Dam is fenced so without prior arrangement there is no way to access the Dam. During

construction and operation, access roads to the weir and pump station site will be via existing farm roads in the study area (**Figure 60**). There is access to the proposed pump station and weir site via existing access roads (**Figure 61**). Refer to **Section 10.1** for an overview of the existing access roads to be used for the proposed project.

Figure 60: Existing main roads in the study area

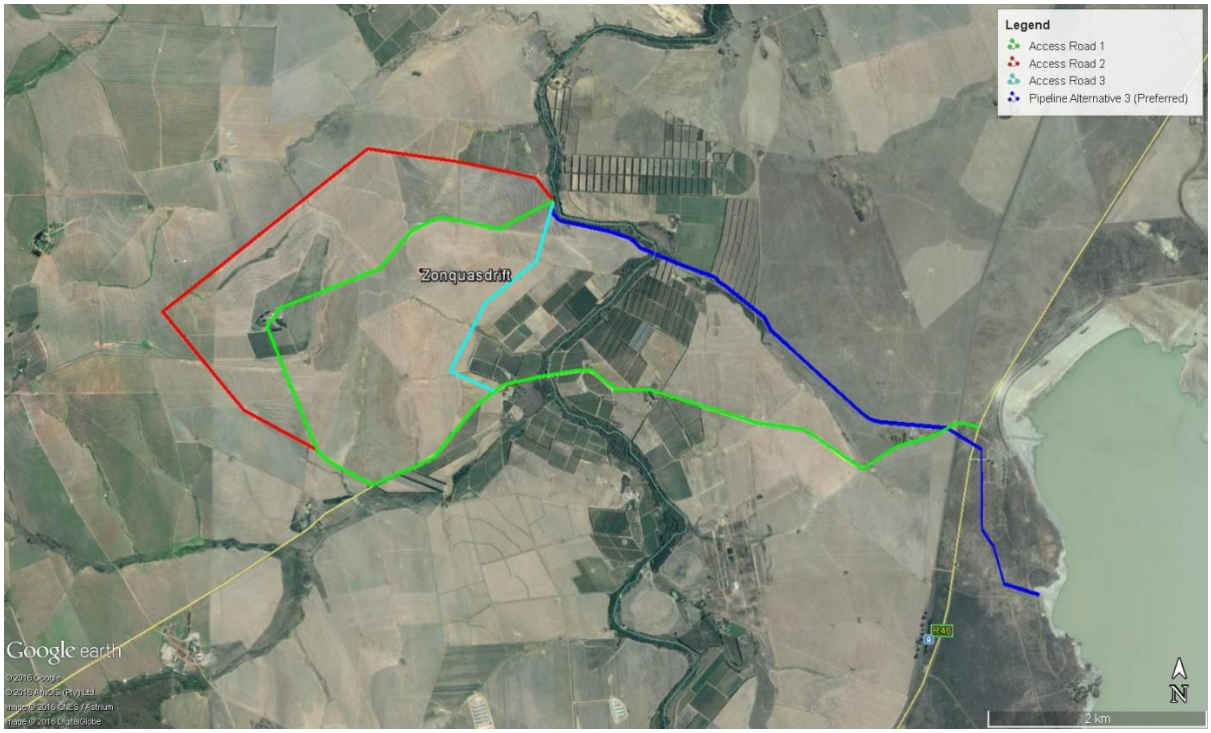


Figure 61: Proposed access to weir and pump station

11.18.2 Potential Impacts/Implications

- During the construction period, there will be an increase in traffic on the local road networks due to the delivery of plant and material, transportation of staff and normal construction-related traffic. Haul roads and access roads will also be created on site, within the construction domain.

- As part of the construction phase, measures will be implemented for the selective upgrade of the roads (if necessary) and to render these roads safe for other users (amongst others).
- After the construction phase, the local roads will only need to be used for operation and maintenance purposes.

Any disruptions to the transportation network must be mitigated, and will be discussed in the EMPr.

12 PUBLIC PARTICIPATION

The purpose of the public participation process for the proposed development includes:

- Providing IAPs with an opportunity to obtain information about the project;
- Allowing IAPs to express their views, issues and concerns with regard to the project;
- Granting IAPs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the project; and
- Enabling the project team to incorporate the needs, concerns and recommendations of IAPs into the project, where feasible.

The public participation process that was followed for the proposed surface water developments is governed by NEMA and GN No. R. 982 (4 December 2014).

12.1 Landowner Notification

The properties that are directly affected by the proposed development are shown in **Figure 7** and listed in **Table 2**. The details of the affected landowners are included in the IAP database which is contained in **Appendix D5**.

Proof of written notification to the landowners / persons in control of the land is included in **Appendix D1**.

12.2 Identification of IAPs and Compilation of IAP Database

IAPs were identified based on regulatory requirements and the specific site/project requirements. In summary, the database includes the following:

- Landowners, adjacent landowners/occupiers;
- Relevant Organs of State / Authorities including the following;
    - DEA;

- Department of Water and Sanitation (DWS);
- City of Cape Town;
- West Coast District Municipality;
- Drakenstein Local Municipality;
- Cape Winelands District Municipality;
- Swartland Local Municipality;
- Western Cape DEA&DP;
- Western Cape Department of Agriculture;
- Department of Mineral Resources (DMR);
- South African Heritage Resource Authority (SAHRA);
- Western Cape Heritage;
- Cape Nature;
- Berg Water Use Association;
- Western Cape Department of Roads;
- Drakenstein Local Municipality Ward Councillor 31; and
- Swartland Local Municipality Ward Councillor 12.

- General IAPs that may have an interest in the project.

Please note that a copy of the IAP database will be updated in the Final Scoping Report to be submitted to DEA; however, a copy is available in **Appendix D5**.

12.3 IAP Registration Period

A 30 day registration period was conducted from 26 May 2016 to 27 June 2016 which provided the public with the chance to register as an IAP in order to review and provide comments on the draft reports, as well as be invited to the public meetings. The 30 day registration period was advertised in the Daily Voice (published 26 May 2016) and the Paarl Post (published 26 May 2016).

12.4 Notification Process

The notification process undertaken is detailed in the sections to follow:

12.4.1 Background Information Document

Background Information Documents (BIDs) (**Appendix D2**) and Reply Forms were distributed by email or hand delivered to IAPs contained in the IAP Database. In addition, BIDs were placed at the Gouda Library (**Figure 62**). BIDs contained a brief background and description of the project, as well as the EIA process, and listed the details for submitting comments regarding the proposed developments. The BID was compiled in both English and Afrikaans, the two predominant languages of the study area. The BID served to notify IAPs of the project and the details on how to register as an IAP.

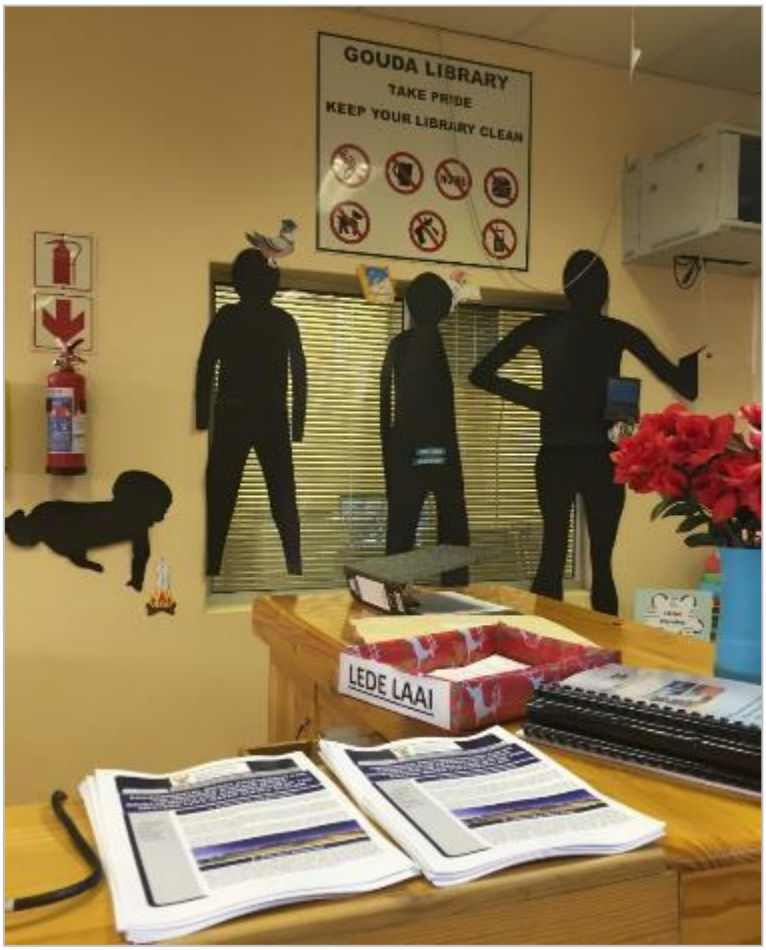


Figure 62: BIDs placed at the Gouda Library for the public

Notification of the proposed WCWSS developments took place on 24 May 2016. Proof of initial notification is provided in **Appendix D1**. All reply forms from registered IAPs and landowners to date are included in **Appendix D6**.

12.4.2 Onsite Notices

Eleven site notices were placed at strategic points along the proposed pipeline route and around the pump station and Dam locations (**Figure 63**). Notification of the proposed developments and how to register as an IAP were provided on the site notice. Onsite notices were primarily placed in proximity to the project components, based on the availability of public access.

Figure 64 provides the locations of each site notice in relation to the proposed developments. Details of the locations of the onsite notices and accompanying photographs are contained in **Appendix D4**.

Figure 63: Example of a site notice placed in the study area

Figure 64: Locations of site notices within the project area

12.4.3 Newspaper Notices

Advertisements were placed in the following newspapers as notification of the project and how to register as an IAP (refer to copies of the newspaper advertisements contained in **Appendix D3**):

- The Daily Voice, published 26 May 2016; and
- The Paarl Post, published 26 May 2016.

12.5 Review Process for Draft Scoping Report

The Application Form was submitted to DEA on **22 September 2016** and the reference number was provided: 14/12/16/3/3/2/973.

Initially, the Application Form included Activity 14 of GN No R985 of 04 December 2014, however, WC DEA&DP stated that Activity 14 would not be applicable as the site is not located in a protected area in terms of NEMA; no environmental management framework and/or systematic biodiversity plans have been adopted by the competent authority; and the site is not located in a core area in a biosphere reserve. Therefore, an Amended Application Form will be submitted to DEA on 28 October 2016 along with the Final Scoping Report.

12.5.1 Public Review

In accordance with G.N. No. R. 982 of 04 December 2014, IAPs are granted an opportunity to review and comment on the Draft Scoping Report. Hardcopies of the document will be placed at the venue listed below (**Table 19** and **Figure 65**). Emails and SMSes will be sent to all registered IAPs to notify them of the review of the Draft Scoping Report. Proof of the notification of the public review period will be included in the Final Scoping Report.

Table 19: Location of Draft Scoping Report for Review

Venue	Address	Contact Details
Gouda Library	Malva Street, Gouda	023 232 0841

The public review of the Draft Scoping Report will occur for a 30 day review period **from 23 September 2016 to 25 October 2016**.

Figure 65: Draft Scoping Report at Gouda Library

12.5.2 Authority Review

Hardcopies of the document will also be provided to the following key regulatory and commenting authorities for a 30 day review period **from 23 September 2016 to 25 October 2016**.

12.6 Meetings

12.6.1 Authority Meeting and Site Visit

An authority meeting and site visit was conducted on 25 May 2016 (**Figure 64**). Three locations along the proposed pipeline route were visited, being the weir location, a site near the wetland and the Discharge Point, and the Dam.

Details of the site visit are contained in the Comments and Responses Report in **Appendix D7** and the attendance register, meeting agenda, and minutes of the meeting are contained in **Appendix D8**.

Figure 66: Photos from the authority site visit

The Draft Scoping Report was presented to the authorities on 16 August 2016.

12.6.2 Focus Group Meetings – Landowners

Meetings were arranged with most of the affected landowners on 27 September 2016 to discuss the potential impacts of the project components on their properties. The minutes and attendance registers of the focus group meetings are provided in the Final Scoping Report in **Appendix 8**.

12.6.3 Public Meetings

A public meeting was held at the Gouda Library (**Table 20**). The aim of the meeting was to present the Draft Scoping Report and to provide IAPs with a platform for project related discussions. The minutes and attendance registers of the meeting are provided in the Final Scoping Report in **Appendix 8**. All registered IAPs were notified of the public meeting via

email or SMS. Proof of notification of the public meeting is included in the Final Scoping Report.

Table 20: Public Meeting Details

Date	Time	Venue
04/10/2016	16:00 – 18:00	Gouda Library (Malva Street, Gouda)

12.7 Comments and Responses Report

The Comments and Response Report, which summarises the salient issues raised by I&APs and the project team's response to these matters, is contained in **Appendix D8**. The issues listed in the Comments and Response Report were identified from minutes of meetings, completed Reply Forms and other correspondence received to date.

The Scoping phase serves to identify and prioritise issues for further assessment during the EIA phase. Accordingly, the comments received from IAPs during public participation as part of Scoping will be afforded due consideration and further investigation during the pending EIA stage.

The main concerns raised by IAPs to date are as follows:

- The impacts of the proposed developments on the water quality of the Dam and the Berg River;
- The monitoring of overflow from the Dam;
- The impact of the project on flooding in the area;
- The redundancy of the existing canal;
- The impact to the project on landowners existing pumps; and
- The impact of access roads on existing properties.

13 ENVIRONMENTAL ISSUES

In accordance with the purpose of the Scoping exercise as part of the overall environmental assessment, this section aims to identify potentially significant environmental issues for further consideration and prioritisation during the EIA stage. This allows for a more efficient and focused impact assessment in the ensuing EIA Phase, where the analysis is largely limited to significant issues and reasonable alternatives.

13.1 Approach

13.1.1 Predicting Significant Environmental Issues

The potential environmental issues associated with the proposed development were identified during the Scoping Phase through an appraisal of the following:

- Project-related components and infrastructure (see **Section 10.1**);
- Activities associated with the project life-cycle (i.e. pre-construction, construction, operation and decommissioning) (see **Section 10.2**);
- Proposed alternatives (see **Section 11**);
- Nature and profile of the receiving environment and potential sensitive environmental features and attributes (see **Section 12**), which included a desktop evaluation (via literature review, GIS, topographical maps and aerial photography) and site investigations;
- Review of information from Technical Feasibility Study;
- Understanding of direct and indirect effects of the project as a whole;
- Input received during public participation from authorities and IAPs (see **Section 13.4** and **13.5**); and
- Legal and policy context (see **Section 5**).

The two main categories of environmental impacts of the proposed project are those which are inherent to construction (including site clearing, camp establishment, provision of services; construction of units and operation (maintenance of infrastructure)).

Apart from explaining the receiving environment, **Section 12** discusses possible impacts during primarily the Construction and Operational Phases of the project. The significant environmental issues were distilled from the aforementioned section and are summarised in **Section 14.2**. Cumulative impacts are briefly explained in **Section 14.3**.

13.1.2 Mitigation of Impacts

During the EIA stage a detailed assessment will be conducted to evaluate all potential impacts (paying particular attention to the significant issues listed in the Scoping Report), with input from the project team and requisite specialist studies and through the application of the impact assessment methodology contained in **Section 15**.

Suitable mitigation measures will be identified to manage the environmental impacts according to the following hierarchy:

- Initial efforts should strive to prevent the occurrence of the impact;
- It this is not possible, mitigation should include measures that reduce or minimise the significance of the impact to an acceptable level;

- Remediation and rehabilitation should take place if measures cannot suitably prevent or reduce the impacts, or to address the residual impacts; and
- As a last measure, compensation should be employed as a form of mitigating the impacts associated with a project.

The mitigation measures will be incorporated into the EMPr, which will form part of the EIA Report. This deliverable, together with the Environmental Authorisation, can act as a standalone document that can be used to inter alia monitor against compliance of the project with its pre-determined objectives, targets and management actions.

13.2 Summary of Environmental Issues

Pertinent environmental issues, which will receive specific attention during the EIA Phase, are listed in **Table 21** and **Table 22** which follows:

Table 21: Pertinent Issues (Construction Phase) for Prioritisation during the EIA Phase

Environmental Factor	Potential Issues/Impacts	Proposed Resolution/Study to Determine Extent of Impacts and Propose Mitigation Measures
Geology and Soil	• Unsuitable geological conditions • Blasting • Soil erosion • Improper disposal of spoil material • Compaction and erosion of removed and stockpiled soils • Soil contamination from incorrect storage/handling/disposal of hazardous waste • Soil contamination through spillages and leakages • Soil contamination due to mismanagement and/or incorrect storage of hazardous chemicals • Poor stormwater management during construction	• Geotechnical Report • Management to be included in the EMPr
Surface Water	• Disturbance of ecological quality and ecosystems, resulting in a vulnerability to alien species • Surface contamination through spillages and leakages, and/or incorrect disposal of hazardous and non-hazardous materials or waste	• Aquatic Assessment and Wetland Delineation • Stormwater Management Plan • Management to be included in the EMPr

Environmental Factor	Potential Issues/Impacts	Proposed Resolution/Study to Determine Extent of Impacts and Propose Mitigation Measures
	• Surface water contamination through runoff containing suspended solids, sediments and fuel residue • Poor stormwater management during construction	
Geohydrology	• Contamination of groundwater resulting from incorrect storage/handling and disposal of hazardous waste materials • Contamination of groundwater through spillages from equipment, machinery and vehicle storage or from a leakage caused by a fracture/crack or rupture in the fuel storage tanks • Contamination of surface water resources through runoff containing suspended solids, sediments and fuel residue	• Management to be included in the EMPr
Hydrology	• Alteration of flow regimes	• Aquatic Assessment and Wetland Delineation • Management to be included in the EMPr
Water Users	• Water quality deterioration and disturbance to flow caused by construction activities may adversely affect downstream water users • Water abstracted from watercourses for construction purposes	• Socio-Economic Impact Assessment • Management to be included in the EMPr
Water Quality	• Sedimentation from instream works • Water quality impacts due to spillages and poor construction practices	• Aquatic Assessment and Wetland Delineation • Management to be included in the EMPr
Aquatic Ecology	• Disruptions to aquatic biota community due to water contamination, alteration of flow, loss of instream habitat (dam) and disturbance to habitat during construction (watercourse crossings) • Spread of noxious / declared weeds	• Aquatic Assessment and Wetland Delineation • Management to be included in the EMPr
Riparian Habitat	• Loss of riparian and instream vegetation within construction domain • Destabilisation of channel morphology at river	• Aquatic Assessment and Wetland Delineation • Management to be included in the EMPr

Environmental Factor	Potential Issues/Impacts	Proposed Resolution/Study to Determine Extent of Impacts and Propose Mitigation Measures
Flora	• Loss of sensitive vegetation and habitat • Disturbance of natural ecosystems, making them vulnerable to invasion of alien species • Soil contamination and compaction, vegetation loss and vegetation disturbance due to fuel and chemical spills • Vegetation and habitat disturbance due to accidental introduction of alien species • Destruction of potential red list plants during site clearing and construction • Disturbance of sensitive plant species if relocated • Illegal harvesting of medicinal plants during construction phase • Damage to plant life outside the proposed site	• Ecological Impact Study • Management to be included in the EMPr
Fauna	• Loss of habitat through site clearing and construction • Illegal killing or hunting of mammals • Killing of snakes during construction phase due to poor environmental education procedures • Potential illness and/or death of fauna due to pollution and/or littering • Noise disturbance to sensitive species • Faunal species harm due to poor environmental education procedures	• Ecological Impact Study • Management to be included in the EMPr
Agricultural Potential	• Loss of fertile soil through land clearance • Loss of grazing land within construction domain	• Agricultural Impact Assessment • Management to be included in the EMPr
Heritage Resources	• Disturbance and/or possible destruction of heritage resources	• Phase 1 Heritage Impact Assessment • Management to be included in the EMPr
Air Quality	• Increased dust generation • Greenhouse gas emissions from construction vehicles	• Management to be included in the EMPr
Noise	• Localised noise increase	• Management to be included in the EMPr

Environmental Factor	Potential Issues/Impacts	Proposed Resolution/Study to Determine Extent of Impacts and Propose Mitigation Measures
Access Roads	• Increase in construction related traffic	• Management to be included in the EMPr
Socio-Economic Environment	• Increased employment opportunities (positive) • Increased economic opportunities in the area (positive) • Increased potential for increased land invasions • Loss of land within construction domain • Safety and Security	• Socio-Economic Impact Assessment • Management to be included in the EMPr

Table 22: Pertinent Issues (Operation Phase) for Prioritisation during the EIA Phase

Environmental Factor	Potential Issues/Impacts	Proposed Resolution/Study to Determine Extent of Impacts and Propose Mitigation Measures
Hydrology	• Alteration of flow regimes • Changes to seasonal flow patterns • Quantity of water releases	• Aquatic Assessment and Wetland Delineation • Management to be included in the EMPr
Water Users	• Impact to existing pumps • Loss of use of existing canal	• Socio-Economic Impact Assessment • Management to be included in the EMPr
Water Quality	• Impact to sediment balance • Quality of water releases	• Aquatic Assessment and Wetland Delineation • Management to be included in the EMPr
Aquatic Ecology	• Impacts to migration of aquatic biota • Fragmentation of affected river - interruptions to river continuum	• Aquatic Assessment and Wetland Delineation • Management to be included in the EMPr
Riparian Habitat	• Destabilisation of channel morphology at river	• Aquatic Assessment and Wetland Delineation • Management to be included in the EMPr
Agricultural Potential	• Permanent loss of potential agricultural land	• Agricultural Impact Assessment

Environmental Factor	Potential Issues/Impacts	Proposed Resolution/Study to Determine Extent of Impacts and Propose Mitigation Measures
	and natural areas	• Management to be included in the EMPr

Please note that the impacts to the Berg Estuary and the water quality was assessed and taken into account during the Feasibility Phase of the project.

13.3 Cumulative Impacts

According to GN No. R. 982 (04 December 2014), a ***"cumulative impact"***, in relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Cumulative impacts can be identified by combining the potential environmental implications of the proposed project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

One of the main cumulative impacts is the loss of sensitive habitat. The proposed developments fall within the Swartland Shale Renosterveld, and the Swartland Alluvium Fynbos, both of which are categorised as CR, according to data sourced from SANBI.

The Swartland Shale Renosterveld originally covered 495 000 hectares and now approximately 8% of natural area remains. Less than 1% of its original area is protected. At least 35 endemic plant species and 151 Red Data List plant species occur in the ecosystem.

The Swartland Alluvium Fynbos originally covered 47 000 hectares and now approximately 27% of natural area remains. Approximately 2% of the ecosystem is protected in the Waterval Nature Reserve, Winterhoek (mountain catchment area) with a further 7% is found in private reserves such as Elandskloof, Langerug and Wiesenhof Wildpark. At least 13 endemic plant species and 57 Red Data List plant species occur in the ecosystem.

During construction there will be traffic-related impacts to the local road network. The construction period for the WCWSS developments will possibly place a significant burden on the roads in the project area. The associated impacts may include traffic disruptions and deterioration of road conditions.

Large-scale land clearing activities and other construction-related disturbances could lead to the proliferation of exotic vegetation. The associated cumulative impact in relation to other activities in the affected areas, such a livestock grazing and agricultural crop farming, will need to be considered further.

The watercourses that will be affected may already be disturbed by anthropogenic influences, such as water quality deterioration by farming practices (e.g. nutrient-rich runoff) and erosion caused by grazing cattle. The project's construction activities may exacerbate impacts to the water quality and channel stability of the affected watercourses.

The project was initiated to meet the water demands in the Drakenstein, Swartland and CCT municipalities. The proposed WSWSS developments will cater for the water demands within these areas on a sustained basis. In turn, this will have a positive impact on the macro socio-economic environment.

14 METHODOLOGY TO ASSESS IDENTIFIED IMPACTS

The impacts and the proposed management thereof are first discussed on a qualitative level by using the methodology provided below. Information provided by specialists will be used to calculate an overall impact score by multiplying the product of the nature, magnitude and the significance of the impact by the sum of the extent, duration and probability based on the following equation:

Overall Score = (NxMxS)x(E+D+P)

Where: N = Nature
E = Extent
M = Magnitude
D = Duration
P = Probability
S = Significance

Table 23: Impact methodology table

Nature		
Negative	Neutral	Positive
-1	0	+1
Magnitude		
Low	Medium	High
1	2	3
Significance		
No impact/None	No impact after mitigation / Low	Residual impact after mitigation / Medium	Impact cannot be mitigated / High
0	1	2	3
Extent		
Local	Regional	National	International

1	2	3	4	
Duration				
Short Term (0-5yrs)	Medium Term (5-11yrs)	Long Term	Permanent	
1	2	3	4	
Probability				
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain
1	2	3	4	5

The following definitions apply:

For the methodology of the impact assessment, the analysis is conducted on a quantitative basis with regard to the nature, extent, magnitude, duration, probability and significance of the impacts. The following definitions and scoring system apply:

Nature (/Status)

The project could have a positive, negative or neutral impact on the environment.

Extent

- Local – extend to the site and its immediate surroundings.
- Regional – impact on the region but within the province.
- National – impact on an interprovincial scale.
- International – impact outside of South Africa.

Magnitude

Degree to which impact may cause irreplaceable loss of resources.

- Low – natural and social functions and processes are not affected or minimally affected.
- Medium – affected environment is notably altered; natural and social functions and processes continue albeit in a modified way.
- High – natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration

- Short term – 0-5 years.
- Medium term – 5-11 years.
- Long term – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
- Permanent – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability

- Almost certain – the event is expected to occur in most circumstances.
- Likely – the event will probably occur in most circumstances.
- Moderate – the event should occur at some time.
- Unlikely – the event could occur at some time.
- Rare/Remote – the event may occur only in exceptional circumstances.

Significance

Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows-

0 – Impact will not affect the environment. No mitigation necessary.

1 – No impact after mitigation.

2 – Residual impact after mitigation.

3 – Impact cannot be mitigated.

For example, the worst possible impact score of -117 would be achieved based on the following ratings:

N = Nature = -1
M = Magnitude = 3
S = Significance = 3
E = Extent = 4
D = Duration = 4
P= Probability = 5

Worst impact score = (-1 x 3 x 3) x (4+4+5) = -117

On the other hand, if the nature of an impact is 0 (neutral or no change) or the significance is 0 (no impact), then the impact will be 0. Overall Impact Scores (OS) will therefore be ranked in the following way:

Table 24: Ranking of Overall Impact Scores

Impact Rating	Low/Acceptable	Medium	High	Very High
Score	0-30	-31-60	-61-90	-91-117

15 PLAN OF STUDY FOR EIA

This Plan of Study, which explains the approach to be adopted to conduct the EIA for the proposed surface water developments for the augmentation of the WCWSS, was prepared in accordance with GN No. R. 982 (04 December 2014).

15.1 Key Environmental Issues Identified During Scoping Phase

The Scoping exercise aims to identify and qualitatively predict significant environmental issues for further consideration and prioritisation during the EIA stage. The issues raised by IAPs during Scoping Phase will also guide the identification of significant issues.

During the EIA stage, a detailed quantitative impact assessment will be conducted via contributions from the project team and requisite specialist studies, and through the application of the impact assessment methodology contained in **Section 15**. Suitable mitigation measures will be identified to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and will be included in an EMPr.

Pertinent environmental issues identified during Scoping, which will receive specific attention during the EIA Phase are listed in **Table 21** (Construction Phase) and **Table 22** (Operation Phase).

15.2 Specialist Studies – Environmental

According to Münster (2005), a 'trigger' is *"a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input".*

Further, the 2014 EIA Regulations define a specialist as: *"A person that is generally recognised within the scientific community as having the capability of undertaking, in conformance with generally recognised scientific principles, specialist studies or preparing specialist reports, including due diligence studies and socio-economic studies."*

The requisite specialist studies 'triggered' by the findings of the Scoping process, aimed at addressing the key issues and compliance with legal obligations, include:

- Ecological Impact Study;
- Aquatic Assessment and Wetland Delineation;
- Socio-Economic Assessment;
- Phase 1 Heritage Impact Assessment; and
- Agricultural Impact Assessment.

The Terms of Reference (ToR), both general and specific, for the abovementioned specialist studies follow in the sub-sections below. Amongst others, the *Guideline for determining the scope of specialist involvement in EIA processes* (Münster, 2005) was used in compiling the general ToR for the specialist studies. The following guidelines were also employed to prepare the specific ToR for the respective specialists (where appropriate):

- Guideline for involving biodiversity specialists in EIA processes (Brownlie, 2005); and
- Guideline for involving heritage specialists in EIA processes (Winter & Baumann, 2005).

In addition to the above guidelines, the relevant specialists need to satisfy specific requirements stipulated by the following key environmental authorities:

- DEA;
- CCT;
- WCDM;
- Drakenstein Local Municipality;
- Cape Winelands District Municipality;
- Swartland Local Municipality;
- Western Cape DEA&DP; and
- WCH.

For the inclusion of the findings of the specialist studies into the EIA report, the following guideline will be used: *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005). Key considerations will include:

- Ensuring that the specialists have adequately addressed IAPs' issues and specific requirements prescribed by environmental authorities;
- Ensuring that the specialists' input is relevant, appropriate and unambiguous; and
- Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

15.2.1 Terms of Reference – General

The following general ToR apply to all the EIA specialist studies to be undertaken for the proposed development:

- Address all triggers for the specialist studies contained in the subsequent specific ToR.
- Address issues raised by IAPs, as contained in the Comments and Response Report, and conduct an assessment of all potentially significant impacts. Additional issues that have not been identified during Scoping should also be highlighted to the EAP for further investigations.

- Ensure that the requirements of the environmental authorities that have specific jurisdiction over the various disciplines and environmental features are satisfied.
- Approach to include desktop study and site visits, as deemed necessary, to understand the affected environment and to adequately investigate and evaluate salient issues. Indigenous knowledge (i.e. targeted consultation) should also be regarded as a potential information resource.
- Assess the impacts (direct, indirect and cumulative) in terms of their significance (using suitable evaluation criteria) and suggest suitable mitigation measures. In accordance with the mitigation hierarchy, negative impacts should be avoided, minimised, rehabilitated (or reinstated) or compensated for (i.e. offsets), whereas positive impacts should be enhanced. A risk-averse and cautious approach should be adopted under conditions of uncertainty.
- Consider time boundaries, including short to long-term implications of impacts for project life-cycle (i.e. pre-construction, construction, operation and decommissioning).
- Consider spatial boundaries, including:
    - Broad context of the proposed project (i.e. beyond the boundaries of the specific site);
    - Off-site impacts; and
    - Local, regional, national or global context.
- The provision of a statement of impact significance for each issue, which specifies whether or not a pre-determined threshold of significance (i.e. changes in effects to the environment which would change a significance rating) has been exceeded, and whether or not the impact presents a potential fatal flaw or not. This statement of significance should be provided for anticipated project impacts both before and after application of impact management actions.
- Recommend a monitoring programme to implement mitigation measures and measure performance. List indicators to be used during monitoring.
- Appraisal of alternatives (including the No-Go option) by identifying the BPEO with suitable justification.
- Advise on the need for additional specialists to investigate specific components and the scope and extent of the information required from such studies.
- Engage with other specialists whose studies may have bearing on your specific investigation.
- Present findings and participate at public meetings, where EIA Report is to be presented to IAPs.
- Information provided to the EAP needs to be signed off.
- The appointed specialists must take into account the policy framework and legislation relevant to their particular studies.
- All specialist reports must adhere to Appendix 6 of GN No. R. 982 (04 December 2014).

15.2.2 Terms of Reference – Specific

15.2.2.1 Ecological Impact Study

Summary of Key Issues and triggers Identified during Scoping and Site Visit

- Potential Red Data List Flora and Fauna occurring on site.
- The site contains sensitive threatened vegetation.

Approach

- Undertake a Terrestrial Ecology Specialist Study.
- A complete potential biodiversity list must be provided.
- The conservation status of each species listed must be determined.
- The potential species list in accordance to the habitat unit availability must also be compiled.
- An assessment of the impact of development on flora and fauna species especially Red Data List species to be undertaken.
- Suggest suitable mitigation measures to address the identified impacts.
- Provide recommendations regarding the alternatives provided from an ecological perspective.
- Compile a report that reflects the above and includes appropriate mapping. Ensure that the report complies with Appendix 6 of GN No. R982 (2014), as part of the EIA Report.
- Prepare a sensitivity map (GIS-based), based on the findings of the study.
- Present findings at the public meeting.

Nominated Specialist

Name:	Ronald Phamphe
Organisation:	Nemai Consulting
Qualifications:	MSc Botany
Affiliation	Pri.Sci.Nat

15.2.2.2 Aquatic Assessment and Wetland Delineation

Summary of Key Issues and triggers Identified during Scoping and Site Visit

- The proposed developments occur on the Berg River and tributaries, as well as on the Voëlvlei Dam.

Approach

Undertake an Aquatic Assessment and Wetland Delineation.

- Delineate the wetlands within 500m of the site and assess river health according to relevant DWS guidelines. Provide the required watercourse buffers.
- An assessment of the impact of development on the watercourses.
- Suggest suitable mitigation measures to address the identified impacts.

- Provide recommendations regarding the alternatives provided from an aquatic perspective.
- Compile a report that reflects the above and includes appropriate mapping. Ensure that the report complies with Appendix 6 of GN No. R982 (2014), as part of the EIA Report.
- Prepare a sensitivity map (GIS-based), based on the findings of the study.
- Present findings at the public meeting.

Nominated Specialist

Name:	Andrew Husted
Organisation:	The Biodiversity Company

15.2.2.3 Phase 1 Heritage Impact Assessment

Summary of Key Issues and triggers Identified during Scoping and Site Visit

- Due to the size of the development, a Phase 1 HIA is required.

Approach

- Undertake a Phase 1 Heritage Impact Assessment in accordance with the South African Heritage Resources Act (No. 25 of 1999).
- The identification and mapping of all heritage resources in the area affected, as defined in Section 2 of the National Heritage Resources Act, 1999, including archaeological sites on or close (within 100 m) of the proposed development.
- An assessment of the significance of such resources in terms of the heritage assessment criteria as set out in the regulations.
- An assessment of the impact of development on such heritage resources.
- Identify heritage resources to be monitored.
- Suggest suitable mitigation measures to address the identified impacts.
- Provide recommendations regarding the alternatives provided from a heritage perspective.
- Compile a report that reflects the above and includes appropriate mapping. Ensure that the report complies with Appendix 6 of GN No. R982 (2014), as part of the EIA Report.
- Prepare a sensitivity map (GIS-based), based on the findings of the study.
- Present findings at the public meeting.

Nominated Specialist

Name:	Tim Hart
Organisation:	ACO Associates
Qualifications:	MA in Archaeology
Affiliation:	• Professional member (no 50) Association of Southern African Professional Archaeologists (ASAPA) • Principal Investigator, cultural resources management section (ASAPA) • Professional member in specialist and generalist categories Association of

Heritage Professionals (APHP)

- Committee Member Heritage Western Cape, Committee Member SAHRA

15.2.2.4 Socio-Economic Impact Assessment

Summary of Key Issues and triggers Identified during Scoping and Site Visit

- There is an influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS).
- Construction-related impacts.

Approach

- Undertake a Socio-Economic Impact Assessment to assess the socio-economic impacts (positive and negative) of the project, and quantify the economic impacts.
- Establish how surrounding residents and communities feel about the project especially in terms of loss of grazing areas, impacts on heritage sites, job creation, etc.
- Provide recommendations regarding the alternatives provided from a social perspective.
- Compile a report that reflects the above and includes appropriate mapping. Ensure that the report complies with Appendix 6 of GN No. R982 (2014), as part of the EIA Report.
- Prepare a sensitivity map (GIS-based), based on the findings of the study.
- Present findings at the public meeting.

Nominated Specialist

Name:	Sameera Munshi
Organisation:	Nemai Consulting
Qualifications:	BA (Econ) Honours

15.2.2.5 Agricultural Impact Assessment

Summary of Key Issues and triggers Identified during Scoping and Site Visit

- Loss of fertile soil, cultivated areas and grazing land.
- Disruptions to farming practices during construction.
- Loss of farming-related infrastructure.

Approach

- Determine agricultural potential in project footprint.
- Determine impacts of project from an agricultural perspective.
- Provide recommendations regarding the alternatives provided from an agricultural perspective.
- Compile a report that reflects the above and includes appropriate mapping. Ensure that the report complies with Appendix 6 of GN No. R982 (2014), as part of the EIA Report.
- Prepare a sensitivity map (GIS-based), based on the findings of the study.
- Present findings at the public meeting.

Nominated Specialist

Name:	Johann Laubscher
Organisation:	Private

15.3 Technical Studies

The following specialist studies will form part of the Technical Studies, and the findings will be incorporated into the EIA Report:

- Geotechnical Study;
- Stormwater Management Plan; and
- Technical Designs.

Although the ToR's for the Technical Specialist Studies were not drafted by Nemai Consulting, the Technical Specialist Studies included as part of the EIA Report will meet the requirements of Appendix 6 of the 2014 EIA Regulations including information on the specialist that prepared the report, their expertise and a declaration that the specialist is independent. Information on the scope of the study will also be included.

15.4 Public Participation during EIA Phase

15.4.1 Updating of IAP Database

The IAP database will be updated as and when necessary during the execution of the EIA.

15.4.2 Notification – Approval of Scoping Report and Notification of Public Review of Draft EIA Report

IAPs will be notified of the approval of the Scoping Report and the public review of the Draft EIA Report at the same time. Notices will be published in the Paarl Post and the Daily Voice. Registered IAPS will be notified of the approval and review period by emails or SMS notices.

15.4.3 EIA Public Meeting

The public meeting details during the EIA Phase will be available in the Draft EIA Report. All registered IAPs will be invited to attend the public meeting. In addition, a second Authority Consultation will take place to present the findings of the Draft EIA Report.

15.4.4 Comments and Response Report

A Comments and Response Report will be compiled and included in the EIA Report, which will record the date that issues were raised, a summary of each issue, and the response of the team to address the issue. In addition, any unattended comments from the Scoping Phase or where the status of the responses has changed, will also be addressed in the Comments and Response Report for the EIA Phase.

15.4.5 Review of Draft EIA Report

A 30-day review period will be provided to registered IAPs to review the Draft EIA Report, and copies of the document will be lodged at the Gouda Library. All comments received from IAPs and the responses thereto will be included in the Final EIA Report for submission to DEA.

15.4.6 Notification of DEA Decision

All registered IAPs will be notified via email, fax or post within 10 days after having received written notice from DEA on the final decision. Advertisements will also be placed in local and regional newspapers regarding the Department's decision. These notifications will include the appeal procedure to the decision.

15.5 EIA Report

The EIA Report will be compiled to satisfy the minimum requirements stipulated in Appendix 3 of 2014 EIA Regulations. The following critical components of the EIA Report are highlighted:

- A detailed description of the proposed development;
- A detailed description of the proposed development site;
- A description of the environment that may be affected by the activity and the manner in which physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed development;
- The methodology of the stakeholder engagement process will be described;
- The Comments and Response Report and Stakeholder Database will be provided as an appendix to the EIA Report;
- A description of the need and desirability of the proposed development and the identified potential alternatives to the proposed activity;
- A summary of the methodology used in determining the significance of potential impacts;
- A description and comparative assessment of the project alternatives;
- A summary of the findings of the specialist studies;
- A detailed assessment of all identified potential impacts;
- A list of the assumptions, uncertainties and gaps in knowledge;
- An opinion by the consultant as to whether the development is suitable for approval within the proposed site;
- An EMPr that complies with Appendix 6 of GN No. R. 982;
- Copies of all specialist reports appended to the EIA report; and
- Any further information that will assist in decision making by the authorities.

The Final EIA Report will be submitted to DEA. Any requested amendments will be discussed with the Department to ensure that their queries are adequately and timeously

attended to. The proposed timeframes for the Scoping and EIA Phase is provided in **Table 24**. Please note that these timeframes are subject to change.

Table 25: EIA Timeframes

Scoping and EIA Phase	Proposed Timeframe
Project Notification / Announcement	24 May 2016 and 25 May 2016
IAP Registration Period	26 May 2016 to 27 June 2016
Submission of Application Form to DEA	22 September 2016
Submission of Draft Scoping Report to DEA	23 September 2016
Public Meeting to Present the Draft Scoping Report	04 October 2016
Authority and Registered IAPs Review Period of Draft Scoping Report – 30 Days	23 September 2016 to 25 October 2016
Submission of Final Scoping Report to DEA	28 October 2016
DEA Review and Decision Making	01 November 2016 to 06 January 2017
Notification of Draft EIA Review	13 February 2017 to 14 February 2017
Authority and Registered IAPs Review Period of Draft EIA Report – 30 Days	15 February 2017 to 17 March 2017
Public Meeting to Present the Draft EIA Report	TBD
Submission of Final EIA Report to DEA	12 April 2017

16 CONCLUSION

Taking cognisance of the findings of the Scoping process, the EIA will need to conduct detailed investigations for the significant environmental issues identified as well as for the proposed alternative pipeline routes and discharge points.

It is the opinion of the EIA team that Scoping was executed in an objective manner and that the process and report conform to the requirements of GN No. R. 982 (04 December 2014).

It is also believed that the Plan of Study for EIA is comprehensive and will be adequate to address the significant issues identified during Scoping, to select the BPEO, and to ultimately allow for informed decision-making.

17 OATH OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

I (name and surname) Donovan Henry

Of (address) 1477 Brian Fisher Drive, Ferndale, 2194

ID No. 7812065057080 *Contact No.* 0117811730

I hereby make an oath and state that:

In accordance with Appendix 2 of Government Notice No. R. 982 (4 December 2014), this serves as an affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

Section 2(j) -

1. *The correctness of the information provided in this report;*
2. *The inclusion of comments and inputs from stakeholders and interested and affected parties; and*
3. *Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.*

Section 2(k) -

The level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment.

1. *I know and understand the contents of this declaration.*
2. *I do not have any objection in taking prescribed oath.*
3. *I consider the prescribed oath to be binding on my conscience.*

Signature _____ *Date:* 24/10/2016

I certify that the deponent has acknowledged that he/she knows and understands the contents of the statement and the deponent signature was placed there on in my presence.

A.T. Odaly — COMMISSIONER OF OATH

Tebogo Audrey Odaly — FULL NAME

Captain — DESIGNATION

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
2016 -10- 24
C.S.C
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SUID-AFRIKAANSE POLISIEDIENS

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APPENDICES