SASOL SOUTH AFRICA LIMITED - SECUNDA OPERATIONS

RE-INSTATEMENT AND DEVELOPMENT OF THE VBC08 WETLAND

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

08 SEPTEMBER 2021

DRAFT

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SASOL SOUTH AFRICA LIMITED - SECUNDA OPERATIONS

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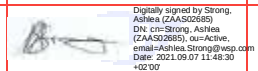
Signature	 Digitally signed by Strong, Ashlea (ZAAS02685) DN: cn=Strong, Ashlea (ZAAS02685), ou=Active, email=Ashlea.Strong@wsp.com Date: 2021.09.07 11:48:30 +02'00'			
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Ashlea Strong, Principal Consultant
Project Manager

This Draft Environmental Management Programme (Report) for the Proposed Re-Instatement and Development of the VBC08 Wetland in Secunda, Mpumalanga Province has been prepared by WSP Group Africa Proprietary Limited (WSP) on behalf and at the request of Sasol South Africa Limited - Secunda Operations (Client), as part of the application process for Environmental Authorisation.

Unless otherwise agreed by us in writing, we do not accept responsibility or legal liability to any person other than the Client for the contents of, or any omissions from, this Report.

To prepare this Report, we have reviewed only the documents and information provided to us by the Client or any third parties directed to provide information and documents to us by the Client. We have not reviewed any other documents in relation to this Report, except where otherwise indicated in the Report.

PROJECT TEAM

CLIENT

Project Co-ordinator	Jaco Linde
Project Manager	Lasalle de Carvalho Jeronimo
Senior Process Engineer	Nico Coetzee
SHE – Senior Specialist Environment	Valery Carelse
Civil engineer	Cara Smith
Safety Practitioner	Ferosa Linen

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Environmental Consultant	Bathabile Mthembu
Hydropedology Study	Thigesh Vather
Hydrology Study	Hassen Khan

SUBCONSULTANTS

Biodiversity and Wetland Study	Andrew Husted – The Biodiversity Company

ACRONYMS

Abbreviation	meaning
BA	Basic Assessment
BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
CRR	Comment and Response Report
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Ecological Support Area
I&AP	Interested and Affected Party
NEMA	National Environmental Management Act (1998)
NEMBA	National Environmental Management: Biodiversity Act (2004)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resource Act
PES	Present Ecological State
SAHRA	South African Heritage Resources Agency
VBC	Valley Bottom Channelled
WMA	Water Management Area
WSP	WSP Group Africa (Pty) Ltd
WUL	Water Use License

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1 INTRODUCTION

1.1 BACKGROUND

Sasol South Africa Limited - Secunda Operation (SO), a division of Sasol South Africa Limited (Sasol) intends to submit an application for Environmental Authorisation (EA) to the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA) for the proposed reinstatement of a Channelled Valley Bottom Wetland (VBC08) located to the west and south of the Nitro Fertiliser plant.

Sasol aim to improve the functionality of the VBC08 wetland system by developing an instream constructed/artificial wetland (passive system) that could augment the existing natural wetland system. The purpose will be to reduce nutrient and salt load into the Groot Bossie Spruit.

1.2 TERMS OF REFERENCE AND DETAILS OF THE EAP

WSP has been appointed by Sasol to fulfil the role of independent Environmental Assessment Practitioner (EAP) to undertake the BA process in terms of the NEMA and the EIA Regulations, 2014, as amended. This Environmental Management Programme (EMPr) was compiled as part of the BA process and must be read in conjunction with the Final Basic Assessment Report (BAR) in support of the EA application. The CV of the EAP is available in **Appendix A. Table 1** details the relevant contact details of the EAP. In order to adequately identify and assess potential environmental impacts, the EAP was supported by a number of specialists.

Table 2 provides the relevant details of the project proponent.

Table 1: Details of EAP

EAP	**WSP GROUP AFRICA (PTY) LTD**
Contact Person:	Ashlea Strong
Physical Address	Building C, Knightsbridge 33 Sloane Street Bryanston 2191
Postal Address:	P O Box 98867, Sloane Park, 2152
Telephone:	011 361 1392
E-mail:	Ashlea.strong@wsp.com
Qualifications	– Masters in Environmental Management, University of the Free State, South Africa, 2006 – B Tech, Nature Conservation, Technikon SA, South Africa, 2001 – National Diploma in Nature Conservation, Technikon SA, South Africa, 1999
Professional Registration	Registered Environmental Assessment Practitioner (Registration Number: 2019/1005)

Expertise to conduct this BA	Mrs A Strong is a Principal Consultant with 17 years' experience in the environmental field. She currently provides technical and strategic expertise on a diverse range projects in the environmental management field, including environmental scoping and impact assessment studies, environmental management plans, waste and water management, as well as the provision of environmental management solutions and mitigation measures Ashlea has been involved in the management of a number of large EIAs specifically within the energy sector such as the Medupi Power Station, and Pebble-Bed Modular Reactor (PBMR) and numerous Transmission Powerlines. She also has significant environmental auditing experience and expertise. Ashlea holds a Masters in Environmental Management; a BTech (Nature Conservation), and a National Diploma (Nature Conservation). She is also a Registered Environmental Assessment Practitioner.

Table 2: Project Proponent

PROPONENT	**SASOL SOUTH AFRICA LIMITED - SECUNDA OPERATION (SO)**
Contact Person:	Wilma Groenewald
Physical Address:	PDP Kruger Drive Secunda 2302
Telephone:	+27 17 610 5105
Cell::	+27 71 680 4315
Email:	wilma.groenewald@sasol.com

1.3 ENVIRONMENTAL MANAGEMENT PROGRAMME STRUCTURE

Table 3 cross-references the sections within the EMPr with the legislated requirements as per Appendix 4 of GNR 326.

Table 3: Legislation Requirements as Detailed in Appendix 4 of GNR 326

APPENDIX 3	**LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 326**	**RELEVANT REPORT SECTION**
(a)	Details of	
	i) the EAP who compiled the EMPr; and	Section 1.2 **Appendix A**
	ii) the expertise of the EAP, including a Curriculum Vitae	Section 1.2 **Appendix A**
(b)	Detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 3

APPENDIX 3	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 326	RELEVANT REPORT SECTION
(c)	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;	Section 3 **Appendix B**
(d)	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	
	i) Planning and design;	Section 3 Section 5 Section 7
	ii) Pre-construction activities;	
	iii) Construction activities	
	iv) Rehabilitation of the environment after construction and where applicable post closure; and	
	v) Where relevant, operation activities.	
(e)	A description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	Section 7
(f)	A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to -	
	i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	Section 7 Section 8
	ii) Comply with any prescribed environmental management standards or practices;	
	iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	
	iv) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable	
(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 6
(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 6
(i)	An indication of the persons who will be responsible for the implementation of the impact management actions;	Section 6 Section 7
(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 7
(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 6

APPENDIX 3	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 326	RELEVANT REPORT SECTION
(l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	Section 6
(m)	An environmental awareness plan describing the manner in which-	
	i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and	Section 6
	ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment; and	
(n)	any specific information that may be required by the competent authority	N/A

1.4 APPLICABLE DOCUMENTATION

The following documents are to be read in conjunction with the EMPr:

- Draft BAR for the proposed Sasol VBC08 wetland reinstatement;
- Biodiversity Assessment for the proposed Sasol VBC08 wetland reinstatement;
- Wetland Assessment for the proposed Sasol VBC08 wetland reinstatement;
- Hydrological Assessment for the proposed Sasol VBC08 wetland re-instatement;
- Sasol Secunda Environmental Management System (EMS); and
- EA once it is issued.

2 GOVERNANCE FRAMEWORK

The South African regulatory framework establishes well-defined requirements and standards for environmental and social management of industrial and civil infrastructure developments. Different authorities at both national and regional levels carry out environmental protection functions. The applicable legislation and policies are shown in **Table 4** below.

Table 4: Applicable Legislation and Policies

APPLICABLE LEGISLATION AND POLICY	DESCRIPTION OF LEGISLATION
The Constitution of South Africa (No. 108 of 1996)	The Constitution cannot manage environmental resources as a stand-alone piece of legislation, hence additional legislation was promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld in an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
National Environmental Management Act (No. 107 of 1998)	In terms of Section 24(2) of the NEMA, the Minister may identify activities which may not commence without prior authorisation. The Minister thus published GNR 327 (Listing Notice 1), 325 (Listing Notice 2) and 324 (Listing Notice 3) listing activities that may not commence prior to authorisation (7 April 2017). The regulations outlining the procedures required for authorisation are published in GNR 326 [Environmental Impact Assessment Regulations (EIA)] (2014, as amended). Listing Notice 1 identifies activities that require a Basic Assessment (BA) process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require an S&EIR process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 3 identifies activities within specific areas that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. WSP undertook a review of the listed activities according to the proposed project description to conclude that **Listed Activity 12 and 19 of GNR 327 and Activities 14 of GNR 324** are considered applicable and therefore a BA process must be followed. An EA is required and is being applied for.
Listing Notice 1: GNR 327 ***Activity 12***	*The development of:– dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 100 square metres; or* *infrastructure or structures with a physical footprint of 100 square metres or more where such development occurs -* *within a watercourse;* The VBC08 wetland reinstatement will include installation of up to18 weir structures along the wetland, with the footprint of more than 100 square metres.
Listing Notice 1: GNR 327 ***Activity 19***	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.* The proposed project will result in infilling or removal of 10 cubic metres or more of material into/from a watercourse for the proposed rehabilitation process.
Listing Notice 3: GNR 324 ***Activity 14***	*The development of –*

APPLICABLE LEGISLATION AND POLICY	DESCRIPTION OF LEGISLATION
	dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or *infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs-* *within a watercourse;* *Outside urban areas:* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *Rehabilitation of the wetland will include installation of up to 18 weir structures along the wetland, with the footprint of more than 10 square metres.* *The proposed project site is classified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs); as identified in the Mpumalanga Biodiversity Sector Plan.*
National Water Act, 1998 (Act No. 36 of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) (NWA) provides the framework to protect water resources against over exploitation and to ensure that there is water for social and economic development, human needs and to meet the needs of the aquatic environment. The Act defines water source to include watercourses, surface water, estuary or aquifer. A watercourse is defined in the Act as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which or from which water flows, and any collection of water, which the Minister may declare a watercourse. The proposed VBC08 wetland reinstatement requires a water use licence (WUL) in terms of Section 21 (c) and (i) of the NWA. The WUL is being applied for simultaneously to the EA application.
National Heritage Resource Act (Act No. 25 of 1999)	The National Heritage Resource Act (Act No. 25 of 1999) (NHRA) serves to protect national and provincial heritage resources across South Africa. The NHRA provides for the protection of all archaeological and palaeontological sites, the conservation and care of cemeteries and graves by the South African Heritage Resource Agency (SAHRA), and lists activities which require any person who intends to undertake to notify the responsible heritage resources agency and furnish details regarding the location, nature, and extent of the proposed development. In terms of the Section 38 of NHRA, any person who intends to undertake a linear development exceeding 300m in length or a development that exceeds 5000m^2 must notify the heritage resources authority and undertake the necessary assessment requested by that authority. The proposed wetland reinstatement is not anticipated to exceed a 5000m^2 footprint and therefor excludes the need of an HIA.

3 PROJECT DESCRIPTION

3.1 PROJECT LOCATION

Sasol are proposing the reinstatement of a Channelled Valley Bottom Wetland (VBC08) located to the west and south of the Nitro Fertiliser plant (**Figure 1**). The reinstatement project entails the installation of eighteen wetland intervention structures (weirs) at various points along the VBC08 wetland system **Figure 2**. The installation of the weirs will help improve the wetland health by reducing nutrient and salt load in the Groot Bossie Spruit and into the downstream water courses. The proposed VBC08 wetland reinstatement will be constructed on the land portion outlined in **Table 5.**

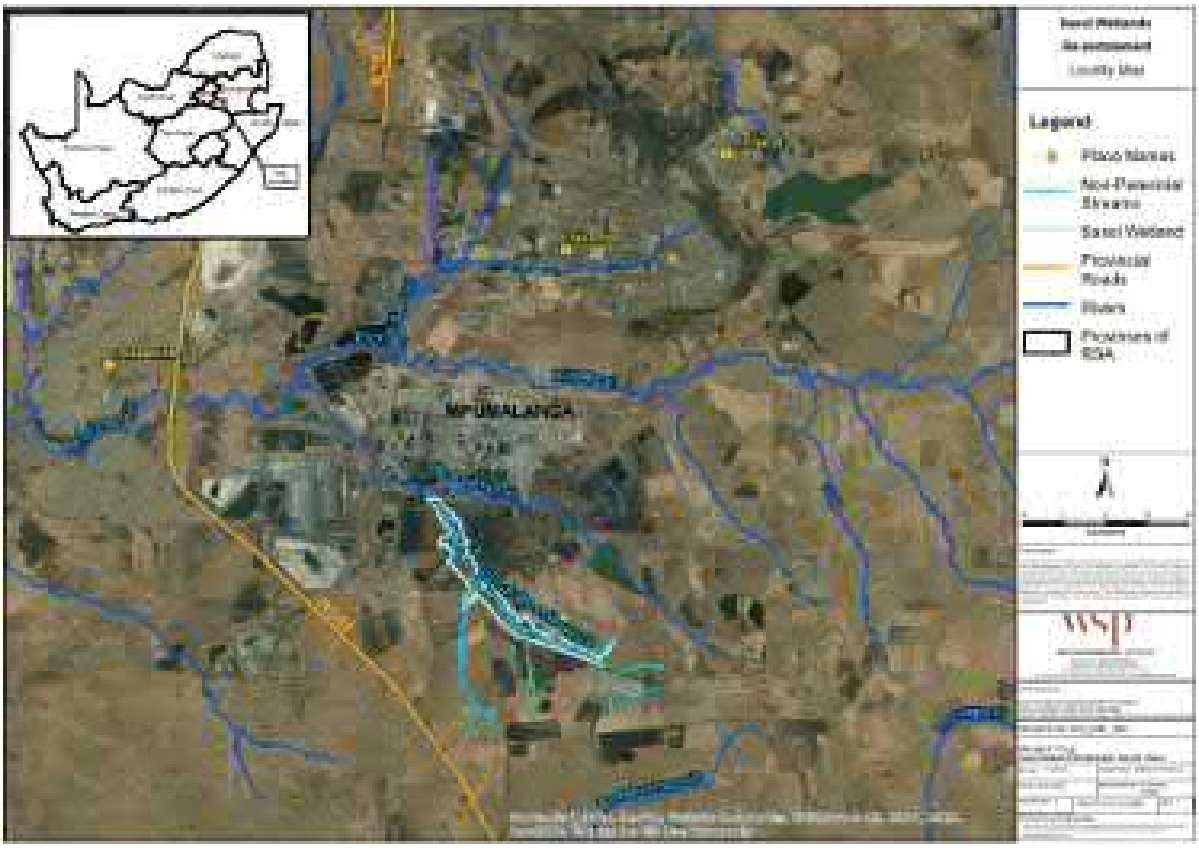

Figure 1: Location of the Proposed Wetland Reinstatement Project

Figure 2: Wetland Intervention Layout

Table 5: Cadastral Information of the Site

SITE LOCATION DETAILS SS PER GN.R326 ANNEX 1 (3)

21 digit Surveyor General code of each cadastral land parcel:	T0IS00000000029100000 T0IS00000000029100004 T0IS00000000028500003 T0IS00000000028500005 T0IS00000000028500006
Landowner:	Sasol South Africa Limited including the following divisions: – Sasol Chemiese Nywerhede Limited – Sasol Mining Pty Ltd
Physical address and farm name:	PDP Kruger Drive Secunda 2302 Mpumalanga Province
Landuse Zoning:	Open Space and Industrial use

The coordinates of the proposed VBC08 wetland reinstatement path are outlined in location are shown in **Table 6.** The co-ordinates of the 18 structures are outlined in **Table 7**.

Table 6: Co-ordinates of the VBC08 Wetland System

Points	Latitude	Longitude
Start	26º 36' 3.64"S	29º 11' 42.75" E
Middle	26º 35' 24.76"S	29º 10' 23.39" E
End	26º 34' 3.89" S	29º 9' 25.20" E

Table 7: Co-ordinates of the 18 Wetland Intervention Structures

Structure	Latitude	Longitude
Wetland interventions		
1	26°36'4.89"S	29°11'40.01"E
2	26°36'2.11"S	29°11'34.86"E
3	26°35'56.77"S	29°11'20.73"E
4	26°35'53.83"S	29°11'9.87"E
5	26°35'53.13"S	29°11'0.02"E
6	26°35'46.48"S	29°10'49.02"E
7	26°35'31.57"S	29°10'28.31"E
8	26°35'25.80"S	29°10'22.20"E
9	26°35'10.29"S	29°10'2.47"E
10	26°35'6.18"S	29° 9'59.56"E
11	26°34'51.56"S	29° 9'52.33"E
12	26°34'38.12"S	29° 9'42.41"E
13	26°34'19.02"S	29° 9'42.95"E
Optional Intervention Structures		
14	26°35'42.18"S	29°10'39.21"E
15	26°34'27.96"S	29° 9'43.98"E
16	26°34'16.21"S	29° 9'38.71"E
17	26°34'10.98"S	29° 9'32.78"E
18	26°34'3.89"S	29° 9'25.20"E

3.1.1 DESIGN AND PLANNING PHASE

Conceptual rehabilitation measures were planned by undertaking numerous site visits, wetland specialist consultation and modelling of the VBC08 wetland system. To ensure an accurate prediction of the functioning aspects of an envisaged system, site-specific data and a number of numerical models were integrated. The planning phase of proposed VBC08 wetland reinstatement included the conceptual design and placement of up to 18 weirs in the wetland system. The conceptualised placement of each structure was determined using the PCSWMM backwater model.

3.1.2 CONSTRUCTION ACTIVITIES

The proposed VBC08 wetland reinstatement project is expected to be completed within a period of 3 to 6 months. The construction phase entails the installation of 18 weirs and other activities outlined below:

- Water within wetland system will have to be diverted to create appropriate conditions for construction;
- General earthworks to reshape uneven ground to allow for a more natural slope on the topography;
- Impeding and diverting the flow of water within a watercourse; and
- The removal of alien invasive species and establishment of vegetation

Each structure must be strategically placed so that the freestanding water under a 1:100 year flood does not back flood the previous structure.

3.1.3 OPERATIONAL ACTIVITIES

There are no major services required for the operation of the weirs except for maintenance activities. Ongoing monitoring and maintenance will be undertaken in line with the EMPr.

3.1.4 DECOMMISSIONING ACTIVITIES

The infrastructure will be decommissioned once it is no longer deemed viable. The decommissioning of infrastructure may be subject to an environmental process in terms of NEMA (dependent on regulations requirements) and an environmental authorisation would be applied for prior to commencement.

3.1.5 WASTE MANAGEMENT

Waste will be generated during the construction phase where the bulk of waste will be from contractors on the site during construction. General waste (domestic waste etc.) and potentially small amounts of hazardous waste (oils, fuel and cement etc.) will be generated during construction. During operation, contractors are only on the site for limited amount of time as and when maintenance is required, which will result in very low waste volumes. Waste Management at the project site will be undertaken in line with the EMPr to consider the correct disposal of general and hazardous waste generated on the project.

3.2 IMPACT ASSESSMENT

A summary[1] of the identified impacts and corresponding (initial and residual) significance ratings for the proposed VBC08 wetland reinstatement project is provided in **Table 8** below.

Table 8: Impact Summary of Construction Phase

NO	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
AQ1	Generation of Dust and PM	Construction	**Low**	-	**Low**	-

[1] The detailed impact assessment can be found in Section 7 of the Basic Assessment Report.

NO	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
N1	Ambient Noise	Construction	**Low**	-	**Low**	-
S1	Soil Erosion	Construction	**Medium**	-	**Low**	-
S2	Soil Contamination	Construction	**Medium**	-	**Low**	-
S3	Improved wetland functionality	Operation	**Low**	+	**Medium**	+
S4	Reduced Soil Erosion	Operation	**Low**	+	**Medium**	+
SW1	Altered Flow Regime	Construction	**Medium**	-	**Low**	-
SW2	Deterioration in Water Quality from contamination	Construction	**Medium**	-	**Low**	-
SW3	Increased Turbidity	Construction	**Medium**	-	**Low**	-
SW4	Improvement of water quality	Operation	**Medium**	+	**Medium**	+
GW1	Deterioration of Groundwater Quality	Construction	**Low**	-	**Low**	-
GW2	Increased Groundwater Levels	Operation	**Medium**	+	**Medium**	+
B1	Temporary Disturbance on wildlife	Construction	**Medium**	-	**Low**	-
B2	Loss and fragmentation of flora	Construction	**Medium**	-	**Low**	-
B3	Increase in Alien Vegetation	Construction	**Medium**	-	**Low**	-
B4	Displacement of fauna and loss of habitat	Construction	**Medium**	-	**Low**	-
B5	Continued habitat degradation	Operation	**Medium**	-	**Low**	-
B6	Continued displacement of fauna and loss of habitat	Operation	**Medium**	-	**Low**	-
B7	Continued alien encroachment	Operation	**Medium**	-	**Low**	-
B8	Recovery of vegetation community and reduction of alien invasive plant species	Operation	**Low**	+	**Medium**	+

NO	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
B9	Preservation of faunal communities	Operation	**Low**	+	**Low**	+
SE1	Employment opportunities	Construction	**Low**	+	**Medium**	+
T1	Increased local traffic	Construction	**Low**	-	**Low**	-
HS1	Employee health and safety	Construction	**Medium**	-	**Low**	-
H1	Damage to heritage resources	Construction	**Low**	-	**Low**	-

4 ENVIRONMENTAL MANAGEMENT OBJECTIVES

The EMPr has the following objectives:

- Encourage good management practices through planning and commitment to environmental issues;
- Prevent water wastage;
- Minimise disturbance of the natural environment;
- Prevent or minimise all forms of pollution;
- Promote the prevention, reduction, reuse, recycling and recovery of waste and develop waste management practices based on prevention, minimisation, recycling, treatment or disposal of waste;
- Adopt the best practical means available to prevent or minimise adverse environmental impacts;
- Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
- Describe all monitoring procedures required to identify impacts on the environment; and
- Train onsite personnel with regard to their environmental obligations.

Please note: This EMPr is a working document and therefore subject to change depending on the requirements of the various project phases. When applicable, these changes are to be approved in accordance with legislative requirements.

4.1 ENVIRONMENTAL OBJECTIVES AND TARGETS

To facilitate compliance to the EMPr, Sasol must comply with all relevant legislation and standards and make personnel aware of the requirements of the EMPr as well as the prescribed penalties should a non-conformance be identified during the different phases of the proposed project.

It is recommended that environmental objectives (as outlined in this document) be emphasised to Sasol as minimum requirements. Objectives include:

- Encourage good management practices through planning and commitment to environmental issues; and
- Provide rational and practical environmental guidelines to:
  - Minimise disturbance of the natural environment;
  - Minimise fugitive emissions;
  - Minimise impact of added construction traffic into the area
  - Ensure surface and groundwater resource protection;
  - Prevent or minimise all forms of pollution;
  - Protect indigenous flora and fauna;
  - Prevent soil erosion;
  - Promote sustainable use of resources;
  - Promote the reduction, reuse, recycling and recovery of waste;
  - Adopt the best practical means available to prevent or minimise adverse environmental impacts;
  - Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
  - Develop waste management practices based on prevention, minimisation, recycling, treatment or disposal of waste;
  - Describe all monitoring procedures required to identify impacts on the environment;
  - Define how the management of the environment is reported and performance evaluated; and
  - Train onsite personnel with regard to their environmental obligations.

5 ENVIRONMENTAL MANAGEMENT PROCEDURES AND REQUIREMENTS

5.1 ROLES AND RESPONSIBILITIES

Formal responsibilities are necessary to ensure that key management measures/procedures are executed. Specific responsibilities of the Project Manager, Site Manager (Main Contractor) and Environmental Control Officer (ECO) are as defined in **Table 8**.

Table 9: Roles and Responsibilities

RESPONSIBLE PERSON	RESPONSIBILITIES
Project Manager	– Ensure that the Site/SHE Manager and the contractor are aware of all specifications, legal constraints and Sasol's standards and procedures pertaining to the proposed development specifically with regards to environmental and social aspects; – Ensure that all conditions of the EA and EMPr are communicated and adhered to by the Site Manager and its contractor(s); – Employ a suitably qualified ECO to monitor the implementation of the EA conditions and the EMPr commitments throughout the proposed development by means of, but not limited to, site inspections and meetings. This must be documented as part of the onsite implementation records; and – Be fully conversant with the BAR for the Proposed Project, the conditions of the licenses and authorisations and of the EMPr.

Site/SHE Manager – Main Contractor	– Be fully conversant with the BAR, the conditions of the EA and of the EMPr;
	– Develop method statements;
	– Provide support to the Internal SHE Representative and ECO;
	– Be fully conversant with all relevant environmental legislation and Sasol's environmental policies and procedures and ensure compliance thereof;
	– Have overall responsibility for the implementation of the conditions of the EA and the EMPr;
	– Ensure that audits are conducted to ensure/assess compliance with the conditions of the EA and the EMPr;
	– Liaise with the Project Manager or his delegate, the Internal SHE, ECO and others on matters concerning the environment;
	– Prevent actions that will harm or may cause harm to the environment, and take steps to prevent pollution and unnecessary degradation onsite; and
	– Confine project activities to demarcated areas.
	– Maintain the following:
	  – A site incident register;
	  – A non-conformance register;
	  – A public complaints register; and
	  – A register of audits.

RESPONSIBLE PERSON	RESPONSIBILITIES
Sasol SHE Representative	– Due to the nature of the project, this role could be fulfilled by Sasol's SHE department. This role could also be fulfilled by the responsible contractor depending on the agreement between the contractor and Sasol; and – A suitably qualified Internal SHE representative who would, on a regular basis (or as necessary depending on the construction activities), monitor the project compliance with the conditions of the EA and the EMPr. Responsibilities of the Internal SHE include: – Be fully conversant with the BAR, the conditions of the EA and the EMPr; – Be fully conversant with all relevant environmental legislation; – Ensure compliance with environmental policies and procedures; – Ensure that internal environmental performance audits/inspections are undertaken on a regular basis by the Site Manager or his/her designated representative to ensure implementation onsite; – Remain employed until the completion of the construction activities; and – Report all findings identified on site to the Project Manager.
Environmental Control Officer (ECO)	– A suitably qualified ECO who would, monthly (or as necessary depending on the construction activities), monitor the project compliance with the conditions of the EA and the EMPr; and – The costs of the ECO shall be borne by Sasol (proof of appointment must be maintained onsite). Responsibilities of the ECO include: – Be fully conversant with the BAR, the conditions of the EA and the EMPr; – Be fully conversant with all relevant environmental legislation – Ensure compliance with environmental policies and procedures – Ensure that external environmental performance audits/inspections are undertaken on a monthly to ensure implementation onsite; – Remain employed until the completion of the construction activities; – Report all findings identified onsite to the Project Manager. In addition, the ECO will: – Convey the contents of the conditions of the EA and the EMPr to the relevant site staff and discuss the contents in detail with the Project Manager and contractor(s); – Undertake regular and comprehensive inspection of the site and surrounding areas in order to monitor compliance with the conditions of the EA and the EMPr; – Take appropriate action if the specifications contained in the EA and the EMPr are not followed; – Monitor and verify that environmental impacts are kept to a minimum, as far as possible; and – Ensure that activities onsite comply with all relevant environmental legislation.
Contractors, Staff and Service Providers	– Complying with Sasol's environmental management specifications; – Be conversant with all conditions of the EA and the EMPr, and ensure compliance thereto; and – Adhering to any environmental instructions issued by the Site Manager/Project Manager on the advice of the ECO.

5.2 ENVIRONMENTAL AWARENESS PLAN

Environmental legislation (NEMA) requires that Sasol develop an environmental awareness plan that describes the manner in which they intend to inform employees of any environmental risks which may result from their

work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment. In recognition of the need to protect our environment, environmental management must not only be a legal obligation but also as moral obligation.

It is important to ensure that all relevant personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and ongoing minimisation of environmental degradation and harm.

To achieve effective environmental management, it is important that employees, contractors (including subcontractors) are aware of the responsibilities in terms of the relevant environmental legislation and the contents of the EMPr, conditions of the EA.

Sasol will provide appropriate resources to facilitate social and environmental awareness training during the construction and operational phases of the project. Sasol will require that all managers associated with the project adhere to the mitigation/management measures detailed in the EMPr and identify, evaluate, and minimise risks to the social, physical and biophysical environments. This will be implemented by educating employees in social and environmental matters and responsibilities relating to performance of their assigned tasks. Furthermore, employees will be entrusted to maintain the necessary level of environmental performance for their activities. Contractors, and their associated sub-contractors, will also need to demonstrate compliance to mitigation/ management measures included in the EMPr.

The following methodologies described must be used to implement and ensure environmental and social awareness and competence.

5.2.1 INTERNAL COMMUNICATION

Internal Communication of environmental issues to ensure environmental awareness will be achieved by using any combination of the following means:

- Meetings;
- Memos;
- Notice boards;
- Briefs;
- Reports;
- Monthly themes;
- Operational bulletins;
- Newsletter;
- E-mail;
- Telephone; and
- Induction training.

5.2.2 STANDARD MEETINGS

The Safety, Health and Environmental (SHE) Meetings will be held in line with Sasol Meetings requirements are outlined under the IMS as Work Instruction: Requirements for SHE Meetings Procedure (CGI-SHE-000009) and are held at specific times to ensure that environmental and social awareness; potential problems; complaints etc. are heard and addressed proactively. During these meetings, discussions will be held regarding raising environmental awareness; identifying potential problems, and discussions regarding any complaints received and corrective actions taken.

5.2.3 ENVIRONMENTAL AND SOCIAL TALK TOPICS

Monthly environmental and social talk topics must be compiled and distributed/shared to relevant personnel and must be displayed on appropriate notice boards or shared by whatever means established on site. As a minimum, the following topics must be considered during the course of the construction phase:

- Water Quality;

- Air Quality i.e. dust;
- Waste Management;
- Fauna and Flora;
- Emergency Procedures;
- Incidents Reporting;
- Systems;
- Noise;
- Landowner Etiquette; Speed Limits;
- Health Risks (such as HIV/ Aids); and
- General Awareness (e.g. World Environment Day, National Arbour Day).

5.2.4 GENERAL COMMUNICATIONS

Communication to the community, government, landowners, neighbouring farmers, environmental groups, non-government organisations and other stakeholders must be communicated to ensure environmental and social awareness by means of informing the tribal authorities who in turn inform the locals. If deemed appropriate, the following means may also be used, where necessary:

- Fax or E-mail; or
- Telephone; or
- Formal meetings.

5.2.5 TRAINING

It is important to ensure that all personnel, contractors and their sub-contractors have the appropriate level of environmental awareness and competency to ensure continued environmental due diligence and on-going minimisation of environmental harm. As a minimum environmental training must include the following:

- Employees must have a basic understanding of the key environmental features of the site and the surrounding environment;
- Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the segments of the project where they are based;
- Employees must undergo training for the operation and maintenance activities associated with project and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated;
- Awareness of any other environmental matters, which are deemed to be necessary by the Internal Environmental Manager; and
- Training must include the environment, health and safety training.

The following facets of the training form part of this Environmental and Social Awareness Plan:

- **Induction:** Environmental and social awareness training will be given at induction when personnel join the company. Induction training will also be given to visitors entering the site. Induction training will include, inter alia:
  - A discussion on the environmental concept, what does it comprise of and how do we interact with it;
  - A general account of how the facility and its associated activities can affect the environment giving rise to what are called environmental impacts; and
  - A discussion on what staff can do in order to help prevent the negative environmental impacts from degrading the environment i.e. environmental impact management.
- **Job Specific Training:** Job specific training programmes will be developed as and when required. The programs will be based on the significant environmental and social aspects/ impacts that are identified during regular audits and site inspections. Supervisory staff will be equipped with the necessary knowledge and information to guide their employees on environmental and social aspects applicable to performing a specific task.

- **Competency Training**: Competency training is done by the contractor before project can start. This training will be performed both on a one-on-one basis and through workshops and presentations. The effectiveness of training and development initiatives can be determined through the following methods:
  - Trend analysis of incidents reported; and
  - Analysis of work areas during visits and audits, if deemed necessary.
- **Training Records:** Training can be done either in a written or verbal format but will be in an appropriate format for the receiving audience. Persons having received training must indicate in writing that they have indeed attended a training session and have been notified in detail of the contents and requirements of the EMPr. The attendance registers must be kept on file.

5.2.6 STAKEHOLDER AND COMMUNITY COMPLAINTS PROCEDURE

A signboard must be erected at the entrance to the project site, informing the public of the construction activities taking place and how they can report any complaints.

Community enquiries or complaints must be brought to the attention of the Site Manager and ECO who must ensure corrective action and close-out. As a minimum the following information must be recorded:

- Time, date and nature of enquiry or complaint.
- The means by which the enquiry or complaints was made
- Personal details of the person / party lodging the enquiry or complaint (subject to privacy considerations).
- Actions taken to investigate and close-out the complaint as well as complainant feedback.

All complaints received are to be investigated and addressed in accordance to Sasol's Environmental Related Complaints from Stakeholders in Secunda Industrial Complex (SGR-SHE-0002) procedure.

Any actions that cannot be managed immediately must be assigned to the appropriate personnel and will become an outstanding action. The action remains outstanding until it is closed off.

5.3 ENVIRONMENTAL PERFORMANCE MONITORING

The following monitoring will be required on site:

- **Construction Phase:** The ECO will conduct environmental monitoring/audits monthly to ensure compliance with the EMPr and conditions of the EA during the construction activities, and will report to the Site/SHE Manager, Project Coordinator and SHE any non-compliance identified or corrective action deemed necessary.
- **Operation Phase:** A Work Instruction: SHE Requirements for Environmental Monitoring Procedure (SGI-SHE-000050) is in place to monitor operational phase impacts on the environment (micro and macro environment).

5.4 NON-CONFORMANCE AND CORRECTIVE ACTION

The auditing of the construction activities may identify non-conformances to the EMPr and conditions of the EA. Non-conformances may also be identified through incidents, emergencies or complaints recorded. In order to correct non-conformances, the source must be determined and corrective actions must be identified and implemented.

5.4.1 COMPLIANCE WITH THE EMPR AND CONDITIONS OF THE AUTHORISATIONS

- A copy of the EMPr and conditions of the EA must be available onsite at all times for the duration of the construction. During operational phase the applicable conditions may be included in the Sasol's EMS;
- All persons employed by a contractor or their sub-contractors shall abide by the requirements of the EMPr and conditions of the EA;

- Any members of the workforce found to be in breach of any of the specifications contained within the EMPr and conditions of the EA may be ordered by the Site Manager to leave the site. A contractor will not direct a person to undertake any activity which would place them in contravention of the specifications contained within the EMPr and conditions of the EA;
- Should a contractor be in breach of any of the specifications, the Site/SHE Manager will, in writing if possible, instruct the contractor responsible for the incident of non-compliance regarding corrective and/or remedial action required, specify a timeframe for implementation of these actions, implement a penalty and/or indicate that work will be suspended should non-compliance continue. Project costs and penalties incurred due to the work stoppage will be for the contravening contractor's cost; and
- Authorities will be given access to the property referred to in the EA and EMPr for the purpose of assessing and/or monitoring compliance of the site, at all reasonable times.

5.4.2 DUTY OF CARE

Under Section 28 of the NEMA, all personnel involved with the construction and operational activities onsite will be responsible for implementing measures to prevent pollution or degradation of the environment from occurring, continuing or recurring. Failure to comply with the above conditions is a breach of the duty of care. If such harm is unavoidable, steps must be taken to minimise and rectify such pollution or degradation of the environment.

5.5 DOCUMENT CONTROL AND REPORTING

The following documentation must be kept onsite in order to record compliance with the EMPr and conditions of the EA:

- Record of complaints; and
- Record of emergencies and incidents.

The contractor will be required to report on the following:

- Environmental incidents involving contractor/employees and/or the public;
- Environmental complaints and correspondence received from the public; and
- Incidents that cause harm or may cause harm to the environment.

The above records will form an integral part of the ECO's reports and records thereof maintained for the duration of the project. These records will be kept with the EMPr and conditions of the EA, and will be made available for scrutiny if so requested by the Site Manager or his delegate and the ECO.

The contractor will ensure that the following information is recorded for all environmental complaints/incidents/emergencies:

- Nature of complaint/incident/emergency;
- Causes of complaint/incident/emergency;
- Party/parties responsible for causing complaint/incident/emergency;
- Immediate actions undertaken to stop/reduce/contain the causes of the complaint/incident/ emergency;
- Additional corrective or remedial action taken and/or to be taken to address and to prevent reoccurrence of the complaint/incident/emergency;
- Timeframes and the parties responsible for the implementation of the corrective or remedial actions;
- Procedures to be undertaken and/or penalties to be applied if corrective or remedial actions are not implemented; and
- Copies of all correspondence received regarding complaints/incidents/emergency.

6 ENVIRONMENTAL MANAGEMENT PROGRAMME

This EMPr identifies various actions which are undertaken throughout the construction and operational phases. Not every action will be required during the entire course of activities. Therefore, the actions identified in the EMPr have been given priority timeframes for proposed implementation. **Table 10** below shows the structure of the EMPr.

Table 10: Structure of EMPr

COLUMN	DESCRIPTION
Activity/Aspect	Highlights the various activities/aspects associated with the project i.e. the contractors' activities that will interact with the environment.
Environmental Measures and Action Plans	Indicates the actions required to prevent and /or minimise the potential impacts on the environment that are associated with the project.
Responsibility	Indicates the party responsible for implementing the environmental measures and action plans laid out in the EMPr. Please note that the Site Manager will have authority to stop works if/as necessary.
Priority Timeframe	Indicates when the actions for the specific aspect must be implemented and/or monitored.

The following assumptions have been made in the development of the environmental specification in this EMPr:

- An environmental file containing the information/documentation required by this EMPr is to remain onsite and to be made available at the request of the auditor or similar monitoring body; and
- For ease of reference, any person(s) employed to assist in the project i.e. contractors, sub-contractor and permanent and temporary staff, will be collectively referred to as 'onsite personnel'.

It should be noted that at this point of the project planning process, the necessity for and timing of the decommissioning phase is unknown. Before decommissioning, Sasol will need to follow the related legal permitting process in terms of the NEMA and other legislation applicable at the time. The future associated permitting process will further supplement any commitments made within this document.

Table 11 outlines the proposed mitigation measures for the project.

None of the management measures are required to be included in the EA and there are no additional monitoring requirements.

Table 11: Environmental Management Programme

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
CONTRACTOR LAYDOWN AREA AND SITE ACCESS			
Objectives: – To implement measures to minimise impacts on the environment from the initiation of construction activities through planning, careful site access route selection and implementation of mitigation measures. Indicator and Compliance Mechanisms: – Health, safety, environmental and community incident and complaints management system register. – Close-out on incidents. – Monitoring and audit reports. – Inductions training and register. – Environmental awareness programme/toolbox talks.			
Project Initiation of Construction Activities	Appoint an external independent ECO to manage and verify compliance with the EA and EMPr on a monthly basis.	Contractor (Site Manager) ECO	Once-Off
	All laydown, chemical toilets etc. should be restricted to outside the wetland areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. No permanent structures should be permitted at construction sites. Buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated project areas.	ECO/SHE/Site Manager	Construction
	A training plan/programme must be developed to focus on Environmental, Health and Safety Aspects.	SHE/Contractor	Construction Operation
	Site clearing must be limited to the footprint of the infrastructure requirements.	ECO/SHE/Site Manager	Construction
	A site layout plan which indicates site access points; stockpile locations; temporary waste storage areas; and other significant development infrastructure must be developed, approved and complied with.	ECO/SHE/Contractor	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	The Contractor shall have a supply of beaters to use in the event of a fire on site	ECO/SHE/Contractor	Construction
VEHICLE, EQUIPMENT AND MACHINERY MANAGEMENT			
Objectives: – To implement measures to minimise impacts on the environment from poorly maintained equipment, machinery and vehicles onsite. Indicator and Compliance Mechanisms: – Health, safety, environmental and community incident and complaints management system register. – Sasol Procedure: SHE requirements for personal safety equipment and facilities (SGR-SHE-000061). – Sasol Procedure: Response to environment related emergencies and a guideline to other incidents ((SGR-SHE-000023). – Close-out on incidents. – Monitoring and audit reports. – Transport route delineation. – Compliance with SANS 10228. – Daily equipment, machinery and vehicle checklists. – Incident Classification and Reporting Procedure.			
Vehicle Maintenance	No machinery should be allowed to park in any wetlands. Only machinery and equipment required is permitted in the wetland area and must be operational.	ECO/SHE/Contractor	Construction Operation
Operation of Equipment, Machinery and Vehicles	Ensure that the equipment, machinery and vehicles are adequately maintained so as to: – Reduce the potential for spillages of oil, diesel, fuel or hydraulic fluid. – Ensure road-worthiness. – Reduce emissions.	ECO/SHE/Contractor	Construction
Traffic Congestion	The movement of construction vehicles into and out of the site must be managed to ensure the impact on public areas is minimised, such as ensuring that abnormal loads are moved outside of peak traffic hours, and reasonable measures are taken to ensure that public and staff safety is managed adequately.	ECO/SHE/Contractor	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Reduce the amount of unnecessary people and restrict vehicle access as far as possible.	ECO/SHE/Contractor	Construction
FUEL AND CHEMICAL MANAGEMENT			
Objectives: – To ensure the correct storage, handling and disposal of fuels and chemicals in order to prevent impacts to the surrounding environment. Indicator and Compliance Mechanisms: – Maintenance records. – Material safety data sheets (MSDS). – Sasol Procedure: SHE requirements for personal safety equipment and facilities (SGR-SHE-000061). – Sasol Procedure: Response to environment related emergencies and a guideline to other incidents ((SGR-SHE-000023). – Health, safety, environmental and community incident and complaints management system register. – Chemicals Management Procedure. – Monitoring and audit reports. – Training records.			
Fuel and Chemical Management	Utilise Sasol's existing procedure for incident classification and reporting (SGR-SHE-000023) for fuel and chemical management including storage, handling and spillages.	ECO/SHE/Contractor	Construction
	Indicate the location of the fuel and chemical storage area on the layout plans.	ECO/SHE/Contractor	Construction
	In cases where a surface leak occurs during loading and off-loading activities, the spill material will be cleaned using a spill kit.	ECO/SHE/Contractor	Construction
	Securely fence and lock the storage areas to accommodate all hazardous substances such as fuel, oils and chemicals. The storage area must be roofed and the floor must be an impermeable surface and suitably bunded as per the requirements outlined in SANS 10089-1 (2008). If storage capacity triggers licencing, those must be acquired.	ECO/SHE/Contractor	Construction
	Label all liquids (chemicals and hydrocarbons) stored onsite for easy identification. Material Safety Data Sheets (MSDS) for onsite chemicals, hydrocarbon materials and hazardous substances must be readily available. MSDS must include mitigation measures to ameliorate	ECO/SHE/Contractor	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	potential environmental impacts which may result from a spill, incorporating health and safety mitigation measures.		
	Keep fuels, oils or other chemicals used outside of the bunded area to a minimum and use suitable secondary containment in the form of drip trays.	ECO/SHE/Contractor	Construction
WASTE MANAGEMENT			
Objectives: – To ensure the correct handling, storage, transportation and disposal of general waste and hazardous waste. Indicator and Compliance Mechanisms: – Induction training and records. – Waste Management Plan (WMP). – Relevant SANS Codes of Practice. – Sasol Secunda Waste Management Procedure (SGR-SHE-000017). – Waste Manifests (all waste streams), waybills (general waste) and Safety disposal certificates (hazardous waste). – Emergency preparedness and response procedure. – Incident Classification and Reporting Management Procedure. – Health, safety, environmental and community incident and complaints management system register. – Monitoring and audit reports.			
General Waste Management	General waste generated as a result of construction activities must be managed in accordance with the Sasol *Secunda* Waste Management Plan (WMP).	ECO/SHE/Contractor	Construction
	Train and inform all onsite personnel regarding general waste minimisation, management and disposal as per the Sasol Secunda WMP.	ECO/SHE/Contractor	Construction Operation
	Prohibit littering and burning of waste onsite.	ECO/SHE/Contractor	Construction
	Place an adequate number of labelled or colour coded general waste bins around the site during construction activities in order to minimise littering. The bins must be removed from the site on a regular basis for disposal at a registered or licensed disposal facility.	ECO/SHE/Contractor	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Retain records such as waybills and waste manifests associated with waste removal, transportation and disposal.	ECO/SHE/Contractor	Construction
	Prohibit the mixing of general waste with hazardous waste. Should general waste be mixed with hazardous waste, it will be considered hazardous waste. See below for managing hazardous waste.	ECO/SHE/Contractor	Construction
	Recover, recycle and reuse waste where possible. Seek to use suppliers who reuse their packaging so that they can collect after initial unpacking onsite.	ECO/SHE/Contractor	Construction
Hazardous Waste Management	Hazardous waste generated as a result of construction activities must be managed in accordance with the Sasol Secunda Waste Management Plan (WMP).	ECO/SHE/Contractor	Construction
	Any recyclable material which is considered hazardous is to be collected and transferred by a permitted/trained waste contractor in accordance with the SANS 10228 for transport to the approved recycling/recovery facility.	ECO/SHE/Contractor	Construction
	Train and inform all onsite personnel regarding hazardous waste minimisation, management and disposal as per the Sasol Secunda WMP.	ECO/SHE/Contractor	Construction
	Clean areas where hazardous waste spills have occurred and dispose of the hazardous material appropriately. Key personnel must be trained on handling spillages.	ECO/SHE/Contractor	Construction
	Retain records of appropriate safety disposal certificates associated with hazardous waste removal, transportation and disposal.	ECO/SHE/Contractor	Construction
	An emergency preparedness and response plan must be implemented. The plan must be placed in key locations around the site, visible to all employees.	ECO/SHE/Contractor	Construction
	Hazardous waste (including used oils and material containing oils, solvents, empty chemical containers etc.) should be undertaken within impermeable bunded and ventilated storage areas, capable of containing 110% of total volume. All storage containers are to be labelled, sealed and stored in accordance with MSDS requirements.	ECO/SHE/Contractor	Construction
	Report any major spill incidents to the Department within 24 hours of occurrence.	ECO/SHE/Contractor	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
FLORA AND FAUNA MANAGEMENT			
Objectives: – To prevent any loss of diversity of indigenous faunal communities and continued encroachment and displacement of indigenous vegetation community by alien invasive plant species, particularly in previously disturbed areas. Indicator and Compliance Mechanisms: – Alien Management Plan – Wetland Rehabilitation, Maintenance and Management Plan – Induction training and records. – Monitoring and audit reports.			
Vegetation Management	The removal requirements of the *Crinum bulbispermum* (and other SCC) must be determined for each construction site and the necessary action taken for the removal / relocation of these species.	ECO/SHE/Contractor	Construction
	Apply for a permit to destroy protected plant species or relocate the species in situ as necessary per rehabilitation structure. Plants can be collected from the construction area and transplanted into bags that should be housed in a nursery onsite or nearby. Removal of the bulb and intact root system as far as possible and then kept in moistened clear plastic bags until they can be replanted;	ECO/SHE/Contractor	Pre-Construction Construction
	Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible.	ECO/SHE/Contractor	Construction
	When vegetation is cleared, hand cutting techniques should be used as far possible in order to avoid the use of heavy machinery.	Site Manager/ ECO/SHE/Contractor	Construction
	Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species.	ECO/SHE/Contractor	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	It should be made an offence for any staff to /take bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	ECO/SHE/Contractor	Construction Operation
Alien Vegetation Management	Compilation of and implementation of an alien vegetation management plan.	SHE/Contractor/ECO	Pre-Construction
	The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas	ECO/SHE/Contractor	Construction
Wetland Management	Ensure the implementation of the Wetland Rehabilitation, Maintenance and Management Plan included in **Appendix C**	ECO/SHE/Contractor	Construction Operation
Fauna Management	Ensure that construction activities are limited only to the demarcated and approved areas.	ECO/SHE/Contractor	Construction
	Education of workers/employees onsite on wildlife on site. Contractor induction and staff/labour environmental awareness training needs are to be identified and implemented through staff/contractor environmental induction training. This must include basic environmental training based on the requirements of the EMPr, including training on avoiding and conserving local wildlife. All personnel and contractors to undergo Environmental Awareness Training.	SHE/Contractor/ECO	Construction Operator
	A qualified environmental control officer prior to construction to identify SCC that will be directly disturbed and to relocate fauna/flora found during the activities. The area must be walked though prior to construction to ensure no faunal species remain in the habitat and are killed. Should animals not move out of the area on their own relevant specialists must be contacted to advise on species relocation.	SHE/Contractor/ECO	Pre-Construction
	If any faunal species of conservation importance are recorded during construction, activities must temporarily cease, and an appropriate specialist must be consulted to identify the correct course of action.	SHE/Contractor	Construction
	No trapping, killing, or poisoning of any wildlife is to be allowed.	ECO/SHE/Contractor	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna.	ECO/SHE/Contractor	Construction Operation
	Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas such as the wetland. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (yellow) lights should be used wherever possible.	Site Manager/SHE/Contractor	Construction Operation
	All excavations such as holes need to be sealed as soon as possible to ensure that no fauna species can fall in.	ECO/SHE/Contractor	Construction Operation
	Schedule any activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons.	ECO/SHE/Contractor	Construction Operation
SOIL AND LAND MANAGEMENT			
Objectives: – To prevent any disturbance, erosion or contamination of soil resources. Indicator and Compliance Mechanisms: – Induction training and records. – WMP. – Incident Classification and Reporting Management Procedure. – Health, safety, environmental and community incident and complaints management system register. – Monitoring and audit reports. – Stormwater Management Plan.			
Soil and Land Management	Implement soil erosion management measures and ensure no erosion gullies are allowed to form within the area under management.	Site Manager/Contractor	Construction
	Where possible, consider conducting construction activities during winter where rainfall is minimal.	Site Manager/Contractor	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Areas requiring shaping involving bulk earthworks shall be excavated, filled, compacted when required, and shaped to the correct contours as outlined in the relevant work method statements.	Site Manager/Contractor	Construction
	Only the proposed demarcated wetland intervention project area must be cleared of vegetation. This must be done in stages as construction works progress, if possible.	Site Manager/Contractor	Construction
	Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching	Site Manager/Contractor	Construction
	All excavations and foundations must be inspected regularly for any silting. If excavations or foundations fill up with stormwater, these areas must immediately be drained and measures to prevent access to these areas must be implemented.	Site Manager/Contractor	Construction
	The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers	Site Manager/Contractor	Construction
	Drip trays are to be inspected daily for leaks and effectiveness, and emptied when necessary. This is to be closely monitored during rain events to prevent overflow.	Site Manager/ECO/SHE	Construction
	Any exposed earth must be rehabilitated promptly, and this could include planting suitable vegetation (that mimics the surrounding environment to protect the exposed soil.	Site Manager/Contractor	Construction
	Landscape the area so that there is a free flow of water, without being erosive, thus increasing the catchment area.	Site Manager/Contractor	Construction
	Ensure that there are sufficient ablution facilities. If portable toilets can be installed for the construction phases, ensure that they in accordance with Occupational Health and Safety Act, (No 85 of 1993).	ECO/SHE/Contractor	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
WATER MANAGEMENT			
Objectives: – To implement measures to prevent the contamination on surface and groundwater resources. – To prevent erosion. Indicator and Compliance Mechanisms: – Induction training and records. – Incident Classification and Reporting Management Procedure. – Environmental awareness programme/toolbox talks. – Stormwater Management Plan. – Water Use Licence Authorisation.			
Surface Water Management – Stormwater Management	Investigate feasibility of construction activities being conducted during the dry season to avoid possible wetland contamination from storm water runoff (as well as soil erosion) that may be experienced during wet seasons, as much as possible.	Site Manager/SHE	Pre-Construction
	To prevent contamination, ensure that there is no storage and handling of materials (i.e. chemicals and waste material) within the designated “clean water areas”.	Site Manager/ Contractor/SHE	Construction
	The Contractor shall submit a Surface Water Management Plan by which any surface water, be it from rain, excavations or any other source, is controlled. Surface water should be returned to the natural environment in a manner which prevents or minimised erosion and without deterioration in water quality.	Site Manager/Contractor ECO/SHE	Pre- Construction
	Compile and implement a stormwater management plan to control the flow of stormwater and limit the potential of dirty water from mixing with clean water sources.	Site Manager/ Contractor/SHE	Construction Operation
	Machinery must be regularly checked to ensure hydrocarbon leaks (including fuel and hydraulic fluids) are not occurring. Drip trays must be used where necessary. Fuels and oils must be stored within bunded areas. Parking areas for staff vehicles must ideally be placed on hardstanding to limit the impacts of oil leaks to the environment.	ECO/SHE/Contractor	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Acquire spill kits to clean up any hydrocarbon or chemical spills during construction to prevent seepage.	ECO/SHE/Contractor	Construction
	Oils, greases, diesel and other chemicals will be stored in the prescribed manner and within bunded areas to prevent surface water contamination. No repairs must be undertaken on the site.	ECO/SHE/Contractor	Construction
	All stormwater generated by the medium to high risk contamination 'dirty' areas must not be allowed to discharge into the surrounding environment.	ECO/SHE/Contractor	Construction Operation
	Any cement mixing shall be completed on impervious hardstanding surfaces to prevent spillage to the environment.	ECO/SHE/Contractor	Construction
	The site must be contoured as according to allow surface water to readily drain away and to prevent ponding of water anywhere within the site.	Site Manager/ Contractor/SHE	Construction
Groundwater Management	Areas with the potential to contaminate the groundwater must be underlain by hardstanding of suitable integrity.	Site Manager/ Contractor/SHE	Construction
	A suitable storm water management plan must for formulated for the project. The plan must ensure that clean and dirty water are separated, that only clean water is diverted into the wetlands (where required) and that the discharge of water will not result in scouring and erosion of the receiving systems.	Site Manager/ Contractor/SHE	Construction Operation
	Prioritise construction during the dry season, starting with the structure furthest down the system.	ECO/SHE/Contractor	Construction
	Acquire spill kits to clean up any hydrocarbon or chemical spills during construction, operation and closure to prevent seepage. All spillage incidents must be reported to the responsible site officer as soon as they occur.	Site Manager/ Contractor/SHE	Construction Operation
	Oils, greases, diesel and other chemicals must be stored in the prescribed manner and within bunded areas to prevent surface water contamination. The site must be contoured as	Site Manager/ECO Contractor/SHE	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	according to the conceptual stormwater management plan to allow surface water to readily drain away and to prevent ponding of water anywhere within the site.		
	Any cement mixing shall be completed on impervious hardstanding surfaces to prevent spillage to the environment.	SHE/Contractor/ECO	Construction
Fire Management	Follow the fire management plan (Section 8.5 of this EMPr) for fire management. Contractors must prove compliance with Sasol Environmental Emergency Management Procedure (SGR-SHE-000023).	Site Manager/ Contractor/SHE	Construction Operation
	Fire prevention facilities must be present at all hazardous storage facilities. Ensure adequate fire-fighting equipment is available and train workers on how to use it.	ECO/SHE/Contractor	Construction
	Ensure that all workers on site know the proper procedure in case of a fire occurring on site. Smoking must be prohibited in areas considered a fire hazard.	ECO/SHE/Contractor	Construction Operation
	Provide suitable fire control measures. No smoking shall be allowed in areas of natural habitat where accidental fires could occur.	ECO/SHE/Contractor	Construction Operation
	All activities where a threat of potential fire is identified shall comply with minimum fire control regulations.	ECO/SHE/Contractor	Construction
	A fire management plan needs to be compiled and implemented to restrict the impact fire might have on the rehabilitated areas.		Post construction
NOISE MANAGEMENT			
Objectives: – To ensure that noise impacts to the surrounding environment are minimal or mitigated. Indicator and Compliance Mechanisms: – Maintenance records. – Incident reporting system. – Induction training and records.			

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
– Health, safety, environmental and community incident and complaints management system register. – Monitoring and audit reports. – Records of Personal Protective Equipment (PPE). – Incident Classification and Reporting Management Procedure.			
Noise	Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals.	ECO/SHE/Contractor	Construction
	Provide a complaints register to report any excessive noise incidents.	ECO/SHE/Contractor	Construction
	Align working hours with the substation related operational times.	ECO/SHE/Contractor	Construction
	Onsite employees must be provided relevant PPE. Onsite personnel are responsible for maintaining their PPE and implementing it during construction activities.	ECO/SHE/Contractor	Construction
SITES OF CULTURAL OR HERITAGE SIGNIFICANCE			
Objectives: – To ensure that sites/artefacts of heritage value are identified and protected. Indicator and Compliance Mechanisms: – Health, safety, environmental and community incident and complaints management system register. – Incident Classification and Reporting Management Procedure. – Monitoring and audit reports.			
Cultural and/or Heritage Sites and Palaeontology	Conduct site excavations within wetland carefully to avoid damaging any potential palaeontological resources. If any palaeontological resources are discovered, the South African Heritage Resource Agency (SAHRA) should be notified and investigation conducted before any activities can commence. Ensure that employees and contractors are aware of requirements for heritage resource protection and communicate any findings immediately. Any potential "chance finds" of heritage objects must be logged in the site incident register.	Site Manager/ECO Contractor/SHE	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
HEALTH AND SAFETY			
Objectives: — To ensure communication with members of the public to promote safety awareness. — To prevent public access to construction sites and storage areas. — To ensure safety for all onsite personnel. Indicator and Compliance Mechanisms: — Induction training and records. — Health, safety, environmental and community incident and complaints management system register. — Monitoring and audit reports. — Sasol Procedure: SHE requirements for personal safety equipment and facilities (SGR-SHE-000061) — PPE Register. — Occupational health and safety plan. — Health and safety protocol. ***Note: The proposed project aims to improve the overall SHE status of the site.***			
Health and Safety	All onsite personnel are required to undergo induction training and regular toolbox talks in order to raise awareness of the conditions contained herein.	Site Manager/ Contractor/SHE	Construction Operation
	The appointed contractor will be responsible for the development of a comprehensive health and safety protocol which must be adhered to.	Contractor	Construction
	All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Contractor/Site Manager	Construction
	Provide and wear appropriate PPE onsite.	Contractor/Site Manager	Construction
	Train all onsite personnel handling chemical or hazardous substances in the use of such substances and the environmental, health and safety consequences of incidents.	Site Manager/ Contractor/SHE	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Provide onsite personnel with sufficient potable water for drinking.	Site Manager/ Contractor/SHE	Construction
SOCIO-ECONOMIC ENVIRONMENT			
Objectives: – To ensure that the negative socio-economic impacts are mitigated and managed. – To ensure that the positive socio-economic impacts are enhanced. Indicator and Compliance Mechanisms: – Employment records and community engagement local enterprise development records.			
Employment Opportunities	As far as possible, contractors and labour must be sourced locally from within the local communities.	Project Manager/Contractor/ SHE	Construction
	Consult with local communities to boost local business.	Project Manager/Site Manager	Construction
AIR QUALITY			
Objectives: – To ensure that air quality impacts to the surrounding area is kept to a minimum or mitigated as far as possible. Indicator and Compliance Mechanisms: – Maintenance records. – Incident reporting system. – Induction training and records. – Records of PPE.			
Dust and Particulate Matter	When required, dust suppression methods such as water suppression must be used, especially during dry and windy periods. Dust must be visually monitored on a daily basis and minimised where possible to ensure emissions are minimised.	Site Manager/Contractor	Construction
	Wetland vegetation clearing should be kept minimum. Early vegetation and stabilising of disturbed areas.	Site Manager/Contractor	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	It is recommended that the clearing of wetland vegetation from the site should be selective and done just before construction so as to minimise erosion and dust.	Site Manager/Contractor	Construction
	All materials transported to site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials.	Site Manager/Contractor	Construction
	Ensure that all vehicles and machines are adequately maintained to minimise emissions.	Site Manager/Contractor	Construction
	All issues/complaints must be recorded in the complaints register and must be in line with Sasol's Environmental Related Complaints from Stakeholders in Secunda Industrial Complex (SGR-SHE-0002) procedure.	Site Manager/Contractor	Construction
	No burning of waste, such as plastic bags, cement bags and littering is not permitted.	Site Manager/Contractor	Construction
	It is recommended that the clearing of vegetation from the site must be selective and done just before construction so as to minimise erosion and dust. Should construction in areas that have been stripped not be commencing within a short period of time the exposed areas shall be re-vegetated with indigenous plants or stabilised.	Site Manager/Contractor	Construction

7 CONCLUSION

In terms of NEMA, everyone (i.e. all persons engaging in any component of this project) is required to take reasonable measures to ensure that they do not pollute the environment. 'Reasonable measures' includes informing and educating employees about the environmental risks associated with their work and training them to operate in an environmentally responsible manner.

Sasol also recognises that, in terms of NEMA, the cost to repair any environmental damage will be borne by the person responsible for the damage. If the above-mentioned environmental guidelines and mitigation measures are adopted, it is anticipated that the negative environmental impacts of the proposed VBC08 wetland reinstatement will be mitigated. A Sasol SHE representative and an appointed ECO can monitor the site periodically throughout construction to ensure that the required environmental controls are in place and working effectively, while the Sasol Environmental Manager monitors environmental controls during operation.

APPENDIX

A EAP CV

ASHLEA STRONG, MEM, EAP

Principal Consultant (Planning & Advisory Services), Environment & Energy

Years with the firm

8

Years of experience

18

Professional qualifications

EAPASA

Areas of expertise

Auditing

ESIR

Energy

Environmental Control

Infrastructure

Mining

Training

Waste Management

CAREER SUMMARY

Ashlea is a Principal Consultant with 18 years' experience in the environmental field. She currently provides technical and strategic expertise on a diverse range projects in the environmental management field, including environmental scoping and impact assessment studies, environmental management plans, waste and water management, as well as the provision of environmental management solutions and mitigation measures

Ashlea has been involved in the management of a number of large EIAs specifically within the energy sector such as the Medupi Power Station, and Pebble-Bed Modular Reactor (PBMR) and numerous Transmission Powerlines. She also has significant environmental auditing experience and expertise having undertaken over 70 compliance audits.

Ashlea holds a Masters in Environmental Management; a BTech (Nature Conservation), and a National Diploma (Nature Conservation). She is also a Registered Environmental Assessment Practitioner.

EDUCATION

Masters in Environmental Management, University of the Free State, South Africa	2006
B Tech, Nature Conservation, Technikon SA, South Africa	2001
National Diploma in Nature Conservation, Technikon SA, South Africa	1999

ADDITIONAL TRAINING

Conduct outcomes based assessment (NQF Level 5), South African Qualifications Authority (SAQA)	2009

PROFESSIONAL MEMBERSHIPS

Registered Environmental Assessment Practitioner (Registration Number: 2019/1005)	2020

PROFESSIONAL EXPERIENCE

Energy Sector

- 100MW Solar Photovoltaic (PV) Plant (2021). Project Director. This project involved the compilation of a Basic Assessment and Environmental Management Plan for a 100MW Solar PV Plant near Springs in Gauteng, South Africa. Client: Calodex (Pty) Ltd.
- Erica 400kV Loop-in-Loop-out (LILO) Powerline (2020). Compilation of an environmental screening assessment for the Erica 400kV LILO Powerline in Cape Town, Western Cape, South Africa. Client: Eskom Holdings SOC Limited.
- Maralla East and West Wind Energy Facilities (2019). Project Manager. Compilation of two Part 2 Amendment Process for the changes in technical scope of the Wind Energy Facilities near Sutherland in the Northern and Western Cape, South Africa. Client: BioTherm Energies (Pty) Ltd.
- Ruigtevallei 132kV Powerline (2019): Project Manager. Compilation of a Part 2 Amendment Process for the deviation of the Ruigtevallei – Dreunberg 132 kV powerline near Gariep in the Free State, South Africa. Client: Eskom Holdings SOC Limited.

- Nakonde and Mpika Wind Energy Projects (2018): Project Manager. Compilation of two Environmental Project Briefs for the establishment of meteorological masts at the Proposed Nakonde and Mpika Wind Project Sites in Zambia. Client: Globeleq
- Rietkloof Wind Energy Facility Project (2018): Project Director. Compilation of a Basic Assessment and Environmental Management Programme for a 140MW Wind Energy Facility, Matjiesfontein, Western Cape. Client: G7 Renewable Energies
- Mozambique – Zambia Interconnector Powerline (2018): Project Manager. This project involved the compilation of the Environmental and Social Impact Assessment and Environmental and Social Management Plan for a 300km 400kV powerline between Tete, in Mozambique, and Chipata, in Zambia. Client: Southern African Power Pool (SAPP).
- Ankerlig – Koeberg 132kV powerline walkdown (2017): Project Manager. This project involved the compilation of a Construction and Operation Environmental Management Plans for the Ankerlig – Koeberg 132kV powerline. Client: Eskom Holdings SOC Limited.
- Gwanda 100MW Solar Project (2018): Project Manager. This project involved the high-level review of the Environmental Impact Assessment for a 100MW Photovoltaic (PV) Solar Project near the town of Gwanda, Matebeleland South Province of Zimbabwe against relevant legislation and international standards. Client: WSP | Parsons Brinckerhoff.
- Southern Energy Coal Fired Power Station (2016): Project Manager. This project involved the high-level review of the Environmental Impact Assessment for the Southern Energy Coal Fired Power Station near Hwange in Zimbabwe against relevant legislation and standards. Client: WSP | Parsons Brinckerhoff.
- Proposed Solar and Wind Projects located in the Northern and Western Cape Provinces (2015) Project Manager. This project involved the compilation of 15 Environmental Impact Assessments and Environmental Management Plans for 2 Solar and 2 Wind energy Projects near Aggenys and Sutherland respectively. Client: BioTherm Energy (Pty) Ltd.
- Proposed Solar Park, Northern Cape Province, South Africa (2012): Strategic Environmental Advisor. This project involved the provision of process expertise for the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Solar Park in the Northern Cape Province. Client: Central Energy Fund (CEF).
- Proposed Tabor - Nzhelele 400kV Transmission Lines and associated infrastructure, Limpopo Province, South Africa (2012): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 100km 400kV powerline between Louis Trichardt and Musina in the Limpopo Province. Client: Eskom Transmission.
- Retrofitting of the existing Electrostatic Precipitators with Fabric Filter Plants at Units 2, 3 and 4 at the Grootvlei Power Station, South Africa (2012): Project Manager. This project involved the compilation of a Basic Assessment Report and Environmental Management Plan for the proposed retrofitting of the existing Electrostatic Precepitators with Fabric Filter Plants at the Grootvlei Power Station. Client: Eskom Holdings SOC Limited.
- Proposed Mulilo Coal Fired Power Station and associated infrastructure as well as associated power lines and substations, Musina, Limpopo, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Mulilo Coal Fired Power Station and associated infrastructure as well as associated power lines and substations in the Musina area of the Limpopo Province. Client: Parsons Brinkerhoff Africa and Mulilo Power.

- Pebble Bed Modular Reactor Demonstration Plant and Associated Infrastructure, Western Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Pebble Bed Modular Reactor Demonstration Plant and Associated Infrastructure in the Western Cape Province. Client: Eskom Generation.
- Proposed Bantamsklip – Kappa 765 kV Transmission Lines and associated infrastructure, Western and Northern Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for four 260km 765kV powerlines between the Bantamsklip Nuclear Power Station Site and the proposed new Kappa Substation in the Karoo, Western Cape Province. Client: Eskom Transmissions.
- Proposed Bantamsklip – Bacchus, Bacchus - Kappa and Bacchus – Muldersvlei 400 kV Transmission Lines and associated infrastructure, Western and Northern Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a number of 400kV powerlines between the Bantamsklip Nuclear Power Station Site and a number of substations, including Bacchus, Kappa and Muldersvlei, in the Western Cape Province. Client: Eskom Transmission.
- Westgate – Tarlton – Kromdraai 132 kV Sub-Transmission line and associated infrastructure, Gauteng, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the Westgate – Tarlton – Kromdraai 132 kV Sub-Transmission line and associated infrastructure in the Gauteng Province. Client: Eskom Distribution – Central region.
- Environmental Scoping Study for the proposed new distribution line and substation for Eskom, Dundonald, Mpumalanga (also involved in the Public Participation Process**)**, Mpumalanaga, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 132kV powerline as well as a new substation in the Tarlton area of Gauteng.
- The proposed new 132 kV sub-transmission line between the Dinaledi and GaRankuwa substations for Eskom, GaRankuwa, North West, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 132kV powerline between the Dinaledi and GaRankuwa substations in the GaRankuwa area of the North West Province. Client: Eskom Distribution.
- Expansion of the Transmission powerline network and associated infrastructure between the Perseus substation and the Beta substation, Free State, South Africa (2008): Project Manager. This project involved the compilation of an alignment specific construction Environmental Management Plan for the 13km 765kV Perseus Beta Turn-ins. Eskom Transmission
- Tarlton – Kromdraai 132 kV Sub-Transmission line and associated infrastructure, Gauteng, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 132kV powerline as well as a new substation in the Tarlton area of Gauteng. Client: Eskom Distribution – Central Region.
- Basic Assessment for the proposed Watershed – Mmabatho 88kV Power line. North West, South Africa (2008): Project Manager. This project involved the compilation of a Basic Assessment and Environmental Management Plan for a new 88kV powerline near Mmabatho in the North West Province. Client: Eskom Distribution – Central Region.

- Proposed Watershed – Mmabatho 88kV Power line. North West, South Africa (2007): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the Watershed – Mmabatho 88kV Power line in the North West Province. Client: Eskom Distribution – Central Region.
- Proposed Combined Cycle Gas Turbine Plant and Associated Infrastructure near Majuba, Mpumalanga, South Africa (2007): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Combined Cycle Gas Turbine Plant and Associated Infrastructure near Majuba in the Mpumalanga Province. Client: Eskom Holdings SOC Limited.
- Proposed Capacity Increase of the Atlantis OCGT Plant and Associated Infrastructure, Western Cape, South Africa (2006): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Capacity Increase of the Atlantis OCGT Plant and Associated Infrastructure in the Western Cape Province. Client: Eskom Generation.
- Proposed Concentrated Solar Thermal Plant in the Northern Cape, South Africa (2006): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Concentrated Solar Thermal Plant near Upington in the Northern Cape Province. Client: Eskom Holdings SOC Limited.
- Proposed Underground Coal Gasification plant, Eskom, Mpumalanga, South Africa (2006): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Underground Coal Gasification plant near the Majuba Power Station in the Mpumalanga Province. Client: Eskom Holdings SOC Limited.
- Proposed new Coal-fired Power Station in the Lephalale Area for Eskom, Limpopo, South Africa (2005): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed new Coal-fired Power Station in the Lephalale Area in the Limpopo Province. Client: Eskom Generation.
- Proposed Open Cycle. Gas Turbine Power Station at Atlantis for Eskom, Western Cape, South Africa (2005): Environmental Consultant. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Open Cycle. Gas Turbine Power Station at Atlantis in the Western Cape Province. Client: Eskom Generation.

Infrastructure Sector

- Emalahleni Water Treatment Plant Amendment Project (EWRP) (2020). Project Manager. Compilation of a Part 1 Amendment Process for the changes to the EWRP Environmental Authorisation as well as an update of the Environmental Management Programme for the EWRP near Emalahleni in Mpumalanga, South Africa. Client: Anglo American
- Hendrina Leachate Dam (2018): Project Manager. This project involves the compilation of a Basic Assessment and Environmental Management Plan for a leachate Dam at the Domestic Waste Landfill Site at the Hendrina Power Station. Client: Eskom Holdings SOC Limited.
- Rehabilitation of the R34 between Vryburg and Schweizer-Reneke, North West, South Africa (2016): Project Manager. This project involved the compilation of a Basic Assessment and Environmental Management Plan for the upgrading of the R34 between Vryburg and Schweizer-Reneke. Client: SANRAL
- Proposed Expansion of the Cremation Facilities at the Envirocin Pet Crematorium, Gauteng, South Africa (2013): Project Manager. This project involves the compilation of a basic assessment for the expansion of the cremation facilities at

the Evnirocin Pet Crematorium in Kyasands, Gauteng Province. Client: Envirocin Incineration Systems CC.

- Proposed Kraft Paper Mill in Frankfort, Frankfort, Free State, South Africa (2013): Project Manager. This project involved the undertaking of an Environmental Impact Assessment, including the compilation of an Environmental Management Programme, for the proposed establishment of a KRAFT paper mill in Frankfort in the Free State Province. Client: Industrial Development Corporation of SA (Pty) Ltd.
- Rehabilitation of the N14 between Delerayville and Sannieshof, North West, South Africa (2011): Project Manager. This project involved the compilation of a Basic Assessment and Environmental Management Plan for the upgrading of the N14 between Sannieshof and Delerayville as well as the construction of a new bridge over the Hartsriver. This project also included the compilation of Water Use License and Mining Permit Applications. Client: SANRAL.
- Proposed new Waterfall Cemetery, Limpopo, South Africa (2011): Project Manager. This project involved the compilation of a Basic Assessment and Environmental Management Plan for the new Waterfall Cemetery, Limpopo Province. Client: Makhado Municipality.
- Route determination of the proposed Metro Boulevard, Gauteng, South Africa (2008): Project Manager. This project involved the undertaking of an Environmental Impact Assessment for the route determination of the proposed Metro Boulevard in the Weltevreden Park Area of the Gauteng Province. Client: Johannesburg Roads Agency.
- Proposed new fuel supply pipeline between Milnerton and Atlantis, Western Cape, South Africa (2007): Project Manager. This project involved undertaking an Environmental Impact Assessment for the proposed new fuel supply pipeline between Milnerton and Atlantis to supply the Ankerlig Power Station in the Western Cape Province. Client: Eskom Generation.

Mining Sector

- Establishment of the Proposed Rietvlei Opencast Coal Mine, Mpumalanga, South Africa (2013): Project Manager. This project involves the undertaking of an integrated environmental authorisation process, including an Environmental Impact Assessment, Environmental Management Programme Report, Waste Management License Application and Water Use License Application, for the establishment of an opencast coal mine north of Middelburg. Client: Rietvlei Mining Company.
- Decommissioning of Redundant Infrastructure at the Vaal River Operations, North West and Free State, South Africa (2013): Project Manager. This project involves undertaking an integrated Environmental Authorisation and Waste Management License process for the proposed decommissioning of redundant infrastructure at AngloGold Ashanti's Vaal River Operations. Client: AngloGold Ashanti.
- Decommissioning of Redundant Infrastructure at the West Wits Operations, Gauteng, South Africa (2013): Project Manager. This project involves undertaking a Basic Assessment process for the proposed decommissioning of redundant infrastructure at AngloGold Ashanti's West Wits Operations. Client: AngloGold Ashanti (Pty) Ltd.
- Inyanda Mine Pegasus South Expansion, Mpumalanga, South Africa (2011): Project Manager. This project included the compilation of an Environmental Impact Assessment, Environmental Management Plan, the Amendment of the existing Environmental Management Programme Report and the amendment of the existing Water Use License for the Inyanda Mine Pegasus South Expansion project, north of Middelburg in the Mpumalanga Province. Client: Exxaro Coal (Pty) Ltd.

- Sishen Infrastructure Program, Northern Cape, South Africa (2010): Project Manager. This project involved the compilation of an Environmental Impact Assessment and an Environmental Management Plan for the infrastructure expansion programme proposed by the Sishen Mine in the Northern Cape. Client: Sishen Iron Ore (Pty) Ltd.
- Prospecting Permit Applications in the Kuruman area of the Northern Cape, South Africa (2011): Project Manager. This project involved the compilation of Environmental Management plans as part of six applications for Prospecting Permits in the Kuruman area of the Northern Cape. Client: Sound Mining Solutions.
- Borrow pits required by the Limpopo Department of Roads and Transport, Limpopo, South Africa (2010): Project Manager. This project involved the compilation of Environmental Management plans as part of the applications for Mining Permits for borrow pits required for the rehabilitation of provincial roads in the Limpopo Province. Client: Limpopo Department of Roads and Transport.
- Borrow pits required for the Medupi Coal Fired Power Station, Limpopo, South Africa (2008): Project Manager. This project involved the compilation of Environmental Management plans as part of the applications for Mining Permits for borrow pits required for the Medupi Coal Fired Power Station in the Limpopo Province. Client: Eskom Generation.
- Borrow pits required for the Ingula Pumped Storage Scheme, KwaZulu-Natal, South Africa (2008): Project Manager. This project involved the compilation of Environmental Management plans as part of the applications for Mining Permits for borrow pits required for the Ingula Pumped Storage Scheme in the Kwa-Zulu Natal Province. Client: Eskom Generation.
- Project Manager, Mining Right Application for a 23 Hectare Borrow Pit required for the Steelpoort Pumped Storage Scheme, Mpumalanga, South Africa (2007): Project Manager. This project entailed the compilation of the required Environmental Management Programme Report in support of a Mining Right Application for a 23 Hectare Borrow Pit required for the Steelpoort Pumped Storage Scheme in the Mpumalanga Province. Client: Eskom Generation.
- Renewed Mining and Prospecting Activities on the farm Quaggaskop 215, Vanrhynsdorp, Western Cape, South Africa (2004): Environmental Consultant. This project involved the compilation of an Environmental Management Programme Report for the recommencement of mining and prospecting activities on the farm Quaggaskop 215 outside Vanrhynsdorp in Western Cape Province. Client: Minexpo.

Waste Management Projects

- Sasol Waste Management Environmental Management Programme (2019). Compilation of an operational Environmental Management Programme for the Sasol Waste Ash Facility, Charlie 1 Disposal Facility and the Waste Recycling Facility. Client: Sasol Secunda Operations.
- Proposed continuous Ashing at Majuba Power Station, Mpumalanga, South Africa (2012): Project Manager. This project entailed the compilation Environmental Impact Assessment and Waste Management License Application for the proposed continuous ashing project at the Majuba Power Station in Mpumalanga. Client: Eskom Holdings SOC Limited.
- Proposed continuous Ashing at Tutuka Power Station, Mpumalanga, South Africa (2012): Project Manager. This project entailed the compilation Environmental Impact Assessment and Waste Management License Application for the proposed continuous ashing project at the Tutuka Power Station in Mpumalanga. Client: Eskom Holdings SOC Limited.
- Proposed extension of Ash Dams at Hendrina Power Station, Mpumalanga, South Africa (2011): Project Manager. This project entailed the compilation

Environmental Impact Assessment and Waste Management License Application for the proposed extension of the ash dams at the Hendrina Power Station in Mpumalanga. Client: Hendrina Power Station.

- Phase 1 of the Environmental Impact Assessment for the Proposed Regional General and Hazardous Waste Processing Facility, Eastern Cape (2005). Project Manager. This project entailed the compilation Environmental Impact Assessment for the Proposed Regional General and Hazardous Waste Processing Facility in the Eastern Cape. Client: Coega Development Corporation.

Specialist Projects

- Strategic Environmental Assessment for the Development. Master Plan Greater Port Harcourt, Rivers State, Nigeria, Africa (2008): Senior Environmental Consultant. This project entailed the compilation of a Strategic Environmental Assessment for the City of Port Harcourt as part of the development of the Master Plan for the Greater Port Harcourt Area. Client: Port Harcourt Government
- Development of an Environmental Policy, Gauteng, South Africa (2006): Environmental Consultant. This project entailed the development and compilation of an environmental policy for the Ekurhuleni Metropolitan Municipality. Client: Ekurhuleni Metropolitan Municipality.
- Environmental Input into the National Transport Master Plan, South Africa (2007): Environmental Consultant. This project included the provision of strategic environmental input in to the Draft National Transport Plan. Client: Department of Transport.
- Development of the Development Corridors, Ekurhuleni, Gauteng, South Africa (2006): Environmental Consultant. This project included the provision of strategic environmental input in to the Ekurhuleni Metropolitan Municipalities Development Corridor Study. Client: Ekurhuleni Metropolitan Municipality.

Auditing

- Compliance Audits at South 32 (2016 – 2020): Project Manager. This project involved the environmental compliance audits of the Water Use Licenses for the BMK, Douglas, Klipfontein and Middelburg Mine North and South Sections at South 32 in Mpumalanga. Client: South 32.
- Compliance Audits at Middelburg Water Reclamation Plant (MWRP) (2016 – 2020): Project Manager. This project involved the environmental compliance audits of the Water Use License and Waste Management License for the MWRP at South 32 in Mpumalanga. Client: South 32.
- BioTherm Round 4 Lenders Technical Advisor (2018 - 2021). Project Manager – Environmental. Environmental monitoring of the construction of the Konkoonsies II and Aggeneys Photovoltaic Solar Plants against the IFC Performance Standards. Client: Nedbank.
- Water Use Licence Audits (2019): Lead Auditor: External compliance audits of the water use licences for the Delmas and Argent Powerlines in Mpumalanga. Client: Eskom Holdings SOC Limited.
- Sasol Alrode and Pretoria West Depot Audits (2016 - 2020): Lead Auditor. Environmental compliance audits for environmental authorisations and environmental management plans for the Sasol Alrode and Pretoria West Depots. Client: Sasol Oil (Pty) Ltd
- Sasol Regulation 34 Audits (2019): Lead Auditor. Environmental compliance audits for 13 authorisations for the Sasol Owned Petrol Filling Stations. Client: Sasol Oil (Pty) Ltd
- Regulation 34 Audits at Mogalakwena Mine (2019). Project Manager. Environmental compliance audits of the EMPR and various environmental

authorisations at the Mogalakwena Mine in the Limpopo Province. Client: Anglo American Platinum.

- Sasol Environmental Authorisations and Environmental Management Plans for the Secunda Operations (2019): Lead Auditor. Environmental compliance audits for 49 authorisations for the Sasol Secunda. Client: Sasol Secunda Operations
- Waste Management Licence Compliance Audit and PCB Plan Close Out Audit, Phalaborwa, Limpopo, South Africa (2019): Project Manager. Environmental compliance audit of a WML and the PCB Plan for the Palabora Mine. Client: Palabora Company
- Sasol Mining Water Use Licence Compliance, South Africa (2018): Project Manager. Environmental compliance audit of six WULs held by mining operations in Secunda. Client: Sasol Mining
- Waste Management License Audits for the Sasol Waste Ash Site, Secunda, Mpumalanga, South Africa (2014 - 2019): Lead Auditor. These projects involve the annual and biannual environmental compliance auditing of the Waste Management licenses for various waste facilities at the Secunda Site in Mpumalanga Province. Client: Sasol Chemical Industries: Secunda Synfuels Operations
- Legal Assessment at South 32 (2019): Project Manager and Lead Auditor. This project involved the assessment of legal compliance against the mine's legal register for the Klipfontein and Middelburg Mine North and South Sections at South 32 in Mpumalanga. Client: South 32
- InvestChem Annual Environmental Compliance Monitoring, Kempton Park, Gauteng, South Africa (2013 - 2019): Lead Auditor. This project involved the annual environmental compliance auditing for InvestChem's Sulphonation Plant in Kempton Park, Gauteng Province. The monitoring included InvestChem's compliance to various commitments contained in their environmental management programmes and conditions within their environmental authorisations (records of decision). Client: Investchem (Pty) Ltd.
- Compliance Audits at Sasol Alrode and Pretoria West Depots (2015-2019). Project Manager and Lead Auditor. Annual Environmental compliance auditing of the Environmental authorisations at the Alrode and Pretoria West Depots in Gauteng. Client: Sasol Oil (Pty) Ltd
- Water Use Licence for the Letabo Power Station (2018): Project Manager. Environmental compliance audit of the WUL held by Eskom Letabo Power Station, Free State, South Africa. Client: Eskom Holdings
- Compliance Audits at Kriel Colliery (2018): Project Manager. This project involved the environmental compliance audits of the Water Use Licenses held by Kriel Colliery in Mpumalanga. Client: Seriti Coal
- Legal Assessment at South 32 (2017): Project Manager and Lead Auditor. This project involved the assessment of legal compliance against the mine's legal register for the BMK, Douglas, Klipfontein and Middelburg Mine North and South Sections at South 32 in Mpumalanga. Client: South 32
- EMPR Performance Assessment Report at South 32 (2016): Project Manager. This project involved the formal assessment and verification of the Environmental Management Programme Report for the BMK, Douglas, Klipfontein and Middelburg Mine North and South Sections at South 32 in Mpumalanga. Client: South 32
- Compliance Audit for the Bokpoort Concentrating Solar Power (CSP) Facility, Groblershoop, Northern Cape, South Africa (2016): Lead Auditor. This project involved the environmental compliance auditing of the Waste Management License, Environmental Authorisation and Water Use License for the Bokpoort

CSP Facility near Groblershoop in the Northern Cape Province. Client: ACWA Power Solafrica Bokpoort CSP Power Plant (Pty) Ltd.

- EMPR Performance Assessment Report for the Landau Colliery, Mpumalanga, South Africa (2013): Auditor. This project involved the formal assessment and verification of the Landau Colliery Environmental Management Programme Report, conducted in accordance with Regulation 55 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002). Client: Anglo Thermal Coal.
- Waste Management License Audit for the Slagment Operation, Vanderbijlpark, Gauteng, South Africa (2013): Lead Auditor. This project involved the annual environmental compliance auditing for AfriSam's Slagment Operation in Vanderbijlpark in Gauteng Province. The audit included AfriSam's compliance to the conditions of their waste management license. Client: AfriSam Southern Africa (Pty) Ltd.
- EMPR Performance Assessment Report for the New Vaal Colliery, Free State, South Africa (2006-2007): Auditor. This project involved the formal assessment and verification of the New Vaal Colliery Environmental Management Programme Report, conducted in accordance with Regulation 55 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002). Client: Anglo American Thermal Coal.

Environmental Control Projects

- N14 rehabilitation between Sannieshof and Delareyville, North West, South Africa (2012): Environmental Control Officer. This project involved the monthly auditing of the contractor's compliance with the conditions of the approved Environmental Management Plan as well as ad hoc environmental advise to the Project Engineer and SANRAL. Client: SANRAL.
- Delmas and Bontleng Waste Water Treatment Works, Mpumalanga, South Africa (2009): Environmental Control Officer. This project involved a once off compliance audit of the above-mentioned Waste Water Treatment Works. Client: Victor Khanye Municipality.
- Nkonjaneni Water Borne Sewer Project in Piet Retief, Mpumalanga, South Africa (2009): Environmental Control Officer. This project involved the monthly auditing of the contractor's compliance with the conditions of the approved Environmental Management Plan as well as ad hoc environmental advise to the Project Engineer. Client: Mkhondo Local Municipality.
- Upgrading of the Waterval Water Care Works, Gauteng, South Africa (2005-2007): Environmental Control Officer. This project involved the monthly auditing of the contractor's compliance with the conditions of the approved Environmental Management Plan. Client: ERWAT.
- Lotus Gardens Ext 2 Township establishment, Gauteng, South Africa (2003): Environmental Control Officer. This project involved the monthly auditing of the contractor's compliance with the conditions of the approved Environmental Management Plan. Client: City of Tshwane.

Training

- N14 rehabilitation between Sannieshof and Delareyville, North West, South Africa (2012): Project Manager. This project involved the provision of training for the staff of the N14 rehabilitation project with regards to the contents of the environmental management plan. Client: SANRAL.
- Training in Environmental Aspects and Rehabilitation for the Small Scale Mining Division of Mintek, City, Province, South Africa (2004): Trainer. This project involved the provision of environmental awareness training for delegates involved in the small scale miner training programme run by the Mintek small scale mining division. Client: Mintek

- Training in Environmental Aspects and Impacts, Germiston, Gauteng, South Africa (2004): Trainer. This project involved the provision of environmental aspects and impacts training for the staff of Transwerk in Germiston. Client: Transwerk Germiston.

APPENDIX

B LAYOUT MAP

SASOL CHEMICAL OPERATIONS

Sasol Wetlands Rehabilitation

Wetland Intervention Map

Legend

- Optional Interventions
- Interventions
- SASOL Monitoring
- Sasol Wetland (VBC08)
- Provincial Roads
- Rivers

N

0 300 600 900

Meters

DISCLAIMER

WSP ENVIRONMENTAL (PTY) LTD

DATA SOURCE:

SOUTH AFRICAN DEPARTMENT OF RURAL DEVELOPMENT AND LAND REFORM- CHIEF DIRECTORATE: NATIONAL GEO SPATIAL INFORMATION

PROJECTION: GCS_WGS_1984

PROJECT TITLE:
Sasol Wetland Rehabilitation BA and WULA

SCALE: 1:30 000	DRAWN BY: TUMELO TSEPHE
DATE: 2020/08/07	REVIEWED BY: NASEEB KHAN

FIGURE NO: 3	PROJECT NO: 41102202	REV: 1

APPENDIX

C WETLAND REHABILITATION, MAINTENANCE AND MANAGEMENT PLAN

GOLDER
MEMBER OF WSP

REPORT

Description of Proposed Wetland Interventions and Management Actions to Inform the Water Use Licensing Application

SECUNDA CHEMICAL OPERATIONS LIMITED

Submitted to:

Mr. Johann Veldman
Sasol Chemical Operations
Secunda

Submitted by:

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1.0 INTRODUCTION

Golder Associates Africa (Pty) Ltd. (Golder) was commissioned by Secunda Chemical Operations (SCO), a division of Sasol South Africa (Sasol), to design wetland interventions to rehabilitate the degraded VBC08 wetland. This wetland is located upstream of the Sasol Synfuels Plant along a southern tributary of the Groot Bossiespruit in the C12D quaternary catchment (Figure 1).

A telephonic pre-consultation meeting was held with the Department of Water and Sanitation (DWS) on 19 March 2021. The DWS requested specific information to support the Integrated Water Use Licence (IWUL) application that is being compiled to apply for the licensing of the proposed interventions. These are summarised in Table 1.

The purpose of this report is to support the IWUL application by describing the proposed wetland interventions and the key wetland management actions and monitoring requirements. This report should be read together with the supporting information such as the detailed design report, construction method statement, etc. as referenced throughout this report. Notes indicating where the supporting information can be found are given in Table 1.

Table 1: Summary of DWS requirements and supporting information

Summary of DWS requirements	Reference
Wetland delineation and assessment report	The Biodiversity Company, 2020
Wetland rehabilitation plan and programme	This report, supported by the detailed design report[1]
Landscape maintenance plan	Landscape maintenance plan in APPENDIX C and monitoring and maintenance programme (section 10.0)
Plant species plan	Section 7.0 and APPENDIX C
Wetland management plan	Section 9.0
Method statement	APPENDIX B
Designs and drawings for weirs and other interventions that will be undertaken	Section 4.0, supported by the detailed design report
Master layout plan	Figure 5: Intervention layout plan, supported by the engineering drawings in the detailed design report
Pre-and post-intervention flood lines	The flood lines are indicated in the hydrology memo attached as APPENDIX D.

[1] Detailed Design Report on the Wetland Interventions at VBC08. Golder report no: 20365014-342027-2, dated May 2021

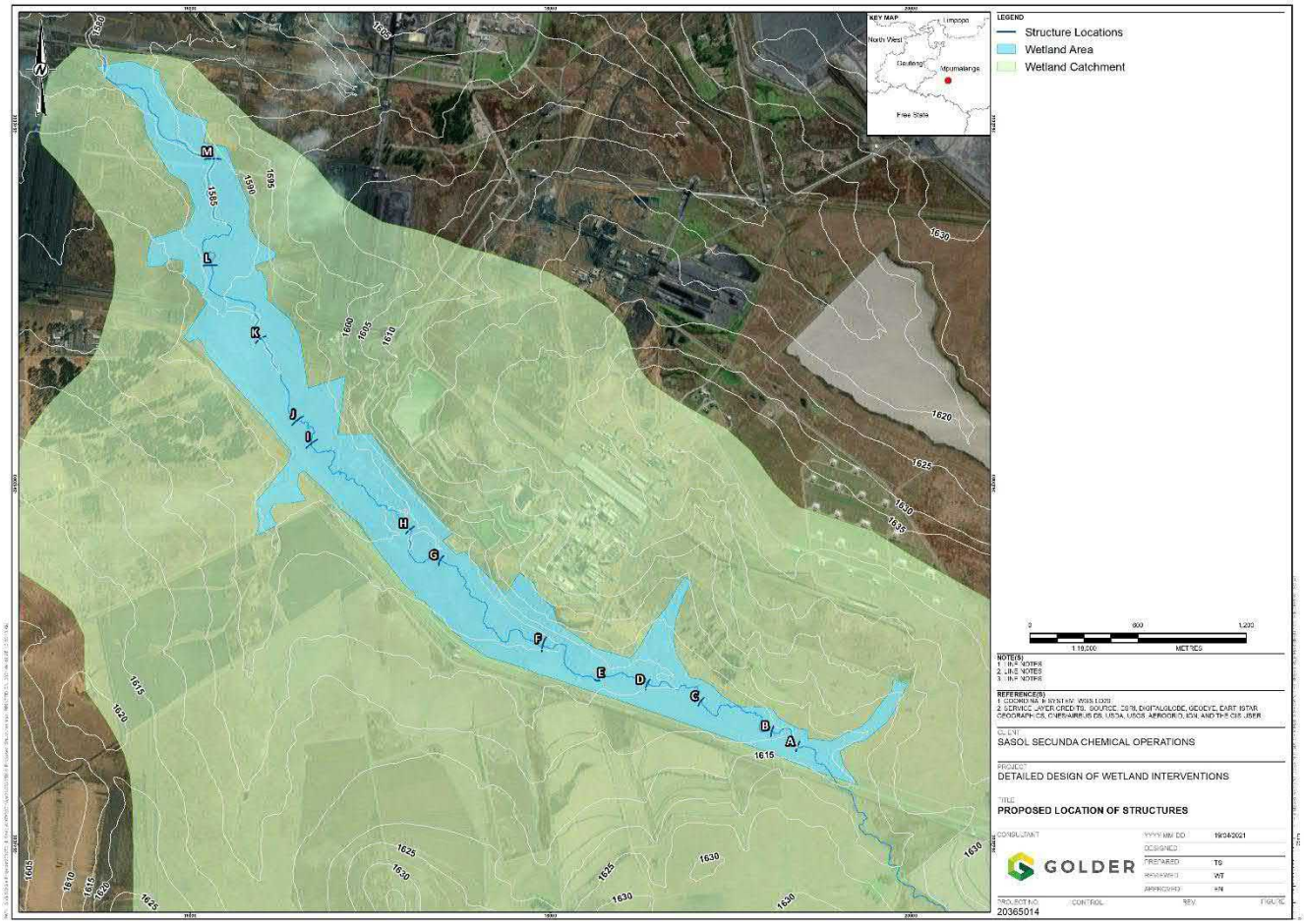


Figure 1: Locality map of the VBC08 wetland within the C12D quaternary catchment with the proposed intervention sites labelled from A to M

2.0 CURRENT WETLAND STATUS

The VBC08 wetland is an incised valley bottom wetland with a relatively shallow and narrow channel in the upper reaches but with significant incision in the lower reaches. The wetland is traversed by several road and conveyor crossings and has in the past received spills of contaminated water from the Sasol Nitro Plant that flanks the middle/eastern section of the wetland. In addition, parts of the wetland have received deposits of coal that were washed in from coal spillages along the conveyor routes under stormflow conditions. It is also possible that other phosphate and/or nitrate-rich contamination hot spots are present along the upper slopes of the wetland area on the eastern side, as observed from variations in vegetation species and/or vegetation die-back and discolouration as well as groundwater quality.

Much of the wetland has natural grassland, with wetter areas being colonised by bulrush (*Typha latifolia*) and reeds (*Phragmites australis*). Kikuyu has also established in drier parts of the wetland. The general underutilisation of the wetland vegetation (by grazing) has resulted in much of the established grass cover being moribund. Stormflow disturbance in the wetland has also resulted in localised scour (disturbance) with these areas being colonised by weedy species (Golder, 2021a).

A recent biodiversity study of the VBC08 wetland was undertaken by The Biodiversity Company (The Biodiversity Company, 2020). This work determined the Present Ecological State (PES) of the wetland and divided the wetland into two sections. The upper reaches of the wetland (above the Sasol Nitro Plant and within the game park) were classed as being Moderately modified (PES category C), while the lower reaches were classed as being Seriously modified (PES category E).

The VBC08 wetland system is bounded by a conveyor belt and powerline servitude along its southwestern boundary, and site access roads and plant infrastructure along its north-eastern extent; factors which typically affect the hydrological and geomorphological characteristics of a wetland (Macfarlane *et al.,* 2008).

The main contributing factors for the low PES scores included the impediment of flow by the presence of the conveyor and the road crossing, as well as the lack of species diversity and presence of alien invasive species.

The system is highly incised, and this contributes to substantial peak flows of 44 m³/s for a 1:10 year 24-hour storm event.

3.0 DESIGN OBJECTIVES AND INTENT

The main design objective/ design intent was to stabilise the wetland system to improve the hydrological functioning of the system. The secondary design objectives vary based upon the location of a specific intervention within the stream reach. Each wetland intervention has been designed to be fit for purpose to achieve the design objectives in that specific location. Once the hydrological functioning has been improved it is expected that other secondary objectives, such as the potential improved ecological functioning of the system, could follow naturally provided that adequate contamination source control and adaptive management are conducted, as schematically illustrated by Figure 2. The system could also be further enhanced through second tier interventions later on, to further improve the ecological functioning of the system.

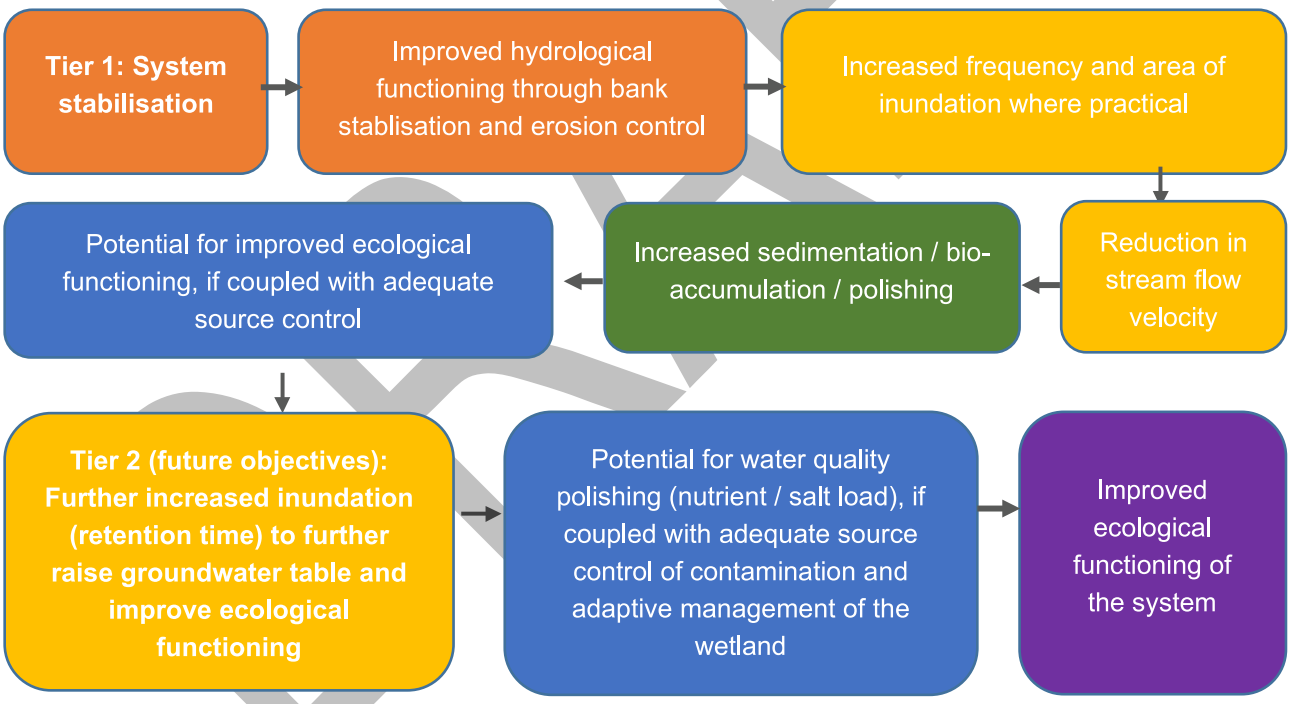


Figure 2: Schematic indicative the primary design objectives, and the secondary design objectives that could follow naturally

4.0 PROPOSED DIRECT INTERVENTIONS

4.1 Intervention zones

From an engineering design perspective, the wetland can be divided into three distinct areas:

- Zone 1: The section upslope of the Nitro Plant that has reasonably good ecological functionality and is much less incised than the downstream areas;

- Zone 2: The section along the Nitro Plant that has been historically impacted by discharges from this site, as well as remnant contaminated sources (e.g. carbonaceous spillages along the conveyor servitude); and
- Zone 3: The section downstream of the conveyor servitude that is characterized by deep incisions in the channeled valley bottom wetland.

The intervention localities of the 13 structures within the wetland are illustrated by Figure 5.

4.2 Intervention material and design considerations

The detailed designs of the proposed wetland intervention structures incorporate various design considerations such as:

- Spillway height (and length) required to pass a 1:20 year 24-hour storm event;
- Founding conditions for each structure, including the depth to competent base material to support a sheet pile wall and mass gravity structure;
- Structure lengths to prevent side cutting, which is erosion around the structures;
- Durability of construction materials given exposure to harsh conditions;
- Area to be disturbed during construction as well as access considerations for plant and machinery during seasonal construction;
- Ease of installation and maintenance; and
- Installation and maintenance costs.

These aspects are discussed in more detail in the detailed design report (Golder, 2021b). A summary of the design alternatives and considerations is given in APPENDIX A.

4.3 Intervention types

Given the design considerations, three types of typical interventions have been designed using modular interlocking DongaLock™ sheets to achieve various configurations as illustrated by Figure 3.

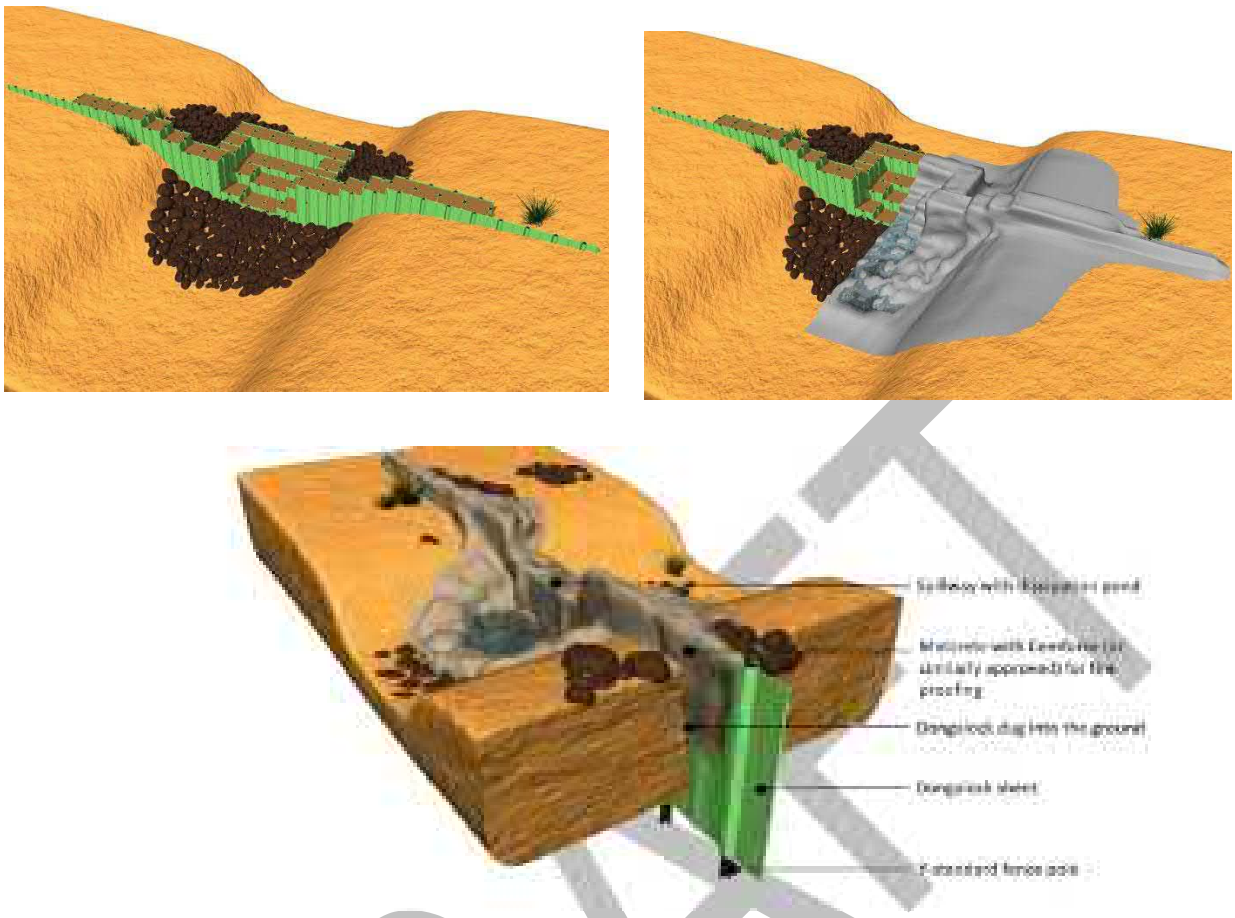


Figure 3: Artistic rendering of typical interventions at VBC08 wetland: Double line boxed DongaLock™ spillway with energy dissipation pond covered with cementitious material

The construction material is a proven technology that has been installed successfully to rehabilitate wetlands.

Figure 4: Examples of installed double line DongaLock™ spillways

4.4 Construction plan

It is proposed that the wetland rehabilitation start at the top of wetland system VBC08 with intervention A and move downward through the system. The top of the wetland is in Zone 1 where stream flows are lower and where the stream channel is shallower. This area will require the installation of smaller interventions where the

construction is more straightforward, and would provide the contractor with the opportunity to understand the construction complexities of DongaLock™ before tackling larger and more complex structures downstream.

It is also recommended that the entire intervention A be built before moving onto intervention B so that the contractor can take all learnings from intervention A and apply them to the remaining interventions. Intervention A should have intensive site supervision by the engineer and wetland ecologist to ensure that the contractor fully understands the construction requirements before moving on to the rest of the site (Golder, 2021b).

It is envisaged that the duration of construction activities would be about four to six months. Construction activities should be limited to the dry season as far as possible.

5.0 INTERVENTION LAYOUT PLAN

The direct interventions comprise the following:

- Zone 1: Interventions A to E comprising single-line DongaLock™ structures (Type 1) in the section upslope of the Nitro Plant that has reasonably good ecological functionality and is much less incised than the downstream areas;
- Zone 2: Interventions F to J comprising double-line box structures (Type 2) in the section along the Nitro Plant that has been historically impacted by discharges from this site, as well as remnant contaminated sources (e.g. carbonaceous spillages along the conveyor servitude); and
- Zone 3: Interventions K to M comprising double-line box structures (Type 3) where the channel is deeply incised.

Figure 5 illustrates the wetland delineation, the intervention zones, the proposed DongaLock™ interventions, the designed wet/inundated areas and associated seasonably wet areas.

The landscape maintenance plan attached in APPENDIX C illustrates the proposed inundated areas and buffer zones as well as the vegetation specifications. The post intervention flood lines are attached in APPENDIX D.

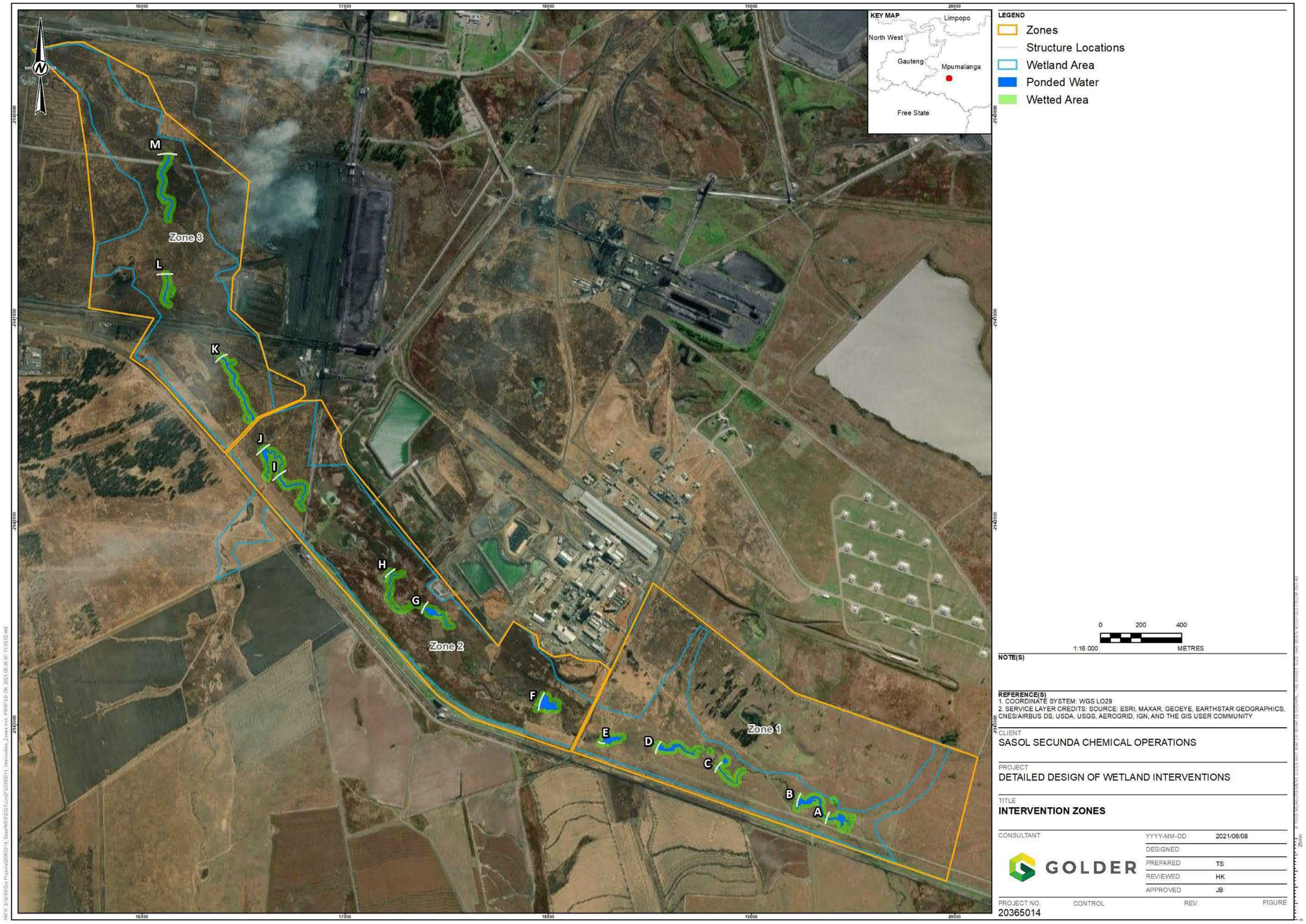


Figure 5: Intervention layout plan

6.0 CONSTRUCTION METHOD STATEMENT

The construction method statement is a guidance document for use by the contractor to guide the implementation of the designs. The construction method statement provides guidance on the following:

- Site demarcation;
- Site establishment and access requirements;
- Impounding stream water that can be pumped around the construction site during operations;
- Site clearance;
- Removal and relocation of *Crinum bulbispermum;*
- Construction activities;
- Rehabilitation activities;
- Site clean-up requirements; and
- Implementation schedule.

The construction method statement is attached as APPENDIX B.

7.0 STANDARD SPECIFICATIONS FOR REHABILITATION ASSOCIATED WITH THE PROPOSED WETLAND INTERVENTIONS

This section summarises the main construction specification in so far as it has a bearing on the protection and rehabilitation of the wetland. Other technical specifications and considerations are covered by the design report and the construction method statement respectively.

7.1 Demarcation of construction area

- Before any construction work commences on site, the footprint of each intervention must be carefully and clearly pegged (for soil and vegetation recovery);
- Access routes through the wetland to the construction sites must also be clearly demarcated, as well as buffer areas around each intervention, including areas immediately above and below each structure where reshaping of stream banks may be required. It is important to keep these areas as small as practically possible to limit construction impacts; and
- All wetland areas outside of the pegged areas should be “no-go” areas. Consider using different coloured pegs to differentiate the smaller footprint of the intervention from the access route and buffer areas around each intervention.

7.2 Removal and re-location of red data species

A single protected flora species is known to occur in the wetland, this is Orange River lily (*Crinum bulbispermum*) which is protected by the Mpumalanga Nature Conservation Act 10 of 1998: Schedule 11. According to the list of protected species under Schedule 11 of the Act; no person may possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected plant unless he or she is the holder of a permit which authorises him or her to do so.

Prior to the commencement of construction works, a dedicated survey must be carried out to determine whether individuals of Orange River lily are growing in the path of the proposed construction work, including the proposed DongaLock™ construction sites, as well as the entire area of steep channel banks, and the road

crossing, that will be subjected to reshaping. Should this be the case, permits for the temporary movement or translocation of individual/groups of specimens should be secured from the Mpumalanga Tourism and Parks Agency (MTPA), and the plants can then be temporarily removed/translocated (Golder, 2021c).

It is advisable to secure the permits well in advance of the commencement of construction so that no administrative delays are experienced. The preconstruction surveys to determine the number of individuals/groups that require permits, and to mark their locations, should therefore take place during the preceding wet season (Golder, 2021c).

Figure 6: Orange River lily (*C. bulbispermum*) flowering and non-flowering forms

7.3 Removal of grass sods

- Before commencing any construction work, all suitable (natural and indigenous) vegetation must be removed from the pegged footprint area of each intervention. Where possible the vegetation should be removed as intact grass sods where the grass should be taken with at least 10 cm of underlying soil. High quality grass sods should be recovered from all of the upper wetland sites (A to D), but this will be more difficult for downstream sites, perhaps with the exception of sites H, I and I; and
- The sods should be placed to one side within the buffer area and watered until construction work has been completed and they can be replaced. Stream water can be used for watering if this is of suitable quality. For sites where there is no vegetation cover, or at least no natural vegetation (i.e., areas covered with weedy exotic species), no sods should be removed before soil stripping. These sites will be seeded after construction, with no vegetative planting.

7.4 Stripping and stockpiling of topsoil

- After the removal of grass sods (where applicable), the remaining A-horizon topsoil (approx. 20-30 cm) should be stripped and stockpiled separately for rehabilitation purposes when construction has been completed. It is important to separate the topsoil stockpiles from any stockpiled G-horizon subsoils. The latter will be used for backfilling, while topsoils will be used to cover backfilled areas and provide a suitable substrate for sodding and / or seeding.

> **Caution**: All soil handing and construction work should be done at the end of the dry season when soils have their maximum strength and construction activities are less likely to cause damage to the wetland soils and vegetation. Where soils are too wet (i.e. have a moisture content at or above their plastic limit) traffic (both people and machines) can result in unwanted soil compaction (increased bulk density) and even soil puddling (with loss of structure) if soils are very wet. Soil damage increases the risk of rehabilitation failure.

7.5 Reshaping of steep banks

- The VBC08 wetland is a Channelled Valley Bottom Wetland, which is incised throughout its length within the study area. The wetland has a shallow incision in its upper reaches (sites A to E), but the channel becomes progressive more deeply incised going downstream;
- Reshaping of the steep channel banks immediately upstream and downstream of each intervention is recommended, to create slopes no steeper than 1:3 that can be stabilised with vegetation;
- Before any reshaping commences the A-horizon (topsoil) material should be stripped away from the channel edge and conserved as a windrow just beyond the crest of the new bank being created. This is to prevent valuable topsoil from being lost into the stream channel during the reshaping work; and
- Immediately after the banks have been reshaped the windrow topsoil can be raked over the new bank area, ready for seeding.

7.6 Rehabilitation after construction

7.6.1 Replacement of sods

- Following construction of the interventions, any exposed / disturbed areas should be dressed with stockpiled topsoil and covered with the grass sods that were set aside before construction;
- The sods should be replaced at approximately the same elevation on the stream bank from which they were stripped. The sods should be kept intact and be spread as evenly as possible over disturbed areas by planting the sods into shallow excavations in the replaced topsoil and by applying foot pressure to the sods to improve contact with the underlying soils; and
- No pegging of the sods is needed because all disturbed areas will also be overseeded and stabilised with a biodegradable mesh that is pegged in place.

7.6.2 Fertilising and seeding of disturbed areas

- All disturbed areas around the interventions and associated with any stream bank reshaping should receive a dressing of topsoil before seeding (preferably using stockpiled topsoil recovered during construction);
- All disturbed and topsoiled areas (including areas where sods have been returned) should be lightly **fertilised**. The following composite fertiliser and application rate is recommended (but is best determined by a soil fertility analysis done by an accredited laboratory):
  - Manually apply a composite N:P:K fertiliser – typically 2:3:2 (22% + 0.5% Zn) at 150 kg/ha, or at the appropriate rate determined by soil analysis; and
  - Manually cultivate the soil to a depth of 10 cm to incorporate the fertiliser.
- All topsoiled and fertilised areas must be seeded as early in the growing season (Spring) as possible. This is to allow the grass seed to germinate and establish early in the wet season to provide a stabilising vegetation cover to reduce soil erosion losses;
- Where **seeding** is done before the onset of the Spring rains, and where early establishment of a grass cover is required, the seeded areas will need to be irrigated to ensure successful establishment. Ponded water in the wetland can be used as a supply of irrigation water if this is of suitable quality;
- The following seed mix and seeding rate is recommended:
  - Manually sow the seed mixture below over the prepared soils:

    Eragrostis tef (Teff – annual nurse crop) 1.0 kg/ha

Chloris gayana (Rhodes grass)	5.0 kg/ha
Digitaria eriantha (Smutsfinger grass)	5.0 kg/ha
Panicum maximum (Guinea grass)	5.0 kg/ha
Cynodon dactylon (Bermuda grass)	4.0 kg/ha
Total	**20 kg/ha**

- Lightly roll or tamp the surface of the soil to improve soil/ seed contact for improved germination and establishment success.
- Make provision to manually water the seeded areas for a period of at least 4 weeks (watering twice a week and until reliable Spring rains commence.

Note – Biodiversity considerations: The VBC08 wetland is not a pristine wetland as evidenced by the presence of many weedy plant species and declared invasive species, including kikuyu, within the wetland. As noted earlier the lower reaches of the wetland are Seriously modified (PES category E) while the upper reaches are Moderately modified (PES category C). The species provided in the seed mix above are commercially available and will provide rapid stability to the disturbed soils in the first few seasons.

It is expected that as the wetland hydrology changes the natural wetland species will re-establish from propagules in the replaced topsoils, and the seeded species will be replaced by these hydrophilic species.

Generally, the seed of wetland species is not commercially available in large quantities, and if it is available this is usually at significant cost. If the enhancement of wetland biodiversity is deemed a key objective of the rehabilitation effort, then this can be achieved by harvesting provenance seed from vigorous grasslands in the upper reaches of the wetland. The ripe seed or inflorescences of wetland grasses, sedges and other wetland plants must be harvested at the correct time (usually early to mid-summer), for drying and later seeding or mulching over areas being rehabilitated. The professional advice of an experienced botanist or ecologist should be sought on the best timing for seed harvesting.

Collected natural seed or mulch can be spread over seeded / topsoiled areas and lightly rolled to improve the contact of the seed with the soil. This overseeding should be done before slopes and other disturbed areas are covered with a stabilising biodegradable mesh.

7.6.3 Armorflex blocks (small spillway at intervention E)

- Strip wetland vegetation sods over footprint to be disturbed (strip vegetation together with at least 100 mm soil, set aside & keep alive with watering until replanted);
- Strip balance of A-Horizon topsoil (to a total depth of 250 mm or transition to subsoil, set aside for use in rehabilitation);
- Mix fertiliser (at 150 kg/ha or ~100 g/m3) and compost (10t/ha or ~5 kg/m3) to stripped topsoil;
- Place amended topsoil (with fertiliser & compost added) over Armorflex blocks to fill the spaces (lacunae);
- Break grass sods to the right size (approx. 150mm diameter) – and plant into every 4th lacuna (replant balance of sods in any available disturbed areas around the Armorflex bed);
- Manually sow a suitable seed mix over topsoiled areas and lightly tamp seed into topsoil within Armorflex blocks. Use the following seed mix:

Eragrostis tef (Teff – annual nurse crop)	1.0 kg/ha
Paspalum notatum (Baja)	12.0 kg/ha

Cynodon dactylon (Bermuda grass)	12.0 kg/ha
Total	25.0 kg/ha

- Seeding must be done at least 6 weeks before the commencement of the Spring rains to ensure that germinated plants are properly rooted before the spillway carries water. Irrigate seeded areas twice a week until seeds have germinated and reliable rainfall is assured.

7.6.4 Stabilising degraded areas with biodegradable mesh

- All seeded areas must be covered with a biodegradable woven jute mesh (~65% porosity) to reduce erosion damage and to hold grass sods, seed and mulch (if applied) in place as the vegetation cover establishes;
- The jute mesh must be keyed into an earthen anchor trench at the top of the slope or on the upstream side on flatter areas. The mesh strips must be stitched together or at least have a 150 mm overlap (with the overlap done to shed water like the tiles of a roof – meaning that the free end of the overlap should always points downstream). The mesh must be secured in place by driving wooden pegs through the mesh at 1 m centres, ensuring that overlap areas are properly pegged;
- Where natural wetland vegetation is present on the area to be disturbed, strip grass/sedge sods for later rehabilitation (strip vegetation together with at least 100 mm soil, set aside & keep alive with watering until replanted). Applicable primarily to Zone1;
- Strip balance of A-Horizon topsoil (to total depth of 250 mm or transition to subsoil, set aside for use in rehabilitation);
- Following construction and reshaping, replace topsoil by spreading all available stockpiled topsoil evenly over disturbed areas;
- Where applicable, replant grass sods evenly over topsoiled areas;
- Manually apply a composite N:P:K fertiliser – typically 2:3:2 (22% + 0.5% Zn) at 150 kg/ha, or at the appropriate rate determined by soil analysis, and manually incorporate fertiliser into the topsoil to a depth of 100 mm;
- Manually sow an appropriate seed mix over topsoiled areas and lightly tamp seed into topsoil. Use the following seed mix:

Eragrostis tef (Teff – annual nurse crop)	1.0 kg/ha
Chloris gayana (Rhodes grass)	4.0 kg/ha
Digitaria eriantha (Smutsfinger grass)	5.0 kg/ha
Cynodon dactylon (Bermuda grass)	10.0 kg/ha
Total	20.0 kg/ha

- Place biojute (~65% porosity or equivalent biodegradable mesh) over all planted and seeded areas. Key mesh into anchor trenches (upslope and or upstream) and peg the mesh in place with wooden pegs at a minimum spacing of 1 m centres, ensuring that overlap areas are properly pegged; and
- Seeding must be done at least 6 weeks before the commencement of the Spring rains to ensure that germinated plants are properly rooted before the heavy summer rains commence. Seeded areas will need to be irrigated twice a week until seeds have germinated and reliable rainfall is assured.

8.0 ADDITIONAL INTERVENTIONS

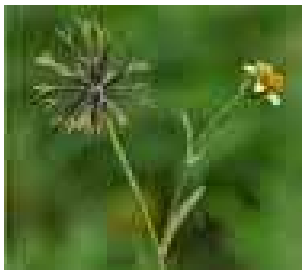
8.1 Alien species control

8.1.1 Alien invasive species present at VBC08

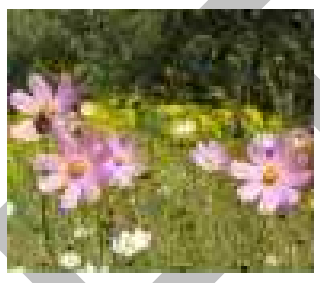
The VBC08 wetland is currently characterised by the extensive presence of herbaceous annual and perennial alien invasive plants including *Tagetes minuta*, *Bidens pilosa* and *Cosmos bipinnatus* and others as illustrated by Figure 7. Dense stands of Kikuyu grass (*Pennisetum clandestinum)* occur especially in the drier areas that have been affected by the presence high "fertiliser" concentrations caused by historical nitrogen and phosphates concentrations from the Nitro Plant.

Isolated stands of Black Wattle and Eucalyptus are also present.

Tagetes minuta (Khakibos) (image sourced from Wikimedia.org)



Bidens pilosa (Black Jack) (image sourced from Wikipedia.org)

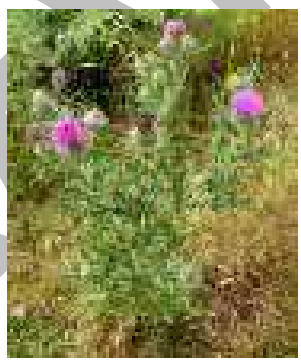


Cosmos bipinnatus (Cosmos) (image sourced from plantsoftheworldonline.org)

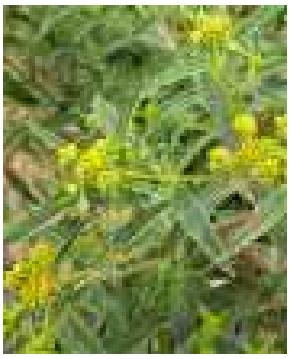
Pennisetum clandestinum (Kikuyu) (image sourced from keys.lucidcentral.org)

Datura stramonium (Stinkblaar/Jimson weed) (image sourced from Monaco Nature Encyclopaedia)

Datura ferox (Large thorn apple) (image sourced from Wikipedia.org

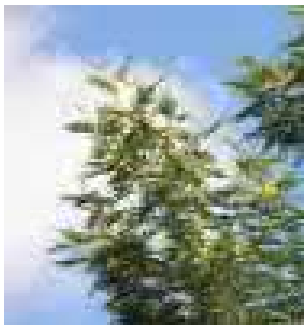


Cirsium vulgare (Scotch thistle) (image sourced from Wikipedia Commons)



Flavaria bidentis (Smelter's Bush) (image sourced from plantsoftheworldonline.com)

Arundo donax (Spanish reed) (image sourced from Dreamstime.com))



Acacia mearnsii (Black Wattle) (image sourced from blogs.sun.ac.za)

Eucalyptus camaldulensis (Red River Gum) (image sourced from www.arc.agric.za)

Figure 7: Series of images of the typical alien invasive species encountered at VBC08

8.1.2 Delineation/mapping of alien invasive species

The biodiversity assessment that was completed by The Biodiversity Company in 2020 included an extensive list of the alien invasive species that are found at the VBC08 wetland (Table 9.5, (The Biodiversity Company, 2020). To phase the control and removal of the alien invasive species to support improved wetland functioning, it is necessary that the occurrence of alien invasive species at the VBC08 wetland be mapped/delineated. The delineation can be used to inform the types and scheduling of the alien invasive species control methods that would be required. The delineation can also be used to assess the success of control interventions over subsequent seasons.

The control methods for the annual and mature invasive species are presented in the sections that follow.

8.1.3 Alien invasive species control

8.1.3.1 Control of annual weeds

Most of the weeds that occur in the area are annuals.

It is envisaged that the gradual rewetting of the wetland that will occur in response to the implementation of the wetland interventions will cause large stands of the alien invasive species to die back naturally and to be replaced by hydrophilic vegetation.

The process of alien invasive species control in the areas adjacent to the wetland (that will remain “dry”) can be enhanced through hand pulling of weed seedlings early in the growing season.

Where hand pulling of dense stands of weeds results in the creation of bare areas the following seed mix and seeding rate are required:

- Manually sow the seed mixture below over the prepared soils:

Eragrostis tef (Teff – annual nurse crop)	1.0 kg/ha
Chloris gayana (Rhodes grass)	5.0 kg/ha
Digitaria eriantha (Smutsfinger grass)	5.0 kg/ha
Panicum maximum (Guinea grass)	5.0 kg/ha
Cynodon dactylon (Bermuda grass)	4.0 kg/ha
Total	**20 kg/ha**

- Lightly roll or tamp the surface of the soil to improve soil/ seed contact for improved germination and establishment success.

Alternatively, the bare areas could be covered with a mulch/thatch sourced from natural wetland seeds vegetation cuttings harvested in Zone 1.

Additionally, improved pasture management as described in section 8.2 will also assist in eradicating alien invasive species.

8.1.3.2 Control of perennial weeds

Kikuyu has likely been seeded in the power line buffer to reduce the risk of fires. The Kikuyu has spread to the adjacent wetland areas. The extensive stands of Kikuyu grass in the wetland areas will die back naturally as the wetland soils rehydrate and anoxic conditions develop in the waterlogged wetland soils. Where dense stands of Kikuyu occur at the outer fringes of the site (that may not be affected by the rewetting of the site – and where Kikuyu requires eradication), it can be controlled through the responsible application of a herbicide spray at the right time of the year.

The wetland areas that are left bare following the treatment of the Kikuyu patches needs to be protected from erosion as follows:

- Cut and bale wetland species from Zone 1 when the seed are ripe. The ripe seed or inflorescences of wetland grasses, sedges and other wetland plants must be harvested at the correct time (usually early to mid-summer), for drying and later seeding or mulching over areas being rehabilitated. The professional advice of an experienced botanist or ecologist should be sought on the best timing for seed harvesting; and
- Use the collected bales as a thatching/mulching layer to protect the bare areas. The thatch layer should be no more than 10 cm thick.

Areas outside of the wetland areas that are left bare following removal of Kikuyu patches can be rehabilitated through seeding the species mix in section 8.1.3.1.

8.1.3.3 Control of mature invasive plants

For larger or mature plants and trees, the physical felling of the plant is most effective method of control. The cut stump should be treated with herbicide to prevent regrowth from occurring.

Mature wattle trees are usually controlled by the Cut stump method where trees are cut approximately 10-15 cm above ground level and the cut area and bark is painted with one of the following approved herbicides as summarised in Table 2:

Table 2: Typical products for the control of mature alien invasive woody species*

Typical herbicide – active ingredient	Typical brand names
fluroxypyr / picloram 80 / 80 g/L ME	Plenum 160 ME (L7702)
imazapyr 100 g/L	Chopper 100 SL (L3444) Hatchet 100 SL (L7409)
picloram (potassium salt) 240 g/L	Access 240 SL (L4920) Browser 240 SL (L7357)
triclopyr (-amine salt) 360 g/L	Lumberjack 360 SL (L7295) Timbrel 360 SL (L4917)

**It is recommended that the advice of a certificated weed control specialist be sought for the effective control of alien invasive weed species.*

The above herbicides are usually applied as an aqueous solution mixed to the correct concentration recommended by the supplier.

8.2 Grassland management

8.2.1 Zone 1

The grassland vigour in Zone 1 is in a much better condition than observed at Zone 2 and Zone 3. Zone 1 is being actively grazed by game stock. It is recommended that this area be managed/grazed in accordance with the carrying capacity of the area in much the same way as present.

8.2.2 Powerline servitude

The vegetation in the powerline servitude (underneath the powerlines) should be cut regularly for safety purposes.

8.2.3 Zone 2 and Zone 3

Substantial areas are currently moribund/underutilised and would benefit from regular but infrequent defoliation, for example every three years. Defoliation can be conducted by controlled burning, controlled grazing or cutting and baling.

Controlled burning is a workable option but given the proximity of the area to gas lines and other hazards it should be carefully managed.

The area could be grazed intensively by cattle or game on a rotational schedule (early in the growing season and then again in the wet season).

The most feasible option for defoliation is possibly to conduct cutting and baling at three-year intervals. The bales can be used for composting or used within the rehabilitated areas to fill and stabilise some of the narrower channels away from the wetland interventions themselves. As the bales become wet and age the organic material will decompose through bacterial and fungal action, resulting in the decomposition of seeds of annual species which will prevent them from spreading and germinating.

After cutting it should be assessed whether further interventions such as thatching and seeding would be required as per the seed mix described in section 8.1.3.1.

8.3 Refinement of source control requirements

The impact of possible sources of contaminant inflow, as well as clean water inflows resulting in dilution, should be better understood to contextualise and interpret the wetland performance in response to the construction of the proposed wetland interventions.

It is recommended that sediment/sludge, coal veneers and water samples be collected from the areas where historical spills are suspected to have occurred. The sediment and coal veneers should be subjected to a typical waste assessment/contaminated land assessment as well as biotoxicity tests. Water samples should be assessed for the standard suite of parameters as well as a full metals analysis.

The areas to be sampled in a once-off assessment may include the following:

- The most upstream point (4.1) is at the dam in the game farm – possible surface water discharge from Sasol Nitro;
- The stream reach 200 m downstream of the game farm – possible discharge of dirty water runoff from the access road (to Sasol Nitro) where it crosses the wetland, as well as a possible discharge from a pipeline passing underneath the access road at this site;

- The area downstream of the two dams at Sasol Nitro including possible concentrated seepage areas where contaminated groundwater plumes enter the wetland between interventions F and G in Zone 2;
- Identification and sampling of a possible source of clean water that is providing dilution of stream water in the 800 m stream reach between RESM 14 and RESM 12;
- Possible contamination sources observed during field inspections and/or on old aerial imagery (2003 to 2016) at:
  - (2021): 26°35’45.39” S and 29°10’47.99” E
  - (2016): 26°35’23.22” S and 29°10’22.65” E
  - (2018): 26°35’19.96” S and 29°10’17.00” E
  - (2016): 26°35’15.47” S and 29°10’15.14” E
  - (2016): 26°35’13.62” S and 29°10’12.01” E
  - (2003): 26°34’37.82” S and 29°09’49.35” E

The outcome of the sampling campaign should be used to determine the requirements for source control interventions, if required, to be implemented as Tier 2 interventions.

9.0 REHABILITATION, MAINTENANCE AND MANAGEMENT PLAN FOR THE PROPOSED INTERVENTIONS

The wetland rehabilitation, management and maintenance plan summarises the key deviations from the standard specifications for Zones 1 to 3. The information is presented as three summaries of the three intervention zones. The information should be read with the standard specifications (section 7.0 and 8.0) as well as the monitoring programme (section 10.0).

The following aspects are summarised in this section for each of the three zones:

- Intervention type;
- Site-specific rehabilitation considerations;
- Specific monitoring and maintenance requirements;
- Qualitative success criteria; and
- Professional statement on how the wetland will respond to the implementation of the interventions.

20365014: SASOL VBC08 WETLAND REINSTATEMENT PROJECT

Description of Proposed Wetland Interventions

GOLDER MEMBER OF WSP

Upstream Wetland Interventions A, B, C and D (Zone 1)

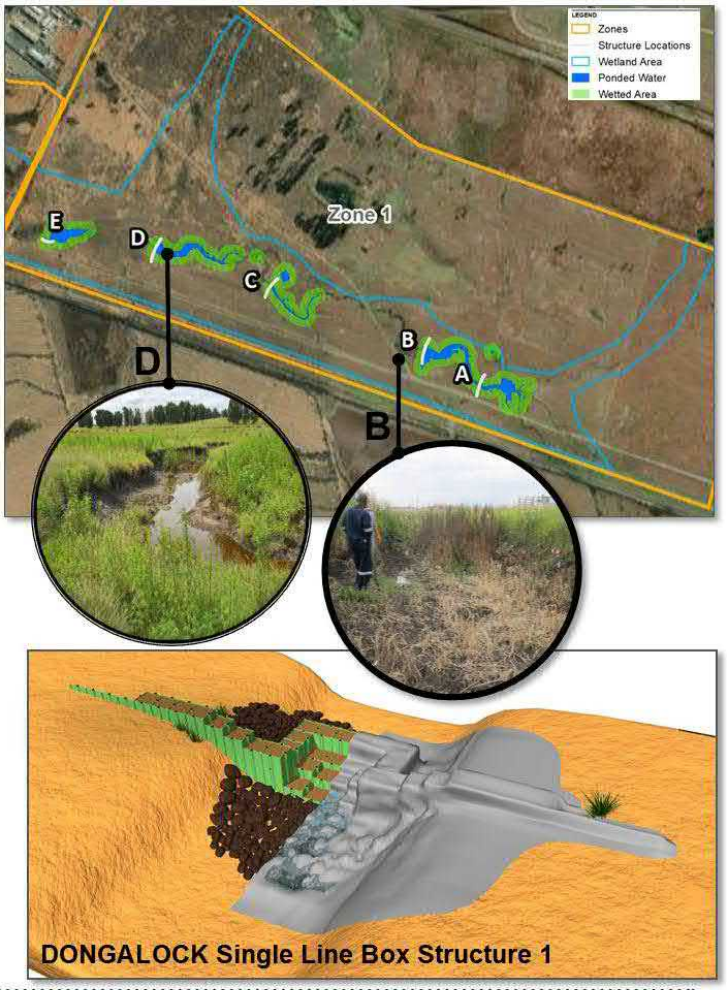
Intervention type(s): Single line box structure (Type 1)

Main design objectives: 1) Improved ecological functioning; 2) Stabilise system to prevent further incision; 3) Allow clean water to move through the system relatively easily by for example the removal of impediments to flow for example the dirt road (at B)

Site-specific rehabilitation considerations: Sourcing of high quality grass thatch/mulch from this upstream area for use in rehabilitation of disturbed areas in Zones 2 and 3; Rehabilitation of redundant dirt road located between interventions points B and C; If in-stream water qualities are suitable, and where stream water is ponded then this could be used for irrigation, alternatively clean irrigation water would need to be trucked in. The likelihood of trucking clean water to site is high given the low flows expected during the construction phase at the end of winter;

Specific monitoring/maintenance requirements: Establishment of a new monitoring point upstream of intervention point (A); Continue with existing defoliation/grazing practices to support grassland vigour.

Success criteria: Successful vegetation establishment on all rehabilitated areas, including the rehabilitated road, and no signs of significant soil loss/erosion. Incised channel stabilized to prevent further deepening/widening.



The implementation of interventions A to D will stabilize the stream channel in Zone 1 by preventing further channel incision. The interventions will also improve the hydrological and geomorphological functioning of this section of the system. The removal of the dirt road and road culverts will reduce flow concentration and erosion risk at this point. In time these interventions are expected to lead to improved ecological functioning as measured by the PES score.

20365014: SASOL VBC08 WETLAND REINSTATEMENT PROJECT

Description of Proposed Wetland Interventions

GOLDER MEMBER OF WSP

Wetland Interventions Sasol Nitro: F, G, H, I and J (Zone 2)

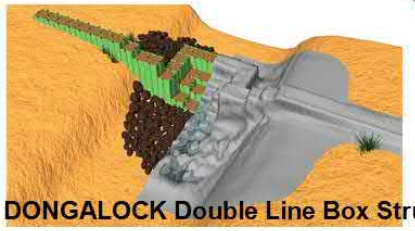
Intervention type(s): Double line box structure (Type 2)

Main design objectives: 1) System stabilization; 2) Increased frequency and area of inundation/wetting; 3) Improved ecological functioning.

Site-specific considerations: Sourcing of high quality grass thatch/mulch from Zone 1 area for the rehabilitation of disturbed areas in Zones 2 and 3; Careful selection and demarcation of a construction access road to minimise disturbance. Avoid as far as possible any disturbance of *Crinum bulbispermum* within demarcated access/construction areas, and where not possible, relocate these plants to suitable alternative sites as advised by a specialist. Where clean water (as demonstrated by sampling) is ponded in wetland depressions then this could be used for irrigation, alternatively clean irrigation water would need to be trucked in. Due to the extensive presence of invasive/weed species in this zone, which has resulted in the loss of natural/wetland vegetation, more emphasis is placed on seeding. The timing of the reshaping of steep banks needs to be aligned with seeding requirements to reduce loss of soil through erosion.

Specific monitoring/maintenance requirements: Ensure implementation of updated monitoring programme and associated adaptive management requirements; Devise and implement a defoliation strategy to assist with weed control and improve grassland vigour;

Success criteria: Successful vegetation establishment on all rehabilitated areas, and no signs of significant soil loss/erosion. Gradual transition to a more typical assemblage of wetland species on the rehabilitated areas around interventions as well as areas where weeds have been removed elsewhere in the wetland. Interventions have increased the areas of ponded areas as per design.



DONGALOCK Double Line Box Structure Type 2

The implementation of interventions F to J will result in increased areas of inundation in Zone 2 which will slow down erosion processes and increase the rate of sedimentation. The groundwater levels are expected to rise in response to the increased inundation. Although second tier interventions may be required to further improve the ecological functioning in Zone 2, the proposed interventions will improve the stability of and the ecological functioning as measured by the PES score. The outcomes of the rehabilitation performance monitoring in Zone 2 will be key in identifying adaptive management requirements.

20365014: SASOL VBC08 WETLAND REINSTATEMENT PROJECT

Description of Proposed Wetland Interventions

GOLDER MEMBER OF WSP

Downstream Wetland Interventions K, L and M (Zone 3)

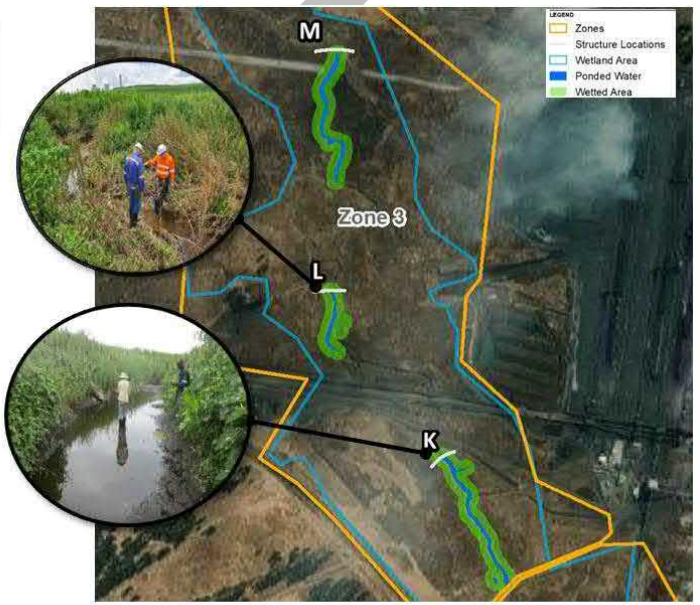
Intervention type(s): Double line box structure (Type 3)

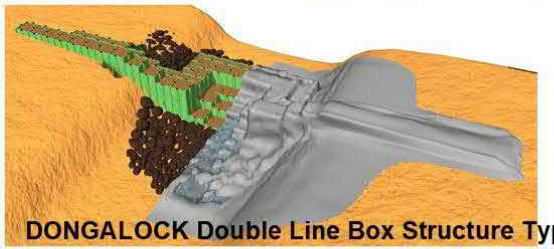
Main design objectives: 1) System stabilization; 2) Slow water velocity; 3) Capture fugitive surface water flows;

Site-specific considerations: All site-specific considerations as for Zone 2, as well as the following: Demarcation of a maximum area of disturbance associated with the reshaping of the side slopes of the stream embankments; Site-specific safety considerations for reshaping of steep side slopes of the stream banks; Possible requirements for temporary diversions to allow construction activities to be proceed.

Specific monitoring/maintenance requirements: As for Zone 2.

Success criteria: As for Zone 2, as well as the following: The reshaped side slopes of the stream banks are stable, vegetated and show no substantive signs of erosion; Successful re-instatement of stream flow if temporary diversions were required during the construction period; Erosion caused by fugitive inflows into the wetland is curbed/dissipated.





DONGALOCK Double Line Box Structure Type 3

The implementation of interventions K to M will stabilize the stream channel in Zone 3 by reducing the rate of channel incision. The interventions will also improve the hydrological and geomorphological functioning of this section of the system. The groundwater levels are expected to rise in response to the increased inundation. Although second tier interventions may be required to further improve the ecological functioning in Zone 3, the proposed interventions will improve the stability of and the ecological functioning as measured by the PES score. The outcomes of the rehabilitation performance monitoring in Zone 3 will be key in identifying adaptive management requirements.

10.0 MONITORING AND MAINTENANCE REQUIREMENTS

10.1 Baseline wetland monitoring

10.1.1 Wetland health score

The wetland health score or PES for the hydrology, geomorphology and vegetation of the wetland has been previously determined and can be used to compare/evaluate the success of the interventions in the improvement of the hydrology and ecological functioning of the wetland over time. The TBC assessment found that the VBC8 habitat is suitable to support Serval. A key outcome of subsequent monitoring events would be to evaluate whether improved habitat conditions result in an increased presence of vulnerable and near threatened and small to medium sized mammal species such as Serval, Cape Clawless Otters, etc.

10.1.2 Diatom sampling

It is understood that regular SASS bio-monitoring is undertaken at the Bossiespruit. The low habitat diversity of the site will likely be the main determinant of the SASS scores reported. It is recommended that Diatom sampling be conducted during the next bio-monitoring event prior to construction of the interventions.

As Diatoms are easily sampled and have an immediate response from either a physical, chemical, and/or biological change/disturbance occurring within the river reach, and provide a more reliable indication of the physical, chemical and biological condition of the river reach.

10.1.3 Baseline stream profiling

In addition to the assessment of the sediment and sludges described in section 8.3, it is recommended that a baseline stream profiling event be conducted. Water samples must be collected at regular intervals along the stream reach of Zone 1, Zone 2 and Zone 3 and RESM 12, 14 and 15 to determine the possible presence of historical contamination that may be affecting the in-stream water quality (particularly phosphates, nitrates, pH and EC). Additionally, the stream profiling will assist in identifying and understanding the influence of cleaner water dilution sources that may be present.

The stream profiling samples should be collected during low flow conditions early in the dry season when the water quality impacts will be the most pronounced. Alternatively, if the steam has baseflow throughout the dry season then the profiling could be delayed to monitor water qualities during mid-season baseflow conditions.

The outcome of the stream profiling assessment may indicate whether further action is required as part of contamination source control.

10.1.4 Optional eDNA sampling

Environmental DNA or eDNA is DNA that is collected from environmental samples such as soil or water rather than directly sampled from an individual organism. As various organisms interact with the environment, DNA is expelled and accumulates in their surroundings.

A single water sample can be analysed to simultaneously assess DNA from entire communities across taxonomic groups including mammals, bacteria, vertebrates, amphibians and invertebrates. The content of an eDNA sample is typically analysed by amplification using a polymerase chain reaction (PCR) and subsequent DNA sequencing.

An eDNA sampling event at the VBC08 wetland may be useful to establish the baseline biodiversity of taxonomical groups, against which the changes that may occur following the implementation of the interventions, can be evaluated.

10.1.5 Pre-construction vegetation transects and aesthetic outcomes

Fixed-point photography is a reliable method to document and monitor the expected transformation of the vegetation community from a terrestrial plant community to a hydrophilic plant community. Additionally, the fixed-point photography series can serve as a baseline for assessing the aesthetic outcomes of the rehabilitation interventions on the vegetation communities over time.

The fixed-point photography locations should be selected upstream of each of the planned structures. Pre-construction vegetation transect locations should be established at each of the intervention sites.

10.2 Performance monitoring during the construction period

During construction implementation, the soils and vegetation at each intervention should be inspected weekly for the first 2 months to ensure that germination and establishment are progressing as expected and that the frequency of watering/irrigation during the construction period is adequate.

On-going corrective action could be required throughout the construction phase to control erosion and sediment mobilisation, as outlined by the construction method statement (APPENDIX B) and/or as indicated through the on-going construction quality assurance process.

10.3 Post rehabilitation performance monitoring and corrective action

On-going rehabilitation performance monitoring will be required to assess the response of the wetland to the implementation of the interventions. It is envisaged that the following monitoring activities will be required.

- Monthly in-stream surface water quality monitoring at RESM12, RESM14, RESM 15, discharge points from the Nitro facility and a new upstream monitoring point to be established (above Intervention A);
- Monthly in-stream surface water flow monitoring to be done simultaneous with the collection of samples for water quality analyses;
- Monitoring of system ecological health (wetlands), bio-monitoring and success of revegetation at varying intervals;
- Annual alien invasive species monitoring; and
- Monitoring of the wetland intervention stability/performance at varying intervals.

The monitoring programme is presented in Table 3.

Table 3: Sasol VBC08 Wetland Intervention Performance Monitoring Activities, Success Criteria and Adaptive Management

Monitoring aspects	Monitoring objectives	Monitoring network	Frequency and period of monitoring	Sampling analysis and parameters to be monitored	Reporting	Success / performance criteria / relinquishment criteria	Corrective action / adaptive management
Surface water							
In-stream surface water quality	■ Monitor surface water quality to track water quality changes over time ■ Evaluate the effect of the increased inundated areas on the water quality along the stream profile ■ Identify unexpected outcomes, if any, and assess whether unexpected outcomes relate to the presence of remnant/unidentified historical contamination hot spots and/or sources of dilution.	The existing monitoring network which includes upstream and downstream sampling sites in streams and drainage lines (Figure 8): ■ RESM15 ■ RESM14 ■ RESM12 ■ New upstream monitoring point to be established at the start of Zone 1 upstream of intervention A. It also recommended that monitoring of the discharge points from Sasol Nitro to the VBC08 wetland be conducted.	Collect surface water samples monthly for chemical analysis by an accredited laboratory. Monitoring will continue as aligned with the validity of the WUL, whereafter monitoring requirements will be re-assessed in consultation with a wetland specialist.	The analysis needs to include the full suite of parameters as per the standard/existing monitoring suite. The results of chemical analyses should be compared against the South African National Standards (SANS). In-field measurements are made for pH and EC (as a minimum) when samples are collected – to allow for immediate corrective action.	Results and findings will be compiled into a quarterly site water monitoring report, with attached laboratory results. Surface water monitoring reports and data will be submitted to the authorities as prescribed by the WUL.	Water quality analyses show that surface water leaving Zone 3 (as measured at RESM12) meets the 2008 WUL requirements of Appendix V condition 3.7.6: ■ EC: 250mS/m ■ TDS: 1625mg/l	■ Investigate the cause of any non-compliance in surface water quality leaving the site (using the source – pathway – receptor model) and address the contaminant source with improved rehabilitation and / or appropriate mitigation measures ■ If unexpected outcomes are observed, conduct an annual stream profiling assessment during late autumn, for a period of three to five years after the interventions have been implemented. The data will be used to compare trends with the baseline (pre-construction situation) to inform adaptive management requirements. ■ Determine the need for second tier interventions to improve ecological functionality (towards water quality improvement)
In stream surface water flow	N/A		Conduct monthly in stream surface water flow monitoring to be done simultaneous with the collection of samples for water quality analyses.	Measure in stream flow using either: ■ A portable in-stream flow measuring instrument; or ■ Measuring the depth of water flow over known cross sections of the broad crested weirs (part of the wetland intervention structures).	To be included as part of the surface water monitoring report	■ Water flow measurements show that the spillways at the wetland interventions are able to pass and maintain the base flow of the system ■ Backflooding does not impact on the integrity of foundations and road structures ■ Impediments to surface water flow are identified and addressed, where	■ Investigate the cause for flow fluctuations that cannot be accounted for by rainfall/runoff patterns.

Monitoring aspects	Monitoring objectives	Monitoring network	Frequency and period of monitoring	Sampling analysis and parameters to be monitored	Reporting	Success / performance criteria / relinquishment criteria	Corrective action / adaptive management
						practical, through adaptive management	
Groundwater							
No specific requirements – continue with existing monitoring programme unless specific requirements are identified through adaptive management.							
Revegetation success, system ecological health and the control of alien invasive species							
System ecological health (wetlands), bio-monitoring and success of revegetation	■ To ensure the successful establishment of vegetation cover during the first year after the construction activities to stabilise the bare areas and prevent erosion ■ To monitor the gradual change in species composition following the installation of the interventions, to ensure that perennial species and/or suitable wetland species persist ■ To assess changes in the wetland system in response to the implementation of the interventions, and how this affects wetland functionality ■ To determine the level at which the integrity of the rehabilitated wetland areas and their delivery of ecosystem services is affected by the rehabilitation – comparing the pre- and post-rehabilitation services	The VBC08 wetland area in general, the 13 direct intervention points, as well as all areas disturbed by the construction activities	■ During construction implementation, the soils and vegetation at each intervention should be inspected weekly for the first 2 months to ensure that germination and establishment are progressing as expected, and that the frequency of watering/irrigation is adequate ■ Following construction implementation, fixed point photography surveys should be conducted to provide a graphic record of the vegetation establishment and associated plant community changes to document the success of rehabilitation efforts at VBC08 at the following intervals *post* construction: ▪ Month 1 ▪ Month 2 ▪ Month 3 ▪ Month 6 ▪ Year 1 ▪ Year 2 ▪ Year 3 ▪ Specific inspections after flood events so that early	Use the Wet-Health and Wet-Rehab Evaluate tools to assess each delineated hydro-geomorphic (HGM) unit hydrology, geomorphology and vegetation of the rehabilitated systems to determine the success of the wetland interventions over time. The visual inspections should include observations on the success of seed establishment and successional changes in vegetation species composition. Diatom sampling should be conducted using two indices: ■ Specific Pollution Sensitivity Index ■ Biological Diatom Index	Wetland rehabilitation assessment report to be compiled at the frequency of monitoring events.	■ No erosion around the installed/constructed interventions ■ Systematic reduction in the proportion of alien invasive species comprising the vegetation cover ■ Successful establishment of grasses/wetland plants over disturbed areas, with proven function of stabilising the soils ■ Ongoing monitoring shows that the successional trajectory is as expected (i.e. the grassland species used to stabilise the disturbed areas are naturally replaced by wetland species over time) ■ Improved grassland management techniques (including defoliation) results in a reduction in annual invasive species composition ■ Ongoing monitoring shows that target wetland species persist	■ Use monitoring data to determine aspects affecting successful hydrological, geomorphological and vegetation re-creation, and modify approach as required ■ Apply appropriate adaptive management strategies to correct any deterioration in the grassland species composition and abundance (e.g. review defoliation / fertilisation practices and modify accordingly

Monitoring aspects	Monitoring objectives	Monitoring network	Frequency and period of monitoring	Sampling analysis and parameters to be monitored	Reporting	Success / performance criteria / relinquishment criteria	Corrective action / adaptive management
			remedial action can be taken to address any loss of soil or loss of vegetation cover ■ Bi-annual diatom sampling – biannually (high and low flow assessments) – for a period of 3 years at least or until the system stabilises (or you could say reaches a new ecological equilibrium ■ Assess potential erosion impacts on revegetated areas, during the above inspection intervals			and that undesirable species that affect the intended land use do not return ■ Improved PES score for the system.	
Invasive alien species	■ To control declared Category 1, 2 and 3 invader within the wetland boundary ■ To minimise the threat posed by invasive species to the ecological functioning of the wetland, as well as natural ecosystems and habitats, and biodiversity ■ To increase the potential for natural systems to deliver improved ecological goods and services.	VBC08 wetland system	Annually for the first 3 years after establishment of grassland on rehabilitated land (or weed clearance on virgin land), then every 3 years at least until closure	Conduct a visual inspection for invasive species over the site on a regular basis, focussing on areas where invasive species have been previously eradicated	Findings will be reported in a wetland rehabilitation report after each assessment	■ Invasive species surveys (using standard vegetation assessment methods or aerial photography) demonstrate that control measures have effectively eradicated invasive species, or that for species with long lived seed that annual maintenance measures are preventing re-infestation	■ If required, review eradication / control measures and modify to improve effectiveness
Performance of the wetland interventions against the design criteria							
Intervention stability/performance	To assess the performance of the wetland interventions against the design criteria	The 13 direct intervention points, as well as all areas disturbed by the construction activities	■ Visual inspections of all 13 wetland interventions, as well as an overall view of the 'indirect/other interventions' at the following intervals after construction: ▪ Month 1	Visual assessment of the area with specific focus on any potential erosion of the rehabilitated areas around the interventions.	The outcomes of these assessments should be included in the regular monitoring report at the frequency at which the assessments are done.	■ No side cutting erosion of structures ■ No substantive erosion at the interface between the stilling pond and the in situ river bed ■ Biodegradable jute mesh over revegetated	■ Eroded areas will be stabilised by infilling and reshaping, and by establishing vegetation on the repaired areas/ bare patches, as required. ■ Once the inundated areas start filling up with sediment,

Monitoring aspects	Monitoring objectives	Monitoring network	Frequency and period of monitoring	Sampling analysis and parameters to be monitored	Reporting	Success / performance criteria / relinquishment criteria	Corrective action / adaptive management
			▪ Month 2 ▪ Month 3 ▪ Month 6 ▪ Year 1 ▪ Year 2 ▪ Year 3 ▪ Specific inspections after flood events ▪ Assess potential erosion impacts on revegetated areas, during the above inspection intervals			areas properly anchored until vegetation has fully established ■ The establishment of vegetation has assumed the role of stabilising the placed soils. ■ Sedimentation taking place as expected ■ Cementitious product covering the DongaLock™ sheets not compromised	the next steps (for example raising the height of the weir) will be determined via adaptive management

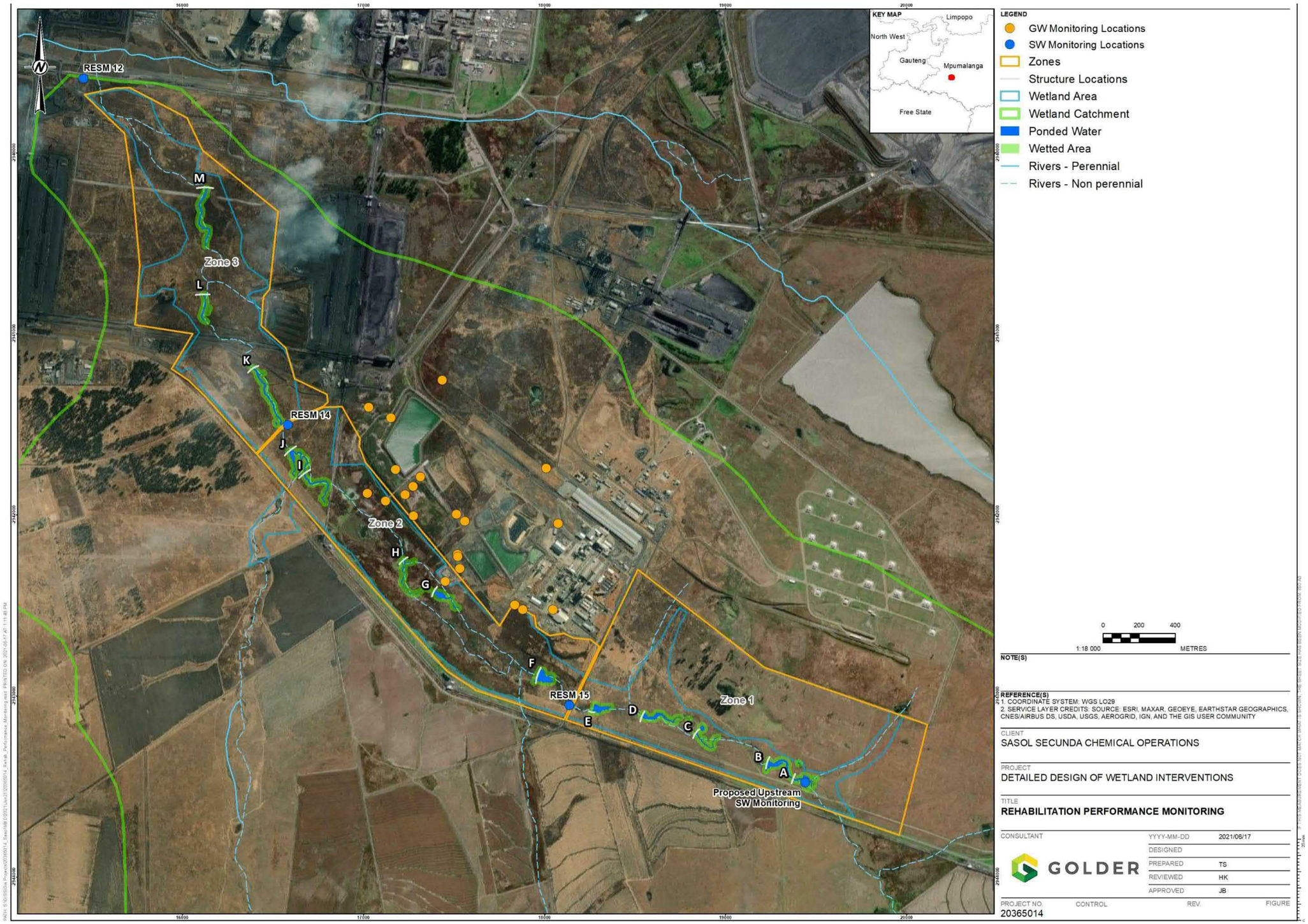


Figure 8: Map indicating the current and proposed monitoring locations

11.0 ADAPTIVE MANAGEMENT

The wetland interventions as described in this report are viewed as the Tier 1 interventions that will be required to stabilise the VBC08 wetland system and improve the system hydrology. The wetland system will respond to the increased wetted areas, and it will take a couple of seasons for the wetland system to stabilise. The need for possible Tier 2 interventions to further improve the ecological functionality of the system cannot be determined at present. It is recommended that the performance of the Tier 1 interventions be monitored and regularly evaluated to determine the need for corrective action and/or Tier 2 interventions to further improve ecological functioning as illustrated below.

Figure 9: Schematic indicating the cycle of adaptive management

Examples of Tier 2 interventions prompted by adaptive management may include the following:

Erosion control and stabilisation

- Dissipation of flow from the two remaining outflows from the Sasol Nitro facility; and
- Increasing the spillway height of wetland structures once these become silted-up.

Contamination source control interventions

- Monitored natural attenuation of contamination sources that are still present within the wetland;
- Follow-up stream profiling to support planning for Tier 2 interventions, if unexpected outcomes are observed;

- Capturing the runoff from the Sasol Nitro access road and re-routing it to a dirty water management area before it enters the wetland area; and
- Targeted source control that could include the removal of carbonaceous veneers and contaminated sediment.

Wetland management

- Construction of additional wetland interventions to further increase the wetted areas and further raise the groundwater levels.

Improved grassland management

- Improved grassland management and alien invasive species control; and
- Enhanced improvement of species diversity through a dedicated seeding programme specifically related to the collection of provenance seeds from healthier and more diverse upstream wetland areas for seeding in the less diverse regions of the wetland (Zones 2 and 3).

12.0 CONCLUSIONS

This report describes the proposed Tier 1 wetland improvement interventions at the VBC08 wetland. The wetland system is currently highly incised and characterised by high peak flows, accelerated erosion, low species diversity and poor water quality. Consequently, the PES scores are low and vary between Category C – Moderately Modified (upper reaches) and Category E – Seriously Modified (lower reaches).

The overarching objective of the proposed Tier 1 wetland interventions is to stabilise the wetland system through improved hydrology. A series of low impact DongaLock™ interventions will be constructed to increase the frequency and area of inundation where practical. The increased inundation will result in a reduction in stream flow velocity and an increased rate of sedimentation/bio-accumulation. Each wetland intervention has been designed to be fit for purpose to achieve the design objectives in that specific location. Once the hydrological functioning has been improved it is likely that other secondary objectives, such as the potential improved ecological functioning of the system, could follow naturally provided that adequate contamination source control and adaptive management are conducted.

The requirements for additional interventions such as alien species control and grassland management are also described by this report.

The proposed interventions have been developed to a detailed level of design, along with engineering drawings and specifications documentation. A construction method statement and rehabilitation specifications have been developed to mitigate the short-term impacts that may result from construction activities. The wetland rehabilitation management activities are summarised by this report.

Targeted baseline sampling is required to complement the rehabilitation performance monitoring programme and the tracking of success.

Once the wetland interventions have been constructed, the rehabilitation performance of the system will be evaluated through a dedicated monitoring programme.

The requirement for possible Tier 2 interventions to improve ecological functionality of the system will be determined through ongoing adaptive management.

Signature Page

Golder Associates Africa (Pty) Ltd.

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Land Use and Closure Consultant

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Africa Environment Business Lead

HK/BB/mc

https://golderassociates.sharepoint.com/sites/133737/project files/6 deliverables/drafts/20365014-342831-4 wetland management plan/20365014-342831-4_wetland_management_plan_draft_20210621.docx

APPENDIX A

Summary of design alternatives/considerations

Site clearance	Site has to be cleared to at least the width and breadth of the concrete footing. Typically, concrete weir structure would require larger site clearance footprint to allow for safe working space and side wall batters.	Site has to be cleared to at least the width and breadth of the gabion structure.	Site only has to be cleared in the area where trenches will be dug.
Bulk earthworks	Over-excavation is needed to at least the width and breadth of the concrete, as well as battering of the side slopes and safe working space.	Over-excavation is needed to at least the width and breadth of the gabion structure, as well as battering of the side slopes.	If sheets can be hit into the ground, no bulk excavation is necessary. If the soil is too hard, a small trench digging machine is required. This can also be done by hand.
Structure lengths	In concrete weirs the most common form of failure is side cutting. As concrete is expensive side cutting during large rainfall events is always a concern.	In gabion weirs one of the most common form of failure is side cutting. Gabion weirs are generally only built in the area of concern valley bottom, therefore side cutting during large rainfall events is always a concern.	The structure can span across the valley bottom all the way to the various floodlines, thereby removing side cutting failure.
Material costs	Concrete structures are relatively expensive due to the number of various types of materials required in concrete structures, such as reinforcing, shuttering aggregate etc. Each material increases the cost of the structure.	These structures are relatively inexpensive and only consist of baskets and rocks.	These structures are relatively inexpensive as they just require Dongalock sheets.
Vegetation	During the construction process, large amounts of vegetation will be affected and finally rehabilitated. Therefore, wetland is first destroyed and then rehabilitated once the concrete weir is constructed.	During the construction process, large amounts of vegetation will be affected and finally rehabilitated.	Has a minimal footprint, therefore vegetation will be minimally affected.
Plant hire	Earthmoving equipment, concrete trucks and/or concrete mixers, compaction equipment will all be required.	Mostly manual labour is required.	Mostly manual labour is required.
Time	Construction can take weeks to months for a single concrete weir.	Construction could be completed in a couple of days to weeks, dependant on size and soil conditions.	Construction could be completed in as little as one day to a week, dependant on size and soil conditions.
Health and safety	High health and safety risk as various plants are at work and reinforcing and other construction activities are also required.	Medium health and safety risks as baskets could injure workers' hands. Sourcing local rocks also increases the risk of coming across insects and snakes.	Medium health and safety risk as sheets are driven and or placed into the ground which could cause hand injuries.
Weight of product	Concrete is inherently a heavy product, whether it be reinforcing, cement, aggregate shuttering etc.	Baskets are light-weight; however, the rocks are heavy.	Product is light-weight and easy to carry.

Seasonal construction	Concrete structures can only be constructed in late winter period.	Gabion structures can be constructed the whole year round.	Dongalock structures can be constructed the whole year round. However, fire proof would need dry conditions.
Ease of construction	Difficult for a small contractor. Must have experience with civil engineering construction.	The structure must be constructed according to design but it involves relatively easy construction. Can be done by a small contractor with little experience.	The structure must be constructed according to design. Sheets slide into one another and can be numbered. Can be done by a small contractor with little experience.
Damage to wetland	Large disturbance area with large machinery moving in and out of the wetland.	Less of a disturbance area as the structure is a mass gravity structure.	Small disturbance footprint as it's a linear structure.
Maintenance	Does not need or very little maintenance.	Needs constant maintenance as baskets break, and the structure then needs to be rebuilt.	Easy maintenance; if the sheet is compromised it can be removed and replaced. Could require yearly maintenance.
Fire risk	Little to no fire risk.	Medium fire risk as baskets can break.	High fire risk but PVC is fire retardant. The structure will also be covered with fire protection (Matcrete).
UV risk	Very durable.	Over time, the baskets' strength deteriorates.	Has a UV stabiliser in the sheet, prolonging material lifespan. However, will become brittle overtime if not covered by Matcrete.
Chemical durability	Good chemical durability	Poor chemical durability; as baskets break, they lose structural support.	PVC has good chemical durability and will not be affected.
Durability	Very durable	Poor durability	Good durability
Cost	Expensive	Inexpensive	Inexpensive
Local economy	Concrete weirs don't lend themselves to be built by small SMME they would typically be constructed by large contractors.	Gabion structures can be constructed by SMMEs allows for upskilling of unskilled labour force, employ workforce from local community. Construction supervision will be required.	Gabion structures can be constructed by SMMEs allows for upskilling of unskilled labour force, employ workforce from local community. Construction supervision will be required.

APPENDIX B

Construction Method Statement

GOLDER
MEMBER OF WSP

REPORT

Construction Method Statement for Sasol Wetland interventions at Sasol Secunda

Sasol Secunda Operations

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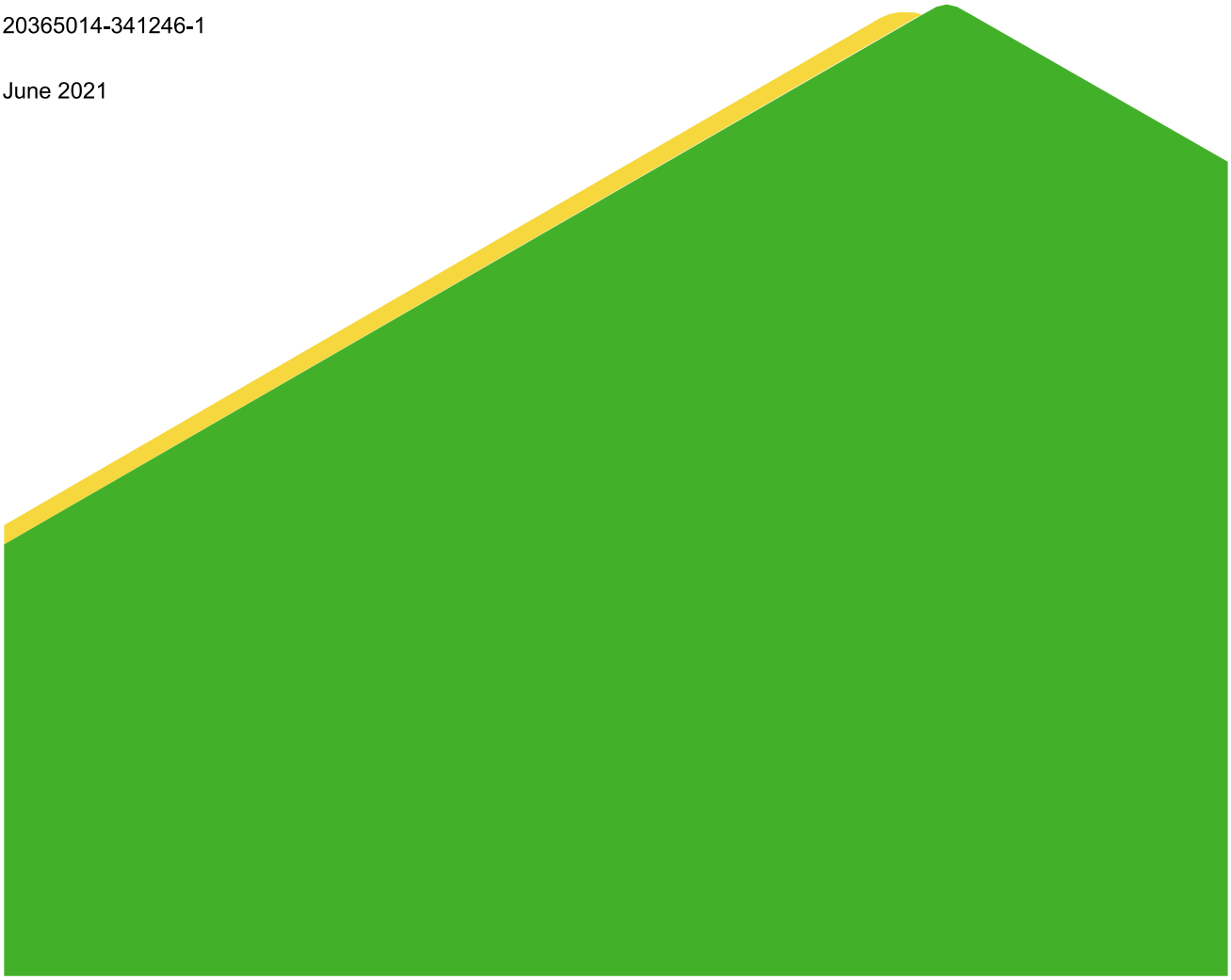

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1.0 INTRODUCTION

Synfuels Operations (Sasol) intends to expand the design work previously completed by Golder Associates Africa (Pty) Ltd. (Golder) for the rehabilitation of the incised VBC08 valley bottom wetland located within the southern tributary of the Groot Bossiespruit, where it passes the extensive Sasol Secunda industrial complex (more particularly Nitro). The incisions are relatively shallow and narrow in the upper reaches, becoming more pronounced downstream, with significant incisions in the lower reaches. The wetland is traversed by several road and conveyor crossings and has, in the past, received spills of contaminated water from the Sasol Nitro Plant. In addition, parts of the wetland have received deposits of coal that were washed in from coal spillages along the conveyor routes under stormflow conditions.

Sasol appointed Golder to compile a detailed design package for the rehabilitation of the VBC08 wetland to inform the Environmental Impact Assessment (EIA) application. Since the rehabilitation measures will require construction activity of varying levels of intensity within the wetland boundary, Golder has prepared this Construction Method Statement (CMS) for the work, that provides instructions to contractors for the minimisation of the risk of damage to the watercourse during rehabilitation activities, and the rehabilitation of any incurred disturbance to wetland vegetation and soils.

1.1 Project Description

The project consists of the rehabilitation of the VBC08 wetland system which requires the installation of wetland rehabilitation structures throughout wetland system. The proposed structures consist of a series of Dongalock^{TM} structures (Figure 1), as well as the construction of a spillway on a small dam in the Game Park. The remainder of the project will consist of levelling and shaping of steeply incised banks, and removal of the existing old farm road crossing the wetland within Zone 1. The location of the wetland rehabilitation structures is shown in Figure 2.

Figure 1: Typical single line DongalockTM structure (GreenGAB, 2021)

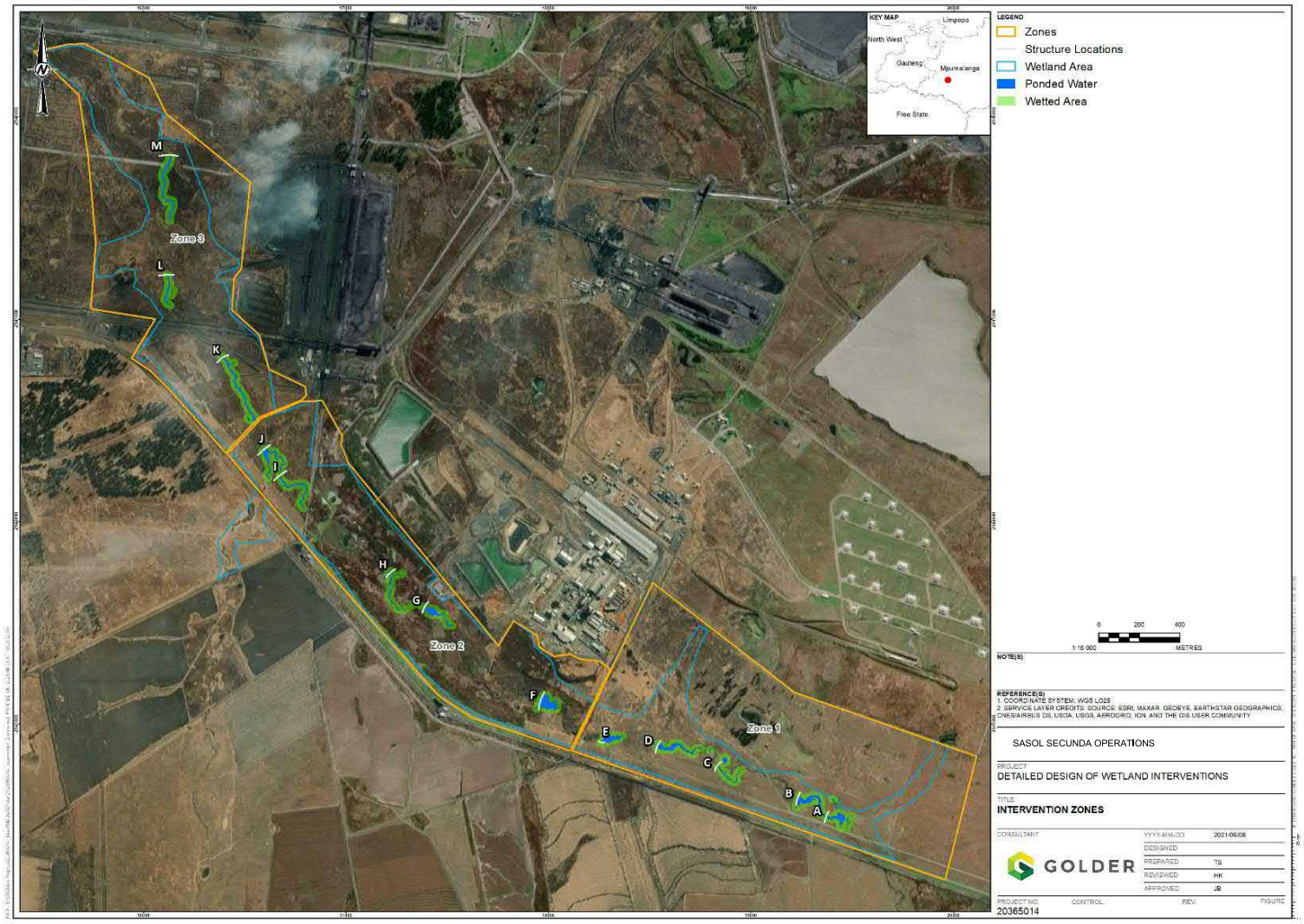

Figure 2: Locations of the intervention zones and structures within the VBC08 wetland system

1.2 Purpose of document

The purpose of this Construction Method Statement (CMS) is to manage the construction activities required for the implementation of rehabilitation structures at the VBC08, in compliance with relevant South African legislation – in particular the National Water Act (NWA), as well as endeavouring to align with industry-standard good construction practise, such as the guidance provided as part of the Water Research Council's WET-Management series of guidelines, and the Working for Wetlands programme.

The document includes details of techniques to minimise disturbance to the vegetation, fauna, soil and hydrology of the area, and the implementation of best practice post-construction rehabilitation methods; thereby ensuring that the rehabilitation activities are undertaken in a manner that minimises the extent and degree of potential damage to the watercourse and wetland.

1.3 Relevant documents

The below-listed documents were referred to in the compilation of this CMS. The proposed mitigation measures set out in two key reports (TBC, 2020 and Golder, 2018) were incorporated in the construction planning and implementation, and reinstatement/rehabilitation phases of the site construction activities.

The soil handling procedures and procedures relating to revegetation/seeding of areas disturbed by construction activities, are aligned with the recommendations of the engineering design report for the rehabilitation structures (Golder, 2021).

a) Engineering design and related report for wetland interventions at Sasol Secunda Operations (SSO) (Golder, 2021).

b) Biodiversity and Wetland Baseline and Impact Assessment for the reinstatement and development of VBC08 Wetland System, Secunda Synfuels Operations (TBC, 2020).

c) Reinstatement and Development of existing VBC08 Wetland System (Golder, 2018).

d) WET-RehabEvaluate Version 2 (Walters et al., 2019).

e) WET-RehabPlan Guidelines (Kotze et al., 2009).

f) WET Rehab Methods (Russell, 2009).

2.0 LEGAL REQUIREMENT

The following piece of National Legislation is applicable to this project:

- National Water Act, 1998 (Act 36 of 1998); Section 21 (c) impeding or diverting the flow of water in a watercourse, and (i) altering the bed, banks, course or characteristics of a watercourse.

This legislation will be given effect through the Water Use License (WUL) or General Authorisation (GA) that is expected to be granted for the construction of the proposed rehabilitation structures in the wetlands in question.

The legal obligations for the wetland construction work, will be stipulated in the WUL or the GA, and should be used as a check-list by Sasol's environmental team, supervising contractors, engineer, or specialist when overseeing the construction process, and/or auditing compliance with the WUL conditions.

3.0 WETLAND SURVEY REQUIREMENTS PRIOR TO CONSTRUCTION

3.1 Applicability and Responsibility

The appointment of an independent ecologist to conduct a pre-construction vegetation/flora survey to achieve the outcomes listed in Section 3.2 is the responsibility of the Sasol environmental team / environmental control

officer (ECO) overseeing the construction of the proposed wetland rehabilitation structures, and must be completed during the wet season prior to the commencement of dry season construction activities.

3.2 Pre-construction vegetation/flora survey

Previous baseline surveys and site inspections have highlighted the presence of the protected flora species Orange River lily (*Crinum bulbispermum*), and stands of alien and invasive weed species, throughout the VBC08 wetland. The following tasks must be completed prior to the commencement of construction activities on-site. Supplementary information on dealing with protected flora species and alien and invasive weed species are provided in Section 3.2.1 and Section 3.2.2, respectively.

Item #	Measure
SAS-1.0	Prior to the commencement of construction, Sasol must appoint an ecologist to conduct a vegetation/flora survey of the wetland. The survey should be done in the wet season prior to the commencement of construction, and will include the following outcomes:
SAS-1.1	Pinpoint the locations of the Orange River lily in the wetland, so that permits can be secured for the translocation of any specimens that are in the path of the proposed rehabilitation construction activities.
SAS-1.2	Demarcate areas of alien and invasive weed species within the proposed construction footprint which must be removed prior to commencement of construction.
SAS-1.3	Demarcate areas of indigenous vegetation suitable for use as sods in site reinstatement post-construction (see Section 5.3.1). These areas are expected to be limited to Zone 1.
SAS-1.4	Set up and survey fixed vegetation monitoring transects 'upstream' of the finalised intervention locations, and prior to the commencement of construction work, to set a baseline against which vegetation change as a result of the interventions can be measured. This survey can be conducted once the final locations of the interventions are confirmed, either via final design drawings issued by the engineers, or once the structures have been physically set out.
SAS-2.0	Prior to the commencement of construction, Sasol must oversee the removal of alien and invasive weed species in demarcated areas within the proposed construction footprint. This may be done by members of the existing Sasol landscaping/maintenance team, and should be overseen by the Sasol ECO.

3.2.1 Dealing with protected flora species

The Orange River lily (*Crinum bulbispermum*) is common in the VBC08 wetland, and is protected by the Mpumalanga Nature Conservation Act 10 of 1998: Schedule 11. According to the list of protected species under Schedule 11 of the Act; no person may possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected plant unless he or she is the holder of a permit which authorises him or her to do so.

Prior to the commencement of construction works, a dedicated vegetation and flora survey will be carried out (see Item SAS-1.0) which will determine whether individuals of Orange River lily are growing in the path of the proposed construction work, including the proposed Dongalock construction sites, as well as the entire area of steep channel banks, and the road crossing, that will be subjected to reshaping. Should this be the case, permits for the movement of individual/groups of specimens should be secured from the MPTA, and the plants can then be temporarily removed/translocated.

it is advisable to secure the permits well in advance of the commencement of construction so that no administrative delays are experienced. The preconstruction surveys to determine the number of individuals/groups that require permits and mark their locations should therefore take place during the preceding wet season.

Figure 3: Orange River lily (*C. bulbispermum*) flowering and non-flowering forms

The plants can either be immediately replanted in a nearby area at the same bank level as the location from which they were removed, or stored in the temporary nursery and then re-planted once the construction of the interventions is completed.

3.2.2 Dealing with alien and invasive vegetation

Dense stands of alien plant species dominated by exotic weeds such as purple nutsedge (*Cyperus rotundus*), thorn apple (*Datura ferox*), spear thistle (*Cirsium* vulgare), tall fleabane (*Conyza sumatrensis*), khaki weed (*Tagetes minuta*), cosmos (*Cosmos bipinnatus*) and purple top (*Verbena bonariensis*) occur throughout the VBC08 wetland (Figure 4).

Figure 4: Stands of exotic weeds growing in the VBC08 wetland

It is envisaged that re-wetting the VBC08 with the implemented structures will create wetter conditions unsuitable for regrowth of dense stands of these weed species from the seedbank. In addition, the introduction of low-level grazing by herbivores during the early rainy season will limit the ability of these species to become dominant. No physical control measures for these species prior to construction are currently proposed for these reasons.

4.0 CONSTRUCTION METHOD STATEMENT

Measures that must be taken during the site-specific rehabilitation and/or construction activities to minimise the impact of the activities themselves on wetland health, are discussed according to the envisaged construction phases in the sections that follow. Each construction requirement is set out in a numbered table for ease of audit/inspection during the construction process. An inspection checklist template is provided in APPENDIX A to facilitate this process.

4.1 Applicability and Responsibility

This Method Statement is applicable to the Construction Contractor involved in the construction activities of the proposed wetland rehabilitation structures.

It is the responsibility of the Construction Contractor to ensure that all the requirements of this Method Statement are implemented and adhered to on site.

The supervision of the construction work on a daily basis by a suitably qualified Environmental Control Officer (ECO), who could be an environmental engineer or wetland ecologist, appointed by Sasol is strongly recommended to ensure that the CMS requirements are adhered to, as prescribed in this document, and to ensure that construction work and rehabilitation activities are completed in an efficient and timely manner.

4.2 Site Preparation and Management

4.2.1 Site Demarcation

Prior to construction, a suitably qualified specialist(s) (environmental engineer / wetland ecologist / Sasol Environmental Control Officer (ECO)) must be appointed to oversee and/or undertake the following activities prior to commencement of construction:

Item #	Measure
1-1	Demarcation of construction footprint for DongalockTM structures and small dam spillway
1-2	Demarcation of road for removal
1-3	Demarcation of site access routes to reach each of the construction locations
1-4	Demarcation of the maximum extent of levelling and shaping activities (i.e. delineation between construction areas and “no-go” areas).

4.2.2 Maintenance and storage areas

Temporary storage areas (for construction materials) must be located at least 50 m outside the wetland boundary, and preferably outside the ‘regulated zone’ of the watercourse, that is, > 500 m from the boundary of the wetland. In cases where existing hardstanding areas are available for the work within 500 m of the

watercourse, the use of these existing areas will be preferred for use as laydown areas, contractor parking, and ablution facilities or refuelling areas (if any).

Table 1: Site preparation and management measures

Item #	Measure
2-1	The area(s) chosen for the stockpiling of construction materials must be demarcated, and notices put up declaring what must be stockpiled where
2-2	Garbage and temporary storage areas should be set up at least 50 m from the edge of delineated wetlands
2-3	No maintenance of vehicles or equipment shall take place within the wetland or 1:100 year floodline or delineated wetland or riparian habitat, whichever is greatest.
2-4	Tools and containers are to be cleaned at the designated laydown areas, to ensure that no concrete-contaminated water, which is highly alkaline and toxic to most organisms, is released to the environment
2-5	Toilet facilities (i.e. portaloos) for workers should be provided (if none are already available in close proximity to the working area) and situated at least 50 m from the edge of delineated wetlands

4.2.3 Access Control

The following access restrictions must be put in place to prevent unnecessary movement of people and machinery through wetlands:

Item #	Measure
3-1	As far as possible, existing paved roads and dirt tracks should be used to access the intervention sites during construction as this will reduce the extent of the disturbed area along the route
3-2	The pedestrian access route from the laydown area to the chosen sites of the structures should be marked out with high-visibility, durable barrier tape and poles, and the supervisor should ensure that the workers understand that movement outside of the areas so demarcated is prohibited. Where possible, materials should be transported from the laydown area to the construction sites manually / with wheelbarrows
3-3	Where vehicles are necessary, a specific vehicular access route from the laydown area to the bank reshaping areas should be marked out with high-visibility, durable barrier tape and poles, and the supervisor should ensure that the workers understand that movement outside of the areas so demarcated is prohibited
3-4	Clear signage will be put in place to indicate that the areas directly adjacent to the wetlands and watercourses where work is being completed are “No-Go Areas”, and access beyond the work zone is prohibited

4.2.4 Site Establishment

The following measures for site establishment must be employed:

Item #	Measure
4-1	The ECO must demarcate the working area for each of the sites targeted for rehabilitation work

Item #	Measure
4-2	The setting out of the structures themselves, i.e. the specific locations and levels of where rehabilitation interventions are to be placed, should be done immediately prior to construction, by the supervising engineer/ECO.

4.3 Vegetation Removal and Soil Handling Requirements

4.3.1 Handling sods and soils for use in site reinstatement

Careful removal and storage of sods that retain growing grass and wetland plant species, as well as top soils and subsoils for use in 'reinstating' the construction area once installation of the interventions is completed, is crucial in ensuring that the rate at which the site recovers from the construction activity is optimised. The following protocol for removal and storage of sods and soils must be strictly adhered to:

Item #	Measure
5-1	Where indigenous vegetation has been identified in the construction footprint during the pre-construction survey (see Section 3.2), sods of vegetation should be carefully removed from the construction area using a spade. Sods should be at least 200 mm x 200 mm in size, and should include at least a 100 mm layer of topsoil. The roots of the vegetation should experience minimal disturbance
5-2	Sods should be stored in a shaded area, until construction is complete, and the site can be reinstated
5-2-1	A basic shelter constructed from poles and shade netting may be useful on site if the sods will be replaced within one week
5-2-2	If the period for storage of the sods is longer than one week, they should be stored at a temporary nursery site (of similar construction), on plastic, and watered frequently to ensure that they are in good condition for the rehabilitation of the disturbed area once construction is completed
5-3	Remaining topsoil and subsequent layers of subsoils, should be excavated and stored separately in an area in the immediate vicinity of the intervention being constructed, where they will not be trampled by workers
5-4	Topsoil and subsoil heaps shall be appropriately protected using tarps and barriers to prevent the soil from drying out or being blown/washed away
5-5	Topsoil shall only be handled twice, once to strip and stockpile, and secondly to replace, level, shape and scarify

4.4 Construction planning and implementation

The construction activities have the potential to generate detrimental impacts on surrounding wetland habitat if not well managed. Additional measures to be adhered to during the construction of these interventions are listed as follows.

Item #	Measure
6-1	Construction activities within wetlands should only be done at the end of the dry season when wetland soils have their lowest moisture content and greatest strength (and preferably when the soil have a moisture content at least 5% below their Plastic Limit (PL)).

Item #	Measure
6-2	Where stream flow is experienced during the winter construction period, and flow must be managed to facilitate construction, a temporary diversion of flow may be required. If required, the channel should be dammed upstream of the construction site (using sand bags) and the impounded water should be pumped or piped downstream. The best of the two below-listed options for water management from an operations point of view, must be decided upon by the supervising engineer in liaison with the ECO. ■ A) Water can be piped if the sand bags are raised above the level of the channel to provide a head to passively pipe water around the construction site ■ B) If flows are low then water can impounded behind sand bags to be pumped during the day and then collected during the night for pumping again in the morning Sandbags may only be installed by hand, and no machinery may be involved in the creation of the temporary dam/diversion.
6-3	Structures should be constructed one after the other, with the first structure being completed before the second one is initiated. This will facilitate more efficient, timeous completion of construction works according to the schedule
6-4	Work must commence at the upstream construction site, moving downstream as each structure is completed
6-5	Machinery (e.g. TLB) and equipment shall avoid entering watercourses. Where TLB movement over the wetland is necessary for reshaping of steep banks, these works should take place only at the end of the dry season so as not to damage the wetland plants and soils.
6-6	In situations where the TLB must enter the watercourse, mitigation measures shall be put in place i.e. timber or textile mats, in order to avoid damage to the wetland/river/stream bed
6-7	Consideration needs to be given on how best to deliver construction materials to the construction site without impacting the wetland soils and vegetation. It may be required that the materials be manually moved onto the site from competent ground outside of the wetland. The use of conveyor belting as a tramming surface can be recommended
6-8	In case of accidental spills of oil, petroleum products or other materials used during construction, absorbent materials must be on hand to allow for the quick remediation of the spill

4.5 Reinstatement of the Construction Site

The following requirements must be adhered to during the reinstatement phase:

Item #	Measure
7-1	Following completion of construction, all litter, building rubble, etc. must be removed and disposed of at an appropriate site.
7-2	Any areas that were cleared of topsoil must be revegetated per the measures outlined in section 5.3.1, and the site left in a safe, stable and environmentally friendly condition
7-3	Soils should be replaced around excavated/disturbed areas in the correct order, i.e. subsoils at the bottom, top soils on the top
7-4	Where Dongalock structures are installed, trenches must be backfilled with subsoil first, and topsoil thereafter, which will be obtained from the adjacent storage heaps specified above

Item #	Measure
7-5	The level of back filling should be above the adjacent topsoil level, to allow for settling
7-6	Any excess topsoil shall be landscaped and stabilised in accordance with the requirements of the Engineer
7-7	For structures in Zone 1, vegetation sods (if available) will then be placed on top of the replaced topsoil layer.
7-8	If any protected plant species were removed from the construction site and kept safely in the nursery, these should be replanted, with locations for planting to be specified, and planting overseen, by a wetland ecologist or botanist
7-9	Any remaining areas of bare soils must be overseeded with an appropriate grass seed mix including a binding creeping grass and a nurse species selected for its rapid growth properties to provide stability to the disturbed soils (Table 2). The seeded areas should be further stabilised with a biodegradable (jute) mesh that is pegged in place. The seed mixture should be manually sown over the prepared soils
7-10	Any imported plants used for revegetation purposes should consist of native grassland species. During the winter months, seed may be harvested from wetland plant species that have been recorded in the upper wetland reaches (Game Farm and above – Zone 1) to increase the diversity of the regrowth. These harvested seeds should be applied as a thatch or a mulch with the recommended seed mix, prior to installation of the mesh; and/or overseeded in areas where saved sods have been replanted
7-11	All seeded areas must be covered with a biodegradable woven jute mesh (~65% porosity) to reduce erosion damage and to hold grass sods, seed and mulch (if applied) in place as the vegetation cover establishes
7-12	The jute mesh must be keyed into an earthen anchor trench at the top of the slope or on the upstream side on flatter areas. The mesh strips must be stitched together or at least have a 150 mm overlap (with the overlap done to shed water like the tiles of a roof – meaning that the free end of the overlap should always point downstream). The mesh must be secured by driving wooden pegs through the mesh at 1 m centres, ensuring that overlap areas are correctly pegged
7-13	Deep watering immediately after installation of the sods/sowing seeds on bare soil areas will be required to promote the rooting of the sods back into the soils below, and/or the germination of the sown seeds. Manual watering should be done twice-weekly for at least four weeks, and every week thereafter for the duration of the dry season.
7-13-1	Ponded water in the wetland can be used as a supply of irrigation water, if this is of sufficiently good quality (determined by chemical analysis in an accredited water lab) – i.e. it must meet the irrigation water quality standard.
7-13-2	If the water in the wetland does not meet the required standard, then clean irrigation water will need to be sourced and delivered to site for watering purposes

Table 2: Recommended seed mix and seeding rate for disturbed areas around wetland interventions

Grass type	Rate
Eragrostis tef (Teff – annual nurse crop)	1.0 kg/ha
Chloris gayana (Rhodes grass)	4.0 kg/ha
Digitaria eriantha (Smutsfinger grass)	5.0 kg/ha
Cynodon dactylon (Bermuda grass)	10.0 kg/ha

Table 3: Recommended seed mix and seeding rate for disturbed areas on flatter ground away from the wetland interventions

Grass type	Rate
Eragrostis tef (Teff – annual nurse crop)	1.0 kg/ha
Chloris gayana (Rhodes grass)	5.0 kg/ha
Digitaria eriantha (Smutsfinger grass)	5.0 kg/ha
Panicum maximum (Guinea grass)	5.0 kg/ha
Cynodon dactylon (Bermuda grass)	4.0 kg/ha

5.0 POST CONSTRUCTION MONITORING AND MANAGEMENT

5.1 Applicability and Responsibility

The post-construction monitoring and management requirements are applicable to the SASOL team overseeing the construction of the proposed wetland rehabilitation structures.

5.2 Monitoring and Management Measures

Once construction of the interventions and site reinstatement is complete, ongoing monitoring of the area will be crucial to ensure that the rehabilitation investment does not become compromised as a result of under-watering, storm flows or invasive species encroachment. The following measures must be strictly implemented by the Sasol ECO:

#	Measure
SAS-3.0	The soils and vegetation at each intervention should be inspected weekly for the first 2 months to ensure that germination and establishment are progressing as expected and that watering frequency is adequate. After that, inspections can be done monthly for the remainder of the year and then quarterly for a further 2 years.
SAS-4.0	The interventions should also be inspected after each stormflow event in the first year so that early remedial action can be taken to address any loss of soil or loss of vegetation cover
SAS-5.0	The rehabilitated areas should be inspected for the presence of alien and invasive weed species monthly during the first growing season. Any emerging weeds should be manually controlled (by hand pulling or slashing) to minimise herbicide use within the wetland. Follow up inspections and weed removal should be planned for at least 3 years or until alien and invasive weeds are under

#	Measure
	control. These inspections should occur at least monthly during the wet season when exponential growth of these plants is experienced

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Signature Page

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APPENDIX A

Construction Method Statement - audit checklist

Phase	Aspect	Item #	Measure	Complete (Y/N?)	Adaptive Management Measures Required
Site preparation and management	Site Demarcation	1-1	Demarcation of construction footprint for dongalock structures and small dam spillway		
		1-2	Demarcation of road for removal		
		1-3	Demarcation of site access routes to reach each of the construction locations		
		1-4	Demarcation of the maximum extent of levelling and shaping activities (i.e. “no-go” areas).		
	Maintenance and storage areas	2-1	The area(s) chosen for the stockpiling of construction materials must be demarcated, and notices put up declaring what must be stockpiled where		
		2-2	Garbage and temporary storage areas should be set up at least 50 m from the edge of delineated wetlands		
		2-3	No maintenance of vehicles or equipment shall take place within the wetland or 1:100 year floodline or delineated wetland or riparian habitat, whichever is greatest.		
		2-4	Tools and containers to be cleaned at the laydown area, to ensure that no concrete-contaminated water, which is highly alkaline and toxic to most organisms, is released to the environment		
		2-5	Toilet facilities (i.e. portaloos) for workers should be provided (if none are already available in close proximity to the working area) and situated at least 50 m from the edge of delineated wetlands		
	Access control	3-1	As far as possible, existing paved roads and dirt tracks should be used to access the intervention sites during construction as this will reduce the extent of the disturbed area along the route		
		3-2	The pedestrian access route from the laydown area to the chosen sites of the structures should be marked out with high-visibility, durable barrier tape and poles, and the supervisor should ensure that the workers understand that movement outside of the areas so demarcated is prohibited. Where possible, materials should be transported from the laydown area to the construction sites manually / with wheelbarrows		
		3-3	Where vehicles are necessary, a specific vehicular access route from the laydown area to the bank reshaping areas should be marked out with high-visibility, durable barrier tape and poles, and the supervisor should ensure that the workers understand that movement outside of the areas so demarcated is prohibited		
		3-4	Clear signage will be put in place to indicate that the areas directly adjacent to the wetlands and watercourses where work is being completed are “No-Go Areas”, and access beyond the work zone is prohibited		
	Site establishment	4-1	The ECO must demarcate the working area for each of the sites targeted for rehabilitation work		
		4-2	The setting out of the structures themselves, i.e. the specific locations and levels of where rehabilitation interventions are to be placed, should be done immediately prior to construction, by the supervising engineer/ECO.		
Vegetation removal and soil handling requirements	Handling sods and soils	5-1	If indigenous vegetation has been identified in the construction footprint during the pre-construction survey (see Section 3.2), sods of vegetation should be carefully removed from the construction area using a spade. Sods should be at least 200 mm x 200 mm in size, and should include at least a 100 mm layer of topsoil. The roots of the vegetation should experience minimal disturbance.		
		5-2	Sods should be stored in a shaded area, until construction is complete, and the site can be reinstated		
		5-2-1	A basic shelter constructed from poles and shade netting may be useful on site if the sods will be replaced within one week		
		5-2-2	If the period for storage of the sods is longer than one week, they should be stored at a temporary nursery site (of similar construction), on plastic and watered frequently, to ensure that they are in good condition for reinstatement of the disturbed area once construction is completed		
		5-3	Remaining topsoil and subsequent layers of subsoils, should be excavated and stored separately in an area in the immediate vicinity of the intervention being constructed, where they will not be trampled by workers		
		5-4	Topsoil and subsoil heaps shall be appropriately protected using tarps and barriers to prevent the soil from drying out or being blown/washed away		
		5-5	Topsoil shall only be handled twice, once to strip and stockpile, and secondly to replace, level, shape and scarify		
Construction Implementation	Construction implementation	6-1	Construction activities within wetlands should only be done should only be done at the end of the dry season when wetland soils have their lowest moisture content and greatest strength.take place in winter (during the dry season). Where summer construction is unavoidable, temporary diversions of the streams might be required, although this is to be avoided.		
		6-2	Where stream flow is experienced during the winter construction period, and flow must be managed to facilitate construction, a temporary diversion of flow may be required. If required, the channel should be dammed upstream of the construction site (using sand bags) and the impounded water should be pumped or piped downstream. The best of the two below-listed options for water management from an operations point of view, must be decided upon by the supervising engineer in liaison with the ECO. A) Water can be piped if the sand bags are raised above the level of the channel to provide a head to passively pipe water around the construction site B) If flows are low then water can impounded behind sand bags to be pumped during the day and then collected during the night for pumping again in the morning Sandbags may only be installed by hand, and no machinery may be involved in the creation of the temporary dam/diversion.		
		6-3	Structures should be constructed one after the other, with the first structure being completed before the second one is initiated. This will facilitate more efficient, timeous completion of construction works according to the schedule		
		6-4	Work must commence at the upstream construction site, moving downstream as each structure is completed		
		6-5	Machinery (e.g. TLB) and equipment shall avoid entering watercourses. Where machinery movement over the wetland is necessary for reshaping of steep banks, these works should take place only at the end of the dry season so as to not damage the wetland plants and soils.		
		6-6	In situations where the TLB must enter the watercourse, mitigation measures shall be put in place i.e. timber or textile mats, in order to avoid damage to the wetland/river/stream bed		
		6-7	Consideration needs to be given on how best to deliver construction materials to the construction site without impacting the wetland soils and vegetation. It may be required that the materials be manually moved onto the site from competent ground outside of the wetland. The use of conveyor belting as a tramming surface may be necessary.		
		6-8	In case of accidental spills of oil, petroleum products or other materials used during construction, absorbent materials must be on hand to allow for the quick remediation of the spill		
Reinstatement of the construction site	Reinstatement of the construction site	7-1	Following completion of construction, all litter, building rubble, etc. must be removed and disposed of at an appropriate site.		
		7-2	Any areas that were cleared of topsoil must be revegetated per the measures outlined in section 5.3.1, and the site left in an environmentally friendly condition		
		7-3	Soils should be replaced around excavated/disturbed areas in the correct order, i.e. subsoils at the bottom, top soils on the top		
		7-4	Where DongalockTM structures are installed, trenches must be backfilled with subsoil first, and topsoil thereafter, which will be obtained from the adjacent storage heaps specified above		
		7-5	The level of back filling should be above the adjacent topsoil level, to allow for settling		
		7-6	Any excess topsoil shall be landscaped and stabilised in accordance with the requirements of the Engineer		
		7-7	For structures in Zone 1, vegetation sods (if available) will then be placed on top of the replaced topsoil layer.		
		7-8	If any protected plant species were removed from the construction site and kept in the nursery, these should be replanted, with locations for planting to be specified, and planting overseen by a wetland ecologist, or the SASOL ECO.		
		7-9	Any remaining areas of bare soils must be overseeded with an appropriate creeping grass seed mix selected for rapid growth properties to provide stability to the disturbed soils (see Table 2 and Table 3 of the CMS) and stabilised with a biodegradable (jute) mesh that is pegged in place. The seed mixture should be manually sown over the prepared soils		
		7-10	Any imported plants used for revegetation purposes should consist of native grassland species. During the winter months, seed may be harvested from wetland plant species that have been recorded in the upper wetland reaches (Game Farm and above – Zone 1) to increase the diversity of the regrowth. These harvested seeds should be applied as a thatch or a mulch with the recommended seed mix, prior to installation of the mesh; and/or overseeded in areas where saved sods have been replanted		
		7-11	All seeded areas must be covered with a biodegradable woven jute mesh (~65% porosity) to reduce erosion damage and to hold grass sods, seed and mulch (if applied) in place as the vegetation cover establishes		
		7-12	The jute mesh must be keyed into an earthen anchor trench at the top of the slope or on the upstream side on flatter areas. The mesh strips must be stitched together or at least have a 150 mm overlap (with the overlap done to shed water like the tiles of a roof – meaning that the free end of the overlap should always point downstream). The mesh must be secured by driving wooden pegs through the mesh at 1 m centres, ensuring that overlap areas are correctly pegged		
		7-13	Deep watering immediately after installation of the sods/sowing seeds on bare soil areas will be required to promote the rooting of the sods back into the soils below, and/or the germination of the sown seeds. Manual watering should be done twice-weekly for at least four weeks, and every week thereafter for the duration of the dry season.		
		7-13-1	Ponded water in the wetland can be used as a supply of irrigation water, if this is of sufficiently good quality (determined by chemical analysis in an accredited water lab) – i.e. it must meet the irrigation water quality standard.		
		7-13-2	If the water in the wetland does not meet the required standard, then clean irrigation water will need to be sourced and delivered to site for watering purposes		

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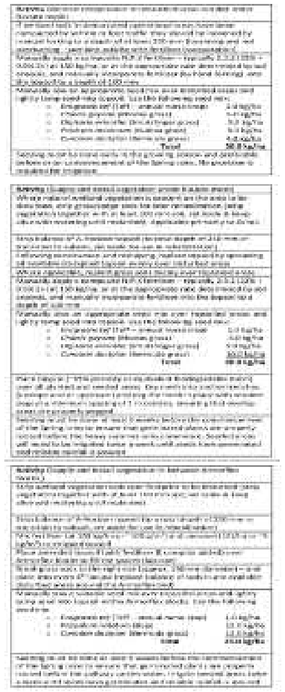
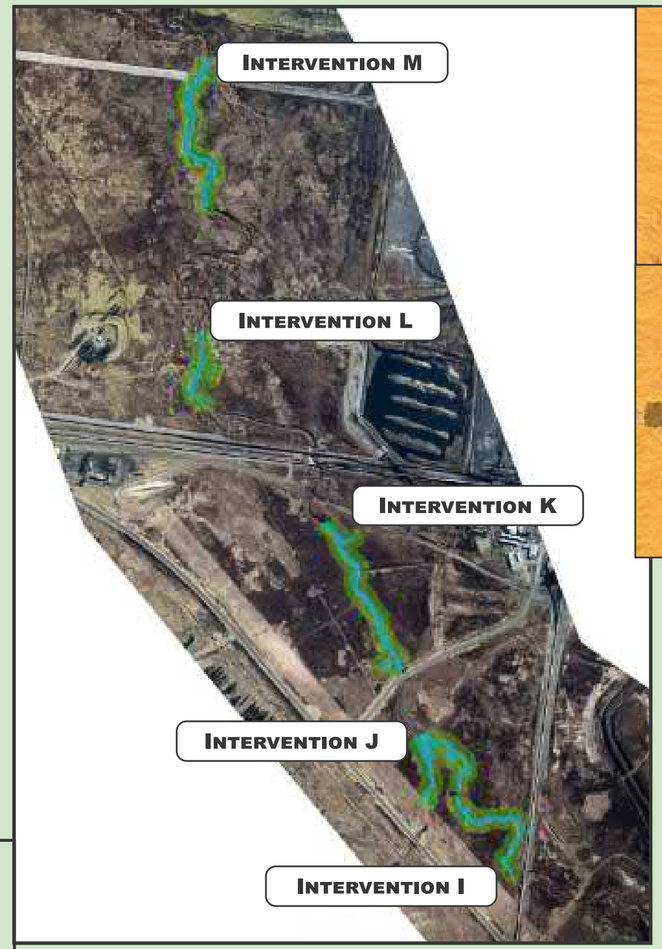
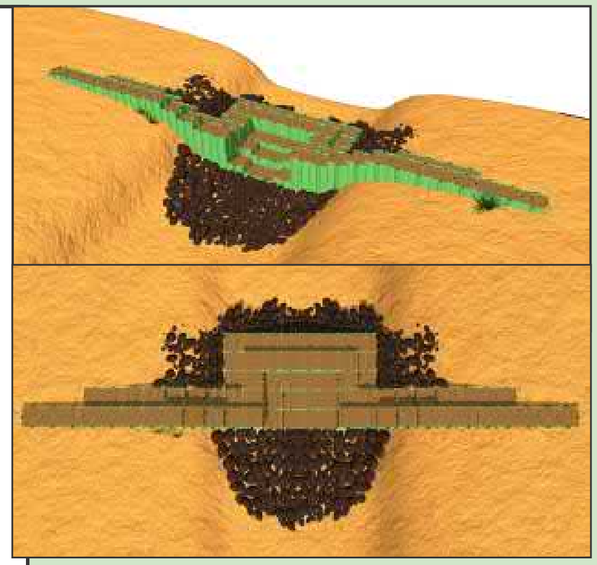
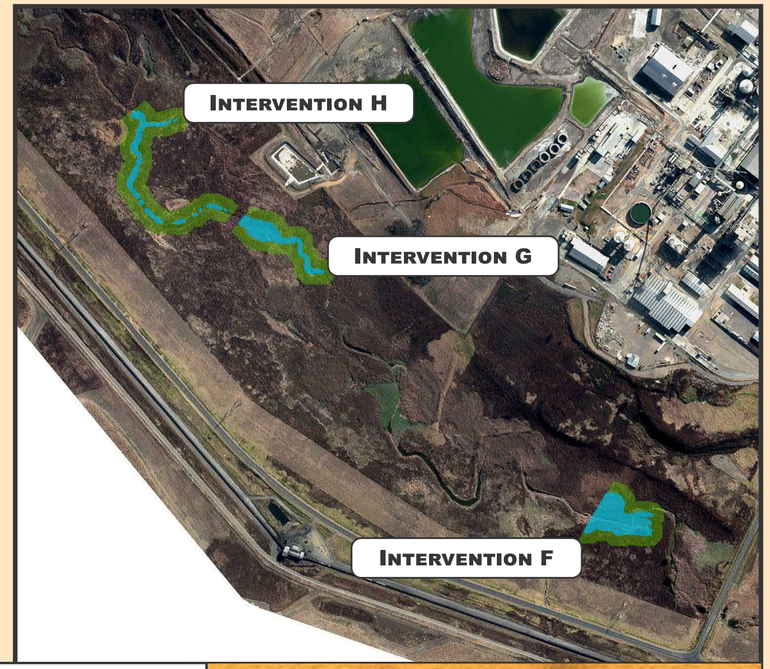
APPENDIX C

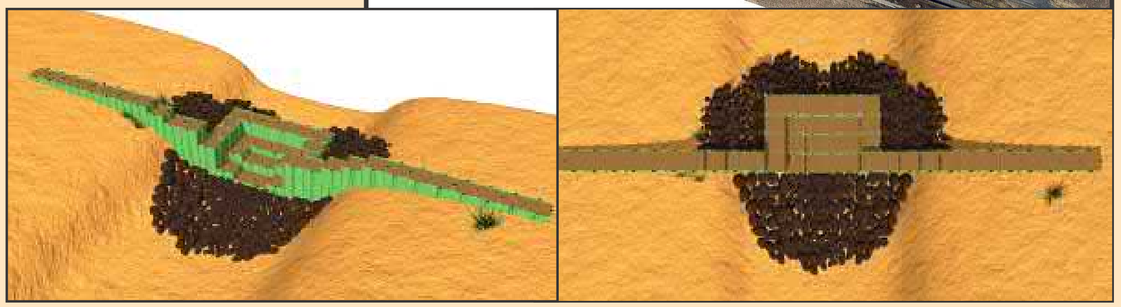
Landscape Maintenance Plan and Plant Species Plan

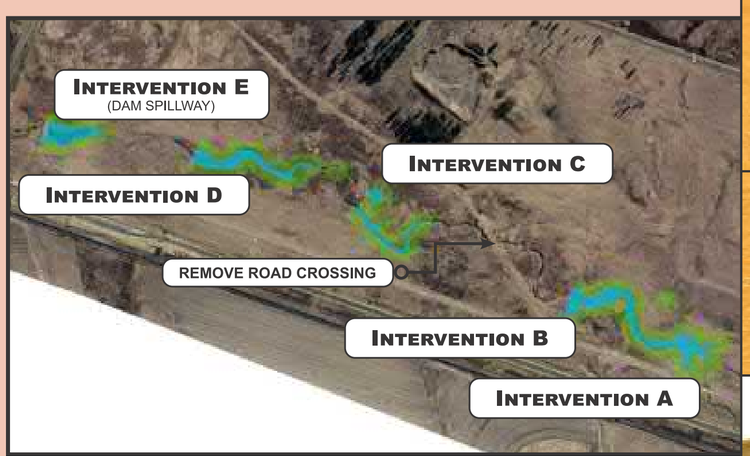


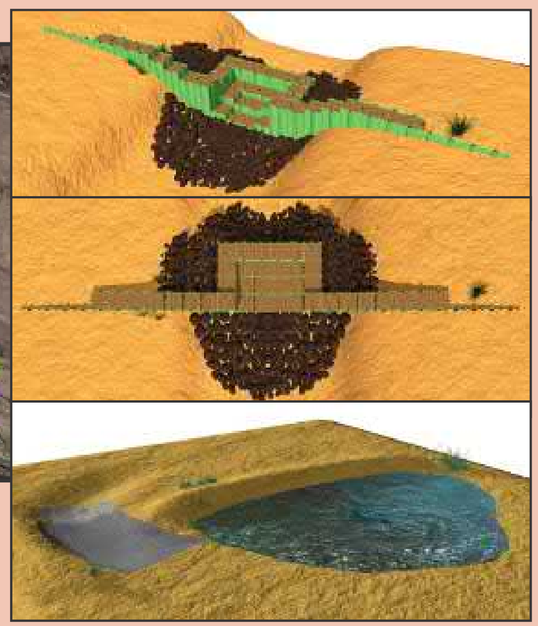












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LEGEND:

- ZONE 1
- ZONE 2
- ZONE 3
- PONDED WATER
- WETTED AREA

SASOL WETLAND DESIGN
LANDSCAPE MAINTENANCE PLAN

GOLDER
MEMBER OF WSP

31th May 2021 - www.greengab.co.za - info@greengab.co.za

APPENDIX D

Post Intervention Flood Line Determination

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