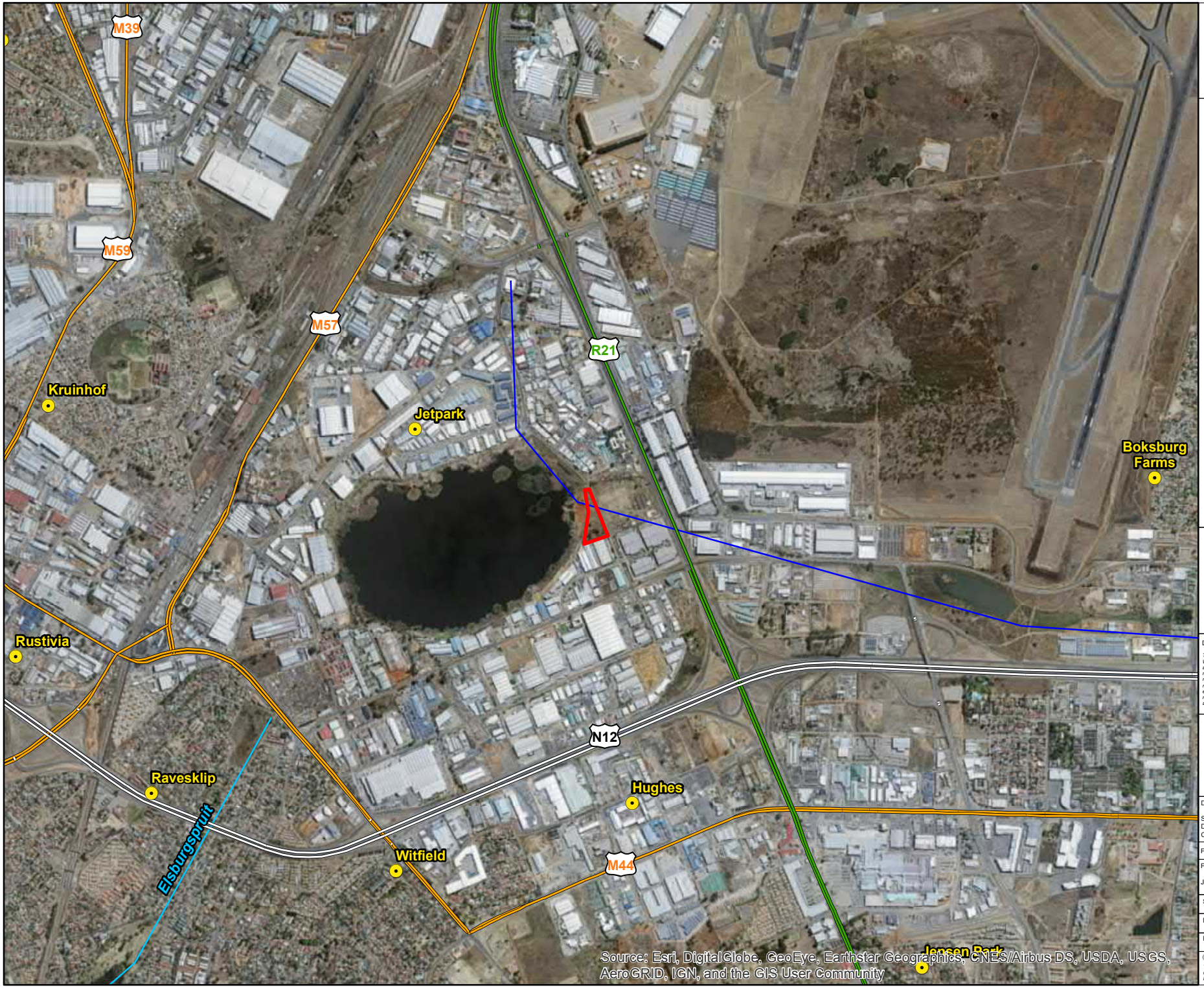
APPENDIX

A SITE PLAN

APPENDIX

A-1 LOCALITY



SABLE PLACE PROPERTIES 131 (PTY) LTD

JET PARK WAREHOUSE DEVELOPMENT
PHASE 3 LOCALITY

Legend

- Place Names
- Rivers
- Canal
- National Route
- Regional Route
- Metropolitan Routes
- Site Boundary

N

0 125 250 375 500 625

Metres

DISCLAIMER

The information on this figure was derived from various digital databases available to WSP Environmental (Pty) Ltd. All information is provided "as is" and it must be acknowledged that data, information, and maps are dynamic and in a constant state of maintenance, correction and update. WSP Environmental (Pty) Ltd cannot accept any responsibility for errors, omissions, or positional accuracy where it has not been directly responsible for the production of the data referenced. There are no warranties, expressed or implied, as to the use of this information, including the warranty of merchantability or fitness for a particular purpose. Notification of any errors will be appreciated.

WSP ENVIRONMENTAL (PTY) LTD
BUILDING C, KNIGHTSBRIDGE,
33 SLOANE STREET, BRYANSTON
P O BOX 98867, SLOANE PARK 2152, RSA
Tel +27 (0)11 361 1380, Fax +27 (0)11 361 1381, wspe@wspgroup.co.za

DATA SOURCE:

SOUTH AFRICAN DEPARTMENT OF RURAL DEVELOPMENT ANDLAND REFORM-
CHIEF DIRECTORATE: NATIONAL GEO-SPATIAL INFORMATION.

PROJECTION: GCS_WGS_1984

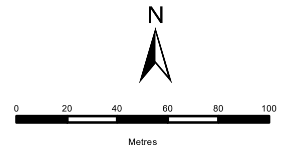
PROJECT TITLE:

JET PARK WAREHOUSE DEVELOPMENT - PHASE 3

SCALE: 1:24,000	DRAWN BY: SINENHLANHLA RADEBE
DATE: 2019/09/17	REVIEWED BY: ANRI SCHEEPERS
FIGURE NO:	PROJECT NO: 41101076 - 01 / REV:

SABLE PLACE PROPERTIES 131 (PTY) LTD

JETPARK WAREHOUSE DEVELOPMENT
PHASE 3
ADJOINING SITES



DATA SOURCE:
ARC GIS 10.2

PROJECTION: UTM Zone 35S (WSG1984)

PROJECT TITLE: NONDVO DAM ESIA

PROJECT NO: 41101262

SCALE: 1:3 000 AT A4	DATE: 2020/07/13

DRAWN BY: ANRI SCHEEPERS

REVIEWED BY: ROBERT ELS

WSP

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APPENDIX

A-2 TOPOGRAPHY AND LAN USE

SABLE PLACE PROPERTIES 131 (PTY) LTD

LAND USE

Legend

- Rivers
- Canal
- Site Boundary

Land Use

- Bird Sanctuary
- Caravan Park
- High Urban Density
- Recreation Area

N

0 130 260 390 520 650

Metres

DISCLAIMER

The information on this figure was derived from various digital databases available to WSP Environmental (Pty) Ltd. All information is provided "as is" and it must be acknowledged that data, information, and maps are dynamic and in a constant state of maintenance, correction and update. WSP Environmental (Pty) Ltd cannot accept any responsibility for errors, omissions, or positional accuracy where it has not been directly responsible for the production of the data referenced. There are no warranties, expressed or implied, as to the use of this information, including the warranty of merchantability or fitness for a particular purpose. Notification of any errors will be appreciated.

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DATA SOURCE:

SOUTH AFRICAN DEPARTMENT OF RURAL DEVELOPMENT ANDLAND REFORM-
CHIEF DIRECTORATE: NATIONAL GEO-SPATIAL INFORMATION.

PROJECTION: GCS_WGS_1984

PROJECT TITLE:

JET PARK WAREHOUSE DEVELOPMENT - PHASE 3

SCALE: 1:25,000	DRAWN BY: SINENHLANHLA RADEBE
DATE: 2019/09/18	REVIEWED BY: ANRI SCHEEPERS

FIGURE NO:	PROJECT NO: 41101076 - 01	REV:

APPENDIX

A-3 RIVERS AND WETLANDS

SABLE PLACE PROPERTIES 131 (PTY) LTD

WATERCOURSES

Legend

- Rivers
- Canal
- NFEPA Wetlands
- Site Boundary

N

0 150 300 450 600 750

Meters

DISCLAIMER

The information on this figure was derived from various digital databases available to WSP Environmental (Pty) Ltd. All information is provided "as is" and it must be acknowledged that data, information, and maps are dynamic and in a constant state of maintenance, correction and update. WSP Environmental (Pty) Ltd cannot accept any responsibility for errors, omissions, or positional accuracy where it has not been directly responsible for the production of the data referenced. There are no warranties, expressed or implied, as to the use of this information, including the warranty of merchantability or fitness for a particular purpose. Notification of any errors will be appreciated.

WSP ENVIRONMENTAL (PTY) LTD
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Tel +27 (0)11 361 1380, Fax +27 (0)11 361 1381, wspe@wspgroup.co.za

DATA SOURCE:

SOUTH AFRICAN DEPARTMENT OF RURAL DEVELOPMENT ANDLAND REFORM-
CHIEF DIRECTORATE: NATIONAL GEO-SPATIAL INFORMATION.

PROJECTION: GCS_WGS_1984

PROJECT TITLE:

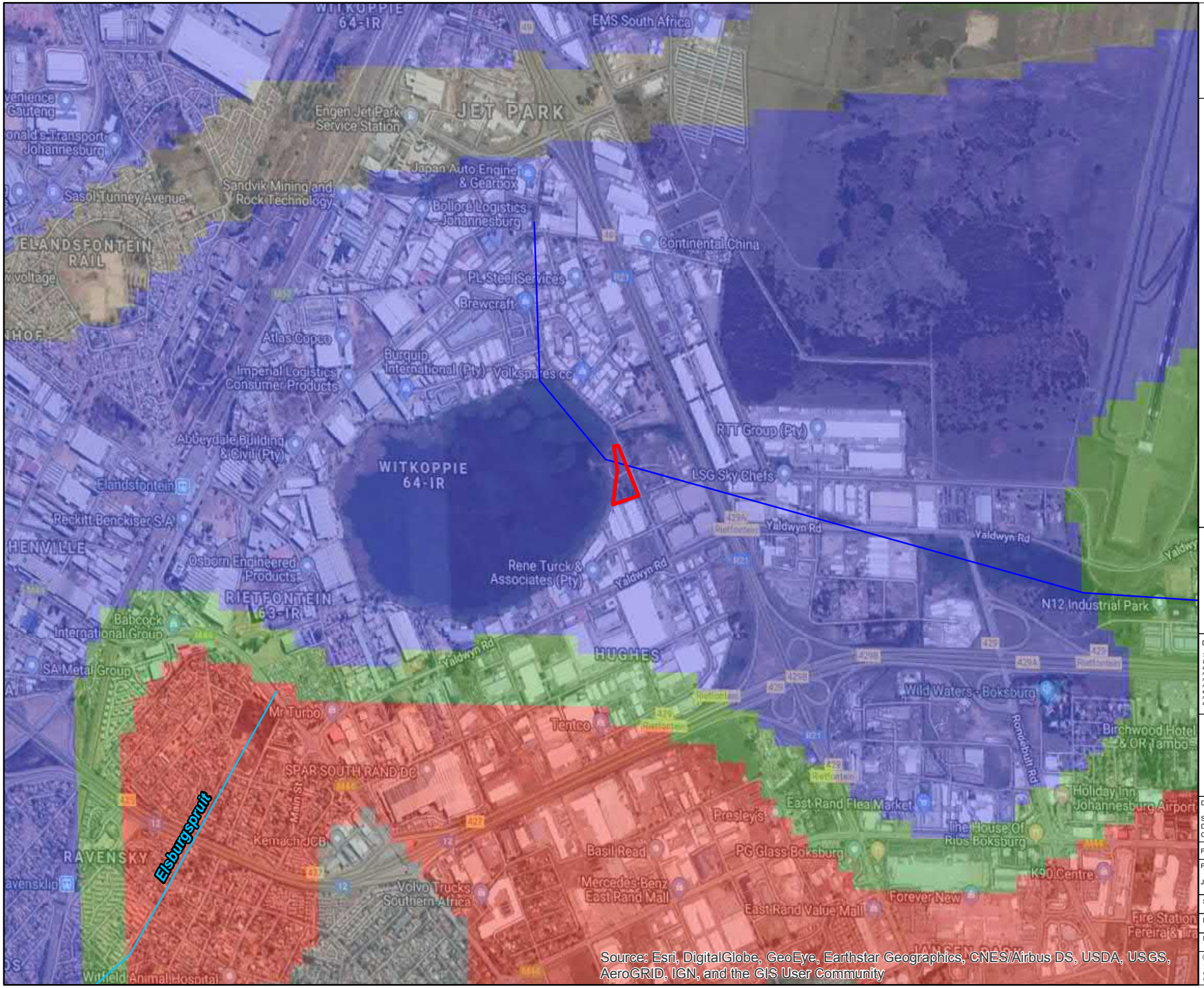
JET PARK WAREHOUSE DEVELOPMENT - PHASE 3

SCALE: 1:30,000	DRAWN BY: SINENHLANHLA RADEBE
DATE: 2019/09/17	REVIEWED BY: ANRI SCHEEPERS

FIGURE NO:	PROJECT NO: 41101076 - 01	REV:

APPENDIX

A-4 PALAEOSENSITIVITY



SABLE PLACE PROPERTIES 131 (PTY) LTD

PALAEOSENSITIVITY

Legend

- Rivers
- Canal
- Site Boundary

Palaeosensitivity

- Very High
- Moderate
- Low
- Insignificant / Zero

N

0 110 220 330 440 550

Metres

DISCLAIMER

The information on this figure was derived from various digital databases available to WSP Environmental (Pty) Ltd. All information is provided "as is" and it must be acknowledged that data, information, and maps are dynamic and in a constant state of maintenance, correction and update. WSP Environmental (Pty) Ltd cannot accept any responsibility for errors, omissions, or positional accuracy where it has not been directly responsible for the production of the data referenced. There are no warranties, expressed or implied, as to the use of this information, including the warranty of merchantability or fitness for a particular purpose. Notification of any errors will be appreciated.

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P O BOX 98867, SLOANE PARK 2152, RSA
Tel +27 (0)11 361 1380, Fax +27 (0)11 361 1381, wspe@wspgroup.co.za

DATA SOURCE:

SOUTH AFRICAN DEPARTMENT OF RURAL DEVELOPMENT ANDLAND REFORM-
CHIEF DIRECTORATE: NATIONAL GEO-SPATIAL INFORMATION.

PROJECTION: GCS_WGS_1984

PROJECT TITLE:

JET PARK WAREHOUSE DEVELOPMENT - PHASE 3

SCALE: 1:22,335	DRAWN BY: SINENHLANHLA RADEBE
DATE: 2019/09/18	REVIEWED BY: ANRI SCHEEPERS
FIGURE NO:	PROJECT NO: 41101076 - 01 / REV:

APPENDIX

A-5 ENVIRONMENTAL SENSITIVITIES

SABLE PLACE PROPERTIES 131 (PTY) LTD

JETPARK WAREHOUSE DEVELOPMENT
ENVIRONMENTAL SENSITIVITIES

Legend

- Site Boundary
- Wetland
- 30m_buffer
- 15m_buffer

Polygons

- Riperian
- Transformed
- Degraded Grassland
- Ecological Support Area
- Important Area

N

0 10 20 30 40 50

Metres

DATA SOURCE:
ARC GIS 10.2

PROJECTION: UTM Zone 35S (WSG1984)

PROJECT TITLE: Jet Park Development

PROJECT NO: 41101262

SCALE: 1:1 908 AT A4 | DATE: 2022/01/24

DRAWN BY: ANRI SCHEEPERS

REVIEWED BY: ROBERT ELS

WWW.WSP.COM

SABLE PLACE PROPERTIES 131 (PTY) LTD

JETPARK WAREHOUSE DEVELOPMENT
ENVIRONMENTAL SENSITIVITIES

Legend

- Site Boundary
- Wetland
- 30m_buffer
- 15m_buffer

Polygons

- Riperian
- Transformed
- Degraded Grassland
- Ecological Support Area
- Important Area

N

0 70 140 210 280 350

Metres

DATA SOURCE:
ARC GIS 10.2

PROJECTION: UTM Zone 35S (WSG1984)

PROJECT TITLE: Jet Park Development

PROJECT NO: 41101262

SCALE: 1:10 000 AT A4 | DATE: 2022/01/24

DRAWN BY: ANRI SCHEEPERS

REVIEWED BY: ROBERT ELS

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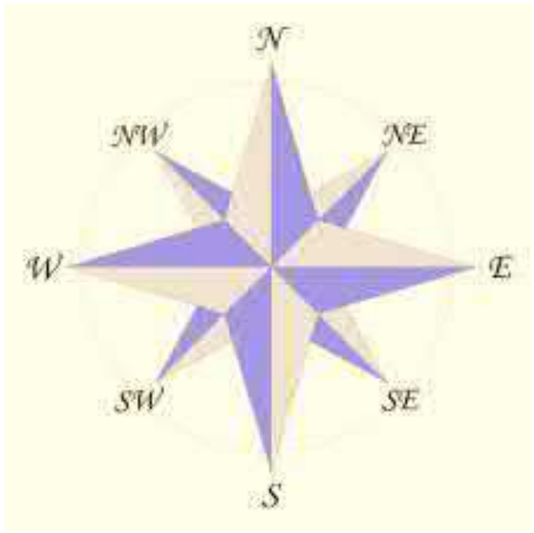
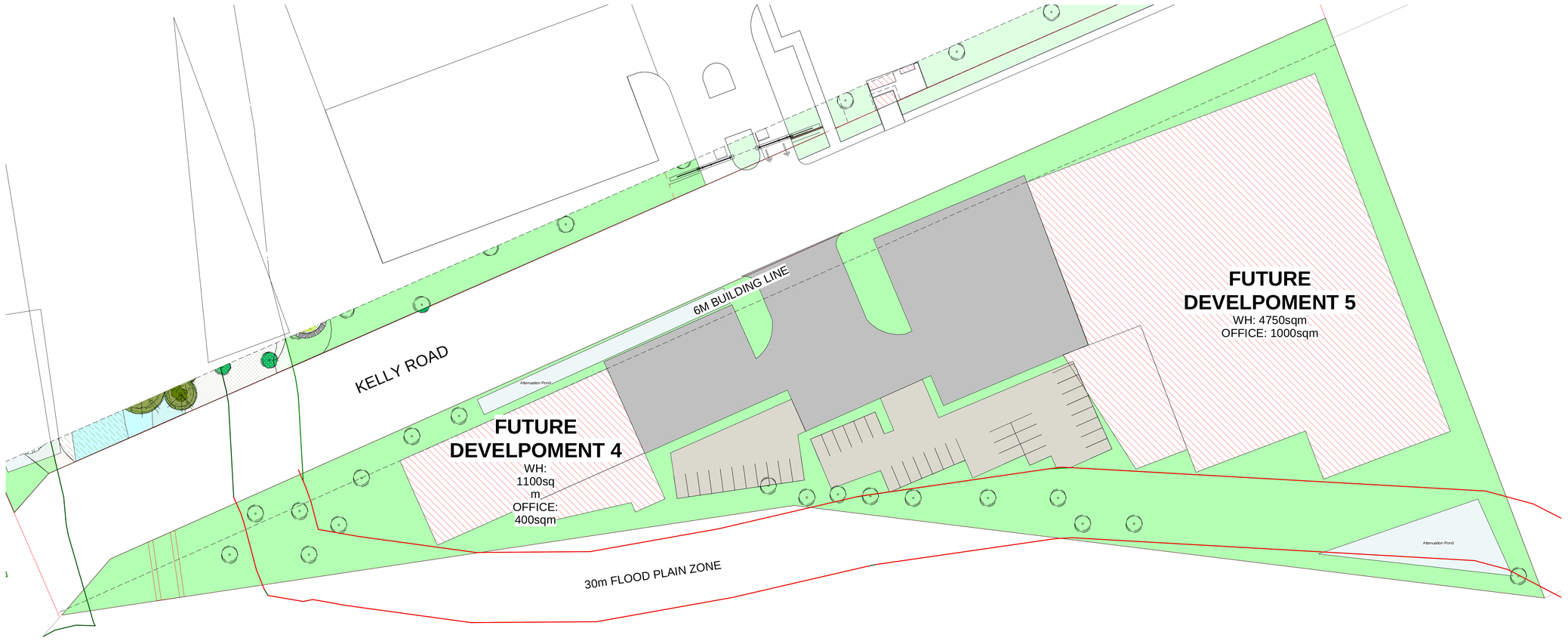
APPENDIX

B PHOTOGRAPHS


N
NW
NE
W
E
SW
SE
S

APPENDIX

C FACILITY ILLUSTRATIONS



1 000 Full Site Plan- 30m Floodplain 01
1 : 350

GENERAL NOTES:

DRAINAGE NOTES:

ALL PLUMBING AND DRAINAGE WORK AND INSTALLATION OF SANITARY
FITTINGS TO COMPLY WITH THE NATIONAL BUILDING REGULATIONS

PROVIDE I.E.'S TO ALL BENDS AND JUNCTIONS WITH SUITABLE MARKERS AT GROUND LEVEL

MINIMUM FALL TO ALL DRAINS PIPES TO BE 1:40.

PROVIDE A.E. TO FOOT OF ALL SOIL STACKS.

PROVIDE APPROVED RESEAL TRAPS TO ALL WASTE FITTINGS.

I.E.'S TO WASTE PIPES TO BE FULLY ACCESSIBLE AT ALL TIMES.

ALL SOIL PIPES PASSING UNDER BUILDINGS OR FOOTINGS TO BE
ENCASED IN CONCRETE OF MINIMUM 100MM THICKNESS ALL ROUND
PIPE.
ALL WASTE FITTINGS ON THE ONE-PIPE STYSTEM TO HAVE 75MM DEAP-SEAL RESEALING TRAP AND AN APPROVED VENT VALVE WHERE REQUIRED

STRUCTURAL NOTES.

ALL STRUCTURAL STEEL AND CONC. WORK TO STRUCTURAL ENGINEERS
DETAIL.

FIRE PREVENTION NOTES

ALL NEW WORK TO BE DONE IN ACCORDANCE WITH PART T OF SANS 10-400 THE FIRE-PREVENTION REGULATIONS AS PROMULGATED IN THE NATIONAL BUILDING REGULATIONS.

SAFETY DISTANCES IN COMPLIANCE WITH TT2.

FIRE DEPARTMENT MUST BE NOTIFIED ON COMPLETION OF INSTALL-
ATION IN ORDER TO OBTAIN A CLEARANCE CERTIFICATE PRIOR TO
ELECTRICAL CONNECTION
FIRE FIGHTING EQUIPMENT TO COMPLY WITH TT32, TT33 AND TT34
INCONSPICUOUS FIRE APPLIANCES AND ALL EMERGENCY EXITS TO
BE INDICATED BY SYMBOLIC SIGNS

HEALTH NOTES

1. DUST CONTROL MEASURES TO BE TAKEN
   DURING DEVELOPMENT AND CONSTRUCTION
2. CHEMICAL TOILETS TO BE PROVIDED
   ON SITE BEFORE CONSTRUCTION
3. NOISE CONTROL MEASURES TO BE
   TAKEN DURING CONSTRUCTION
4. ALL PARTITIONING TO BE VERMIN PROOF
5. REFUSE AREA TO BE PROVIDED WITH CONCRETE FLOOR SLOPED TO A GULLY WITH A TRAP
6. BUILDING RUBBLE TO BE TAKEN TO AN
   APPROVED DUMPING SITE.
7. THE MAKING OF OPEN FIRES AND THE BURNING OF
   REFUSE WILL NOTE BE PERMITTED.

LIGHT AND VENTILATION

ALL LIGHT AND AIR TO BE IN ACCORDANCE WITH PART O OF SANS 10-400

Revision Schedule

Rev	Date	Description
A	2020 07 09	FOR INFORMATION

icm architectural studio cc

unit 18
ridge view office park
248 kent avenue/cnr republic road
randburg

p.o box 2386
pinegowrie
2123

tel: + 27 011 326 3573
fax + 27 011 326 3583
e-mail drawings@icm.co.za

Project Name:
Sandvik

Project Address:
Portion 12 Witkoppie
Jet Park Ext 64.

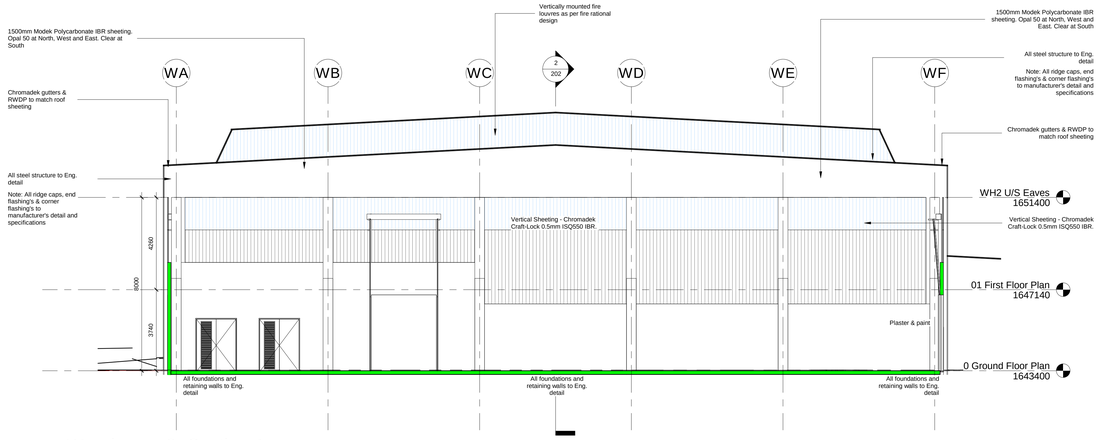
CLIENT SIGN.	
ENG. SIGN.	

Drawing:
Master Plan 01

Scale:	Drawn:	Checked:	Date:
1 : 350	Author	Checker	07/09/20

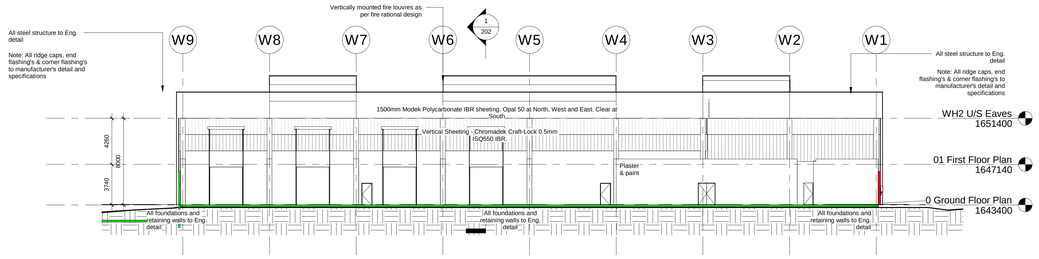
Status: **FOR INFORMATION**

Drawing Number		Revision
1477	053	A



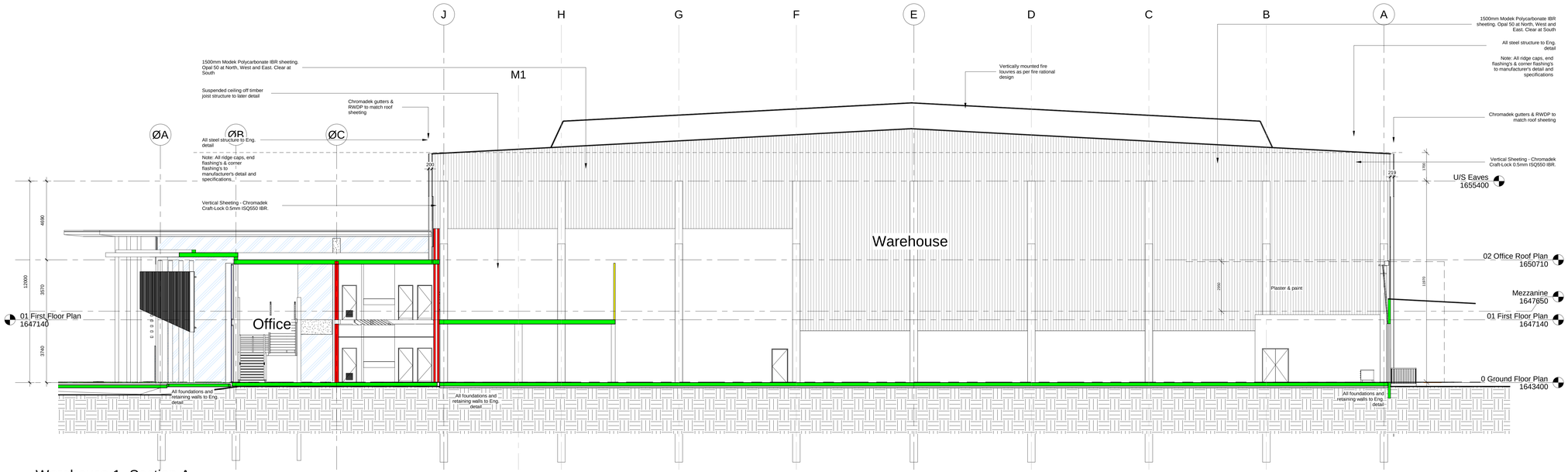
1 Warehouse 2- Section A

1 : 100



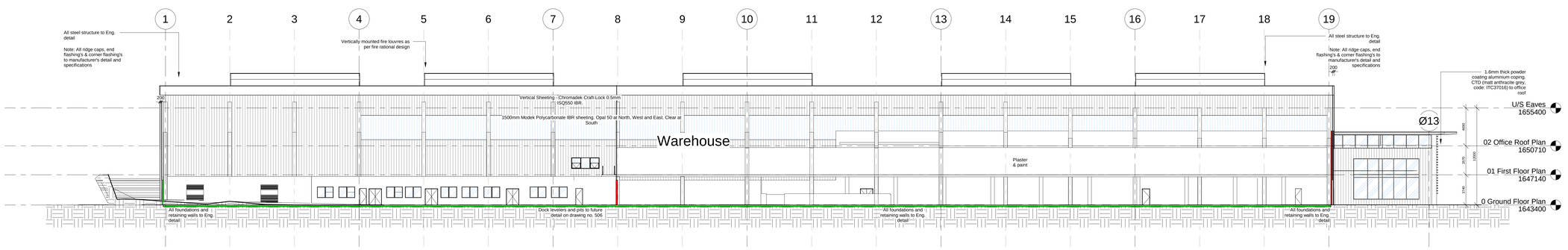
2 Warehouse 2- Section B

1 : 200



3 Warehouse 1- Section A

1 : 100



4 Warehouse 1- Section B

1 : 200

1. This drawing may not be scaled. Only figured dimensions and levels may be used.
2. All Dimensions and levels to be checked on site before commencement of work.
3. Any discrepancies to be reported to the ARCHITECT before proceeding with work.
4. This drawing is to be read in conjunction with all relevant details, and consulting engineers drawings.
5. All work to be carried out in accordance with local authority requirements, National Building Regulations and relevant SANS 10-400 standards.
6. The design on this drawing is copyright and remains the property of **ICM Architectural Studio CC**

GENERAL NOTES:

DRAINAGE NOTES:

ALL PLUMBING AND DRAINAGE WORK AND INSTALLATION OF SANITARY
FITTINGS TO COMPLY WITH THE NATIONAL BUILDING REGULATIONS.
PROVIDE I.E. 'S TO ALL BENDS AND JUNCTIONS WITH SUITABLE MARKERS AT GROUND LEVEL.
MINIMUM FALL TO ALL DRAINS PIPES TO BE 1:40.
PROVIDE A.E. TO FOOT OF ALL SOIL STACKS.
PROVIDE APPROVED RESEAL TRAPS TO ALL WASTE FITTINGS.
I.E.'S TO WASTE PIPES TO BE FULLY ACCESSIBLE AT ALL TIMES.
ALL SOIL PIPES PASSING UNDER BUILDINGS OR FOOTINGS TO BE
ENCASED IN CONCRETE OF MINIMUM 100MM THICKNESS ALL ROUND
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ALL WASTE FITTINGS ON THE ONE-PIPE SYSTEM TO HAVE 75MM DEAP-SEAL RESEALING TRAP AND AN APPROVED VENT VALVE WHERE REQUIRED

STRUCTURAL NOTES.

ALL STRUCTURAL STEEL AND CONC. WORK TO STRUCTURAL ENGINEERS DETAIL.

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1. DUST CONTROL MEASURES TO BE TAKEN DURING DEVELOPMENT AND CONSTRUCTION
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4. ALL PARTITIONING TO BE VERMIN PROOF
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6. BUILDING RUBBLE TO BE TAKEN TO AN APPROVED DUMPING SITE.
7. THE MAKING OF OPEN FIRES AND THE BURNING OF REFUSE WILL NOTE BE PERMITTED.

LIGHT AND VENTILATION

ALL LIGHT AND AIR TO BE IN ACCORDANCE WITH PART O OF SANS 10-400

Revision Schedule

Rev	Date	Description
0	2019/04/01	FOR CONSTRUCTION

icm architectural studio cc
unit 18
ridge view office park
248 kent avenue/cnr republic road
randburg
p-o box 2386
pinegowrie
2123
tel: + 27 011 326 3573
fax + 27 011 326 3583
e-mail drawings@icm.co.za

Project Name:
Fraser Alexander- SKF

Project Address:
ERF 487
Jet Park X21

CLIENT SIGN.

ENG. SIGN.

Drawing:
Sections- 2 Warehouses

Scale:	Drawn:	Checked:	Date:
As indicated	Author	Checker	01/18/19

Status: **FOR INFORMATION**

Drawing Number		Revision
1476	202	0

APPENDIX

D ROUTE POSITION INFORMATION

SABLE PLACE PROPERTIES 131 (PTY) LTD

JETPARK WAREHOUSE DEVELOPMENT
SURROUNDING ROAD NETWORK

Legend

Site Boundary

N

0 70 140 210 280 350

Metres

DATA SOURCE:
ARC GIS 10.2

PROJECTION: UTM Zone 35S (WSG1984)

PROJECT TITLE: Jet Park Development

PROJECT NO: 41101262

SCALE: 1:10 000 AT A4 | DATE: 2021/10/10

DRAWN BY: ANRI SCHEEPERS

REVIEWED BY: ROBERT ELS

WWW.WSP.COM

APPENDIX

E PUBLIC PARTICIPATION INFORMATION

APPENDIX

E-1 PROOF OF SITE NOTICE

BASIC ASSESSMENT PROCESS

NOTICE OF THE PROPOSED CONSTRUCTION OF LIGHT INDUSTRIAL WAREHOUSING AND COMMERCIAL ACTIVITIES IN BOKSBURG, GAUTENG PROVINCE

GAUT 002/21-22/E3022

Notice is given in terms of Regulation 41(2) of GNR 982 (4 December 2014) as Amended published under section 24 and 24D of the National Environmental Management Act (No. 107 of 1998) (NEMA) for submission of applications for Environmental Authorisations (EA) in respect of activities identified in terms of GNR 983 and 985 (4 December 2014) as Amended.

BACKGROUND AND LOCATION

Sable Place Properties 131 (Pty) Ltd (Sable) proposes the construction of light industrial warehousing and commercial activities on a site within 32 metres of the edge of a watercourse situated in a critical biodiversity area (CBA) on the remaining extent of Portion 12 (91) of Witkoppie, 64 IR, Boksburg, Johannesburg, City of Ekurhuleni Metropolitan Municipality (EMM), Gauteng Province. The proposed warehouse development requires an environmental authorisation (EA) in terms of NEMA and the associated Environmental Impact Assessment (EIA) Regulations, 2014 as amended. Due to the nature of the project thresholds, Sable is required to follow a Basic Assessment (BA) process to acquire environmental approval prior to the commencement of the Proposed Project.

ENVIRONMENTAL APPLICATION

The following listed activities are triggered:

- NEMA EIA Regulations: GNR 327 Activity 12, 19 and 27; and
- NEMA EIA Regulations: GNR 324 Activities 12 and 14.

REGISTRATION

WSP Group Africa (Pty) Ltd (WSP) was appointed as the independent Environmental Assessment Practitioner (EAP) by Sable to manage the BA process. Parties wishing to formally register as interested and affected parties in order to receive more information and/ or raise their comment(s) on the proposed project, are requested to forward their full contact details to the EAP and disclose their direct and/or indirect business, financial, personal or other interest in the project. Any comments on the proposed project should be submitted to the EAP via the details provided below. Registered interested and affected parties will be forwarded all future project related correspondence and notified individually of additional opportunities to participate in the process.

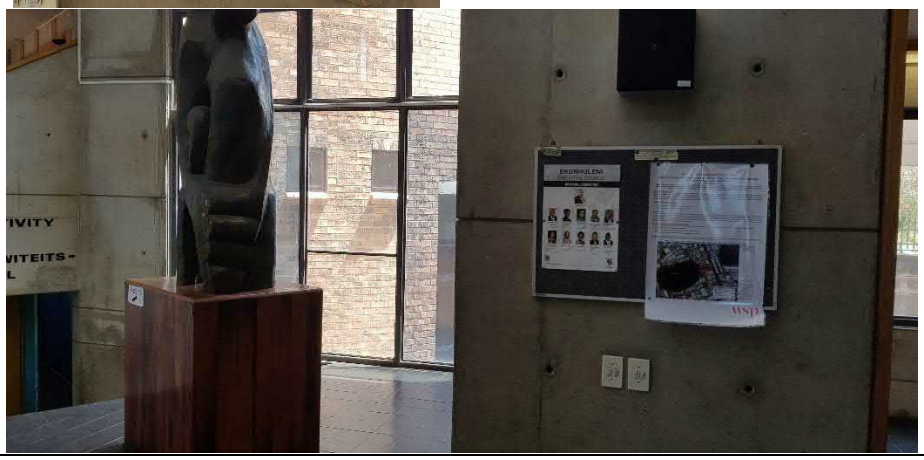
DRAFT BASIC ASSESSMENT REPORT REVIEW PERIOD

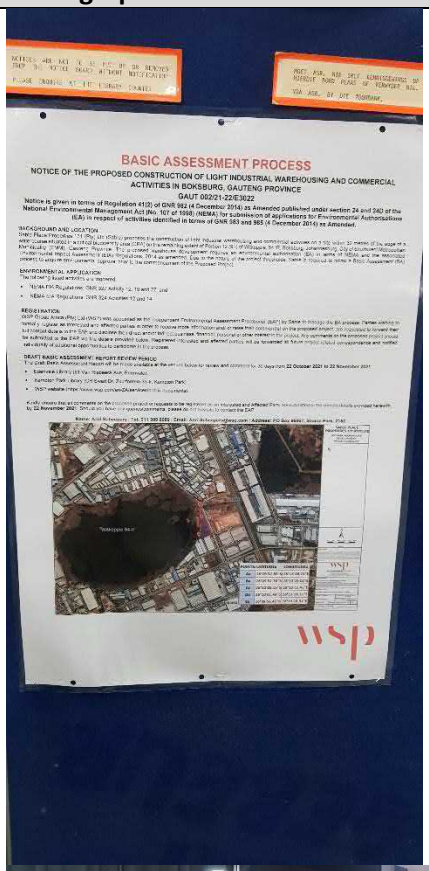
The Draft Basic Assessment Report will be made available at the venues below for review and comment for 30 days from **22 October 2021 to 22 November 2021**.

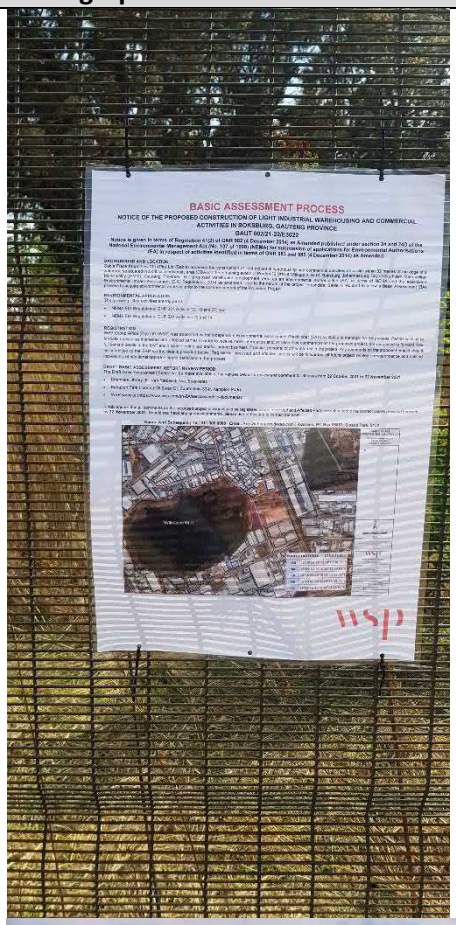
- Edenvale Library (81 Van Riebeeck Ave, Edenvale).
- Kempton Park Library (CR Swart Dr, Zuurfontein 33-Ir, Kempton Park).
- WSP website (https://www.wsp.com/en-ZA/services/public-documents).

Kindly ensure that all comments on the proposed project or requests to be registered as an Interested and Affected Party are submitted to the contact details provided herewith, by **22 November 2021**. Should you have any queries/comments, please do not hesitate to contact the EAP.

Name: Anri Scheepers | Tel: 011 300 6089 | Email: Anri.Scheepers@wsp.com | Address: PO Box 98867, Sloane Park, 2152

Location	Photographic Evidence
Edenvale Library	 

Location	Photographic Evidence
Kempton Park Library	 

Location	Photographic Evidence
Site Fence	 

Location	Photographic Evidence
Site Entrance Gate	 

APPENDIX

E-2 WRITTEN NOTICES ISSUED

WSP ref.: 41101076

22 October 2021

PUBLIC

Dear Stakeholder

Subject: NOTICE OF THE PROPOSED CONSTRUCTION OF LIGHT INDUSTRIAL WAREHOUSING AND COMMERCIAL ACTIVITIES IN BOKSBURG, GAUTENG PROVINCE (GAUT 002/21-22/E3022)

Notice is given in terms of Regulation 41(2) of GNR 982 (4 December 2014) as Amended published under section 24 and 24D of the National Environmental Management Act (No. 107 of 1998) (NEMA) for submission of applications for Environmental Authorisations (EA) in respect of activities identified in terms of GNR 983 and 985 (4 December 2014) as Amended.

BACKGROUND AND LOCATION

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ENVIRONMENTAL APPLICATION

The following listed activities are triggered:

- NEMA EIA Regulations: Listing Notice 1 GNR 983 (as amended) Activity 12, 19 and 27; and
- NEMA EIA Regulations: Listing Notice 3 GNR 985 (as amended) Activities 12 and 14.

REGISTRATION

WSP Group Africa (Pty) Ltd (WSP) was appointed as the independent Environmental Assessment Practitioner (EAP) by Sable to manage the BA process. Parties wishing to formally register as interested and affected parties in order to receive more information and/ or raise their comment(s) on the proposed project, are requested to forward their full contact details to the EAP and disclose their direct and/or indirect business, financial, personal or other interest in the project. Any comments on the proposed project should be submitted to the EAP via the details provided below. Registered interested and affected parties will be forwarded all future project related correspondence and notified individually of additional opportunities to participate in the process.

Building C
Knightsbridge, 33 Sloane Street
Bryanston, 2191
South Africa

T: +27 11 3611390
F: +27 11 361 1301
wsp.com

DRAFT BASIC ASSESSMENT REPORT REVIEW PERIOD

The Draft Basic Assessment Report will be made available at the venues below for review and comment for 30 days from **22 October 2021** to **22 November 2021**.

PUBLIC PLACE	ADDRESS
Edenvale Library	81 Van Riebeeck Ave, Edenvale
Kempton Park Library	CR Swart Dr, Zuurfontein 33-Ir, Kempton Park
WSP Website	https://www.wsp.com/en-ZA/services/public-documents

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We look forward to your participation in this process.

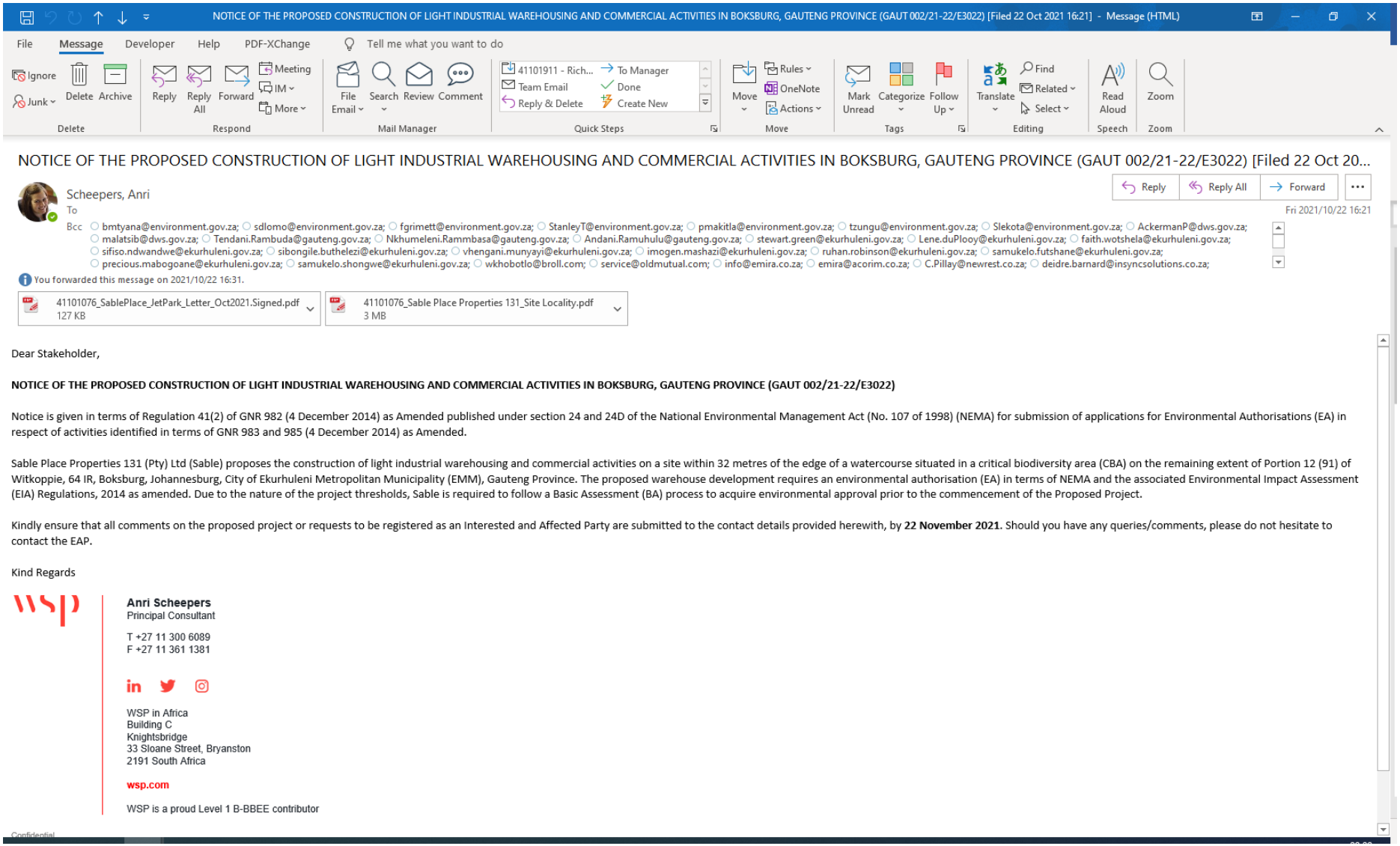
Yours sincerely,

Anri Scheepers
Principal Consultant

Tel: 011 300 6089

E-mail: Anri.Scheepers@wsp.com

Address: PO Box 98867, Sloane Park, 2152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Kind Regards
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F +27 11 361 1381
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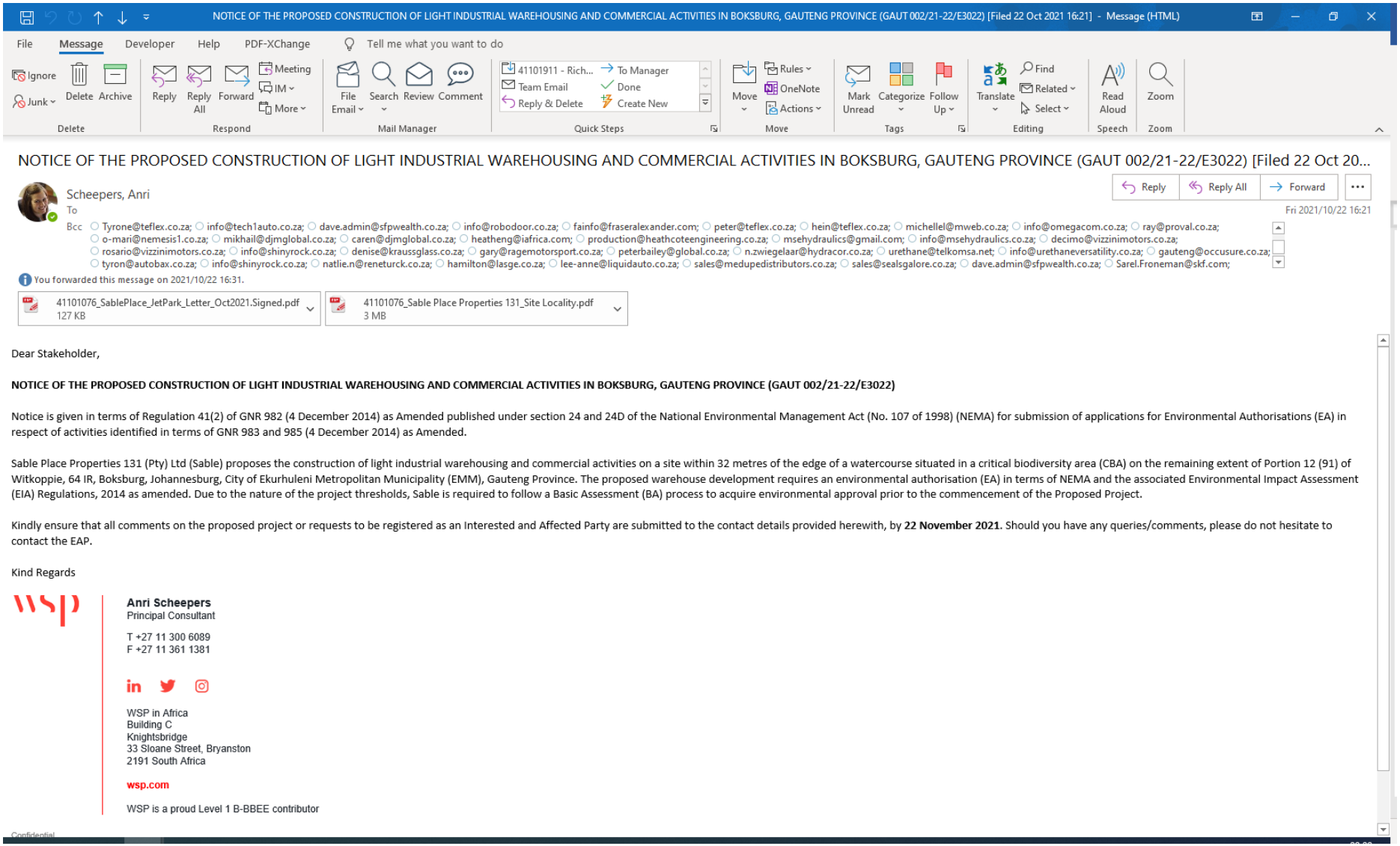
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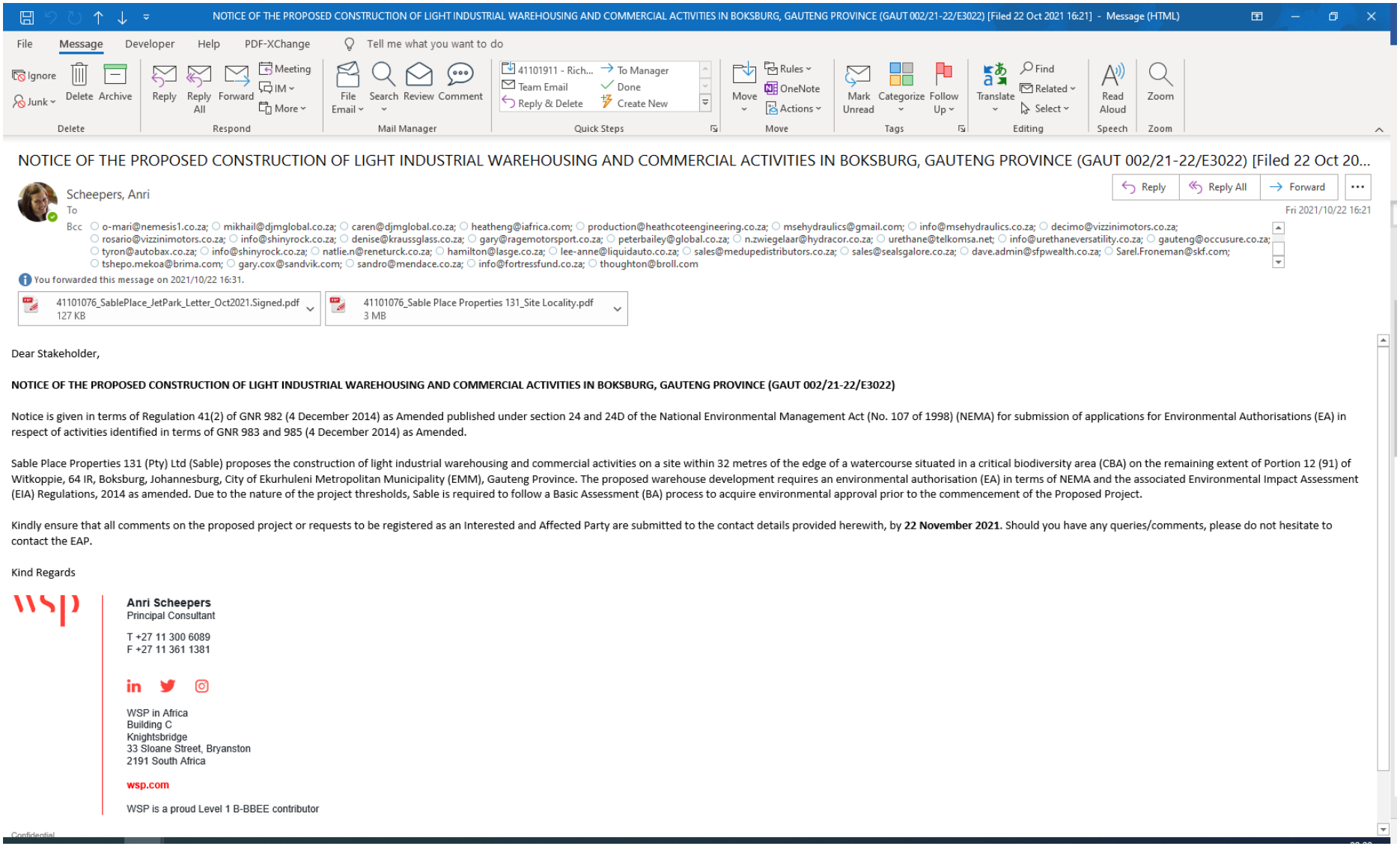
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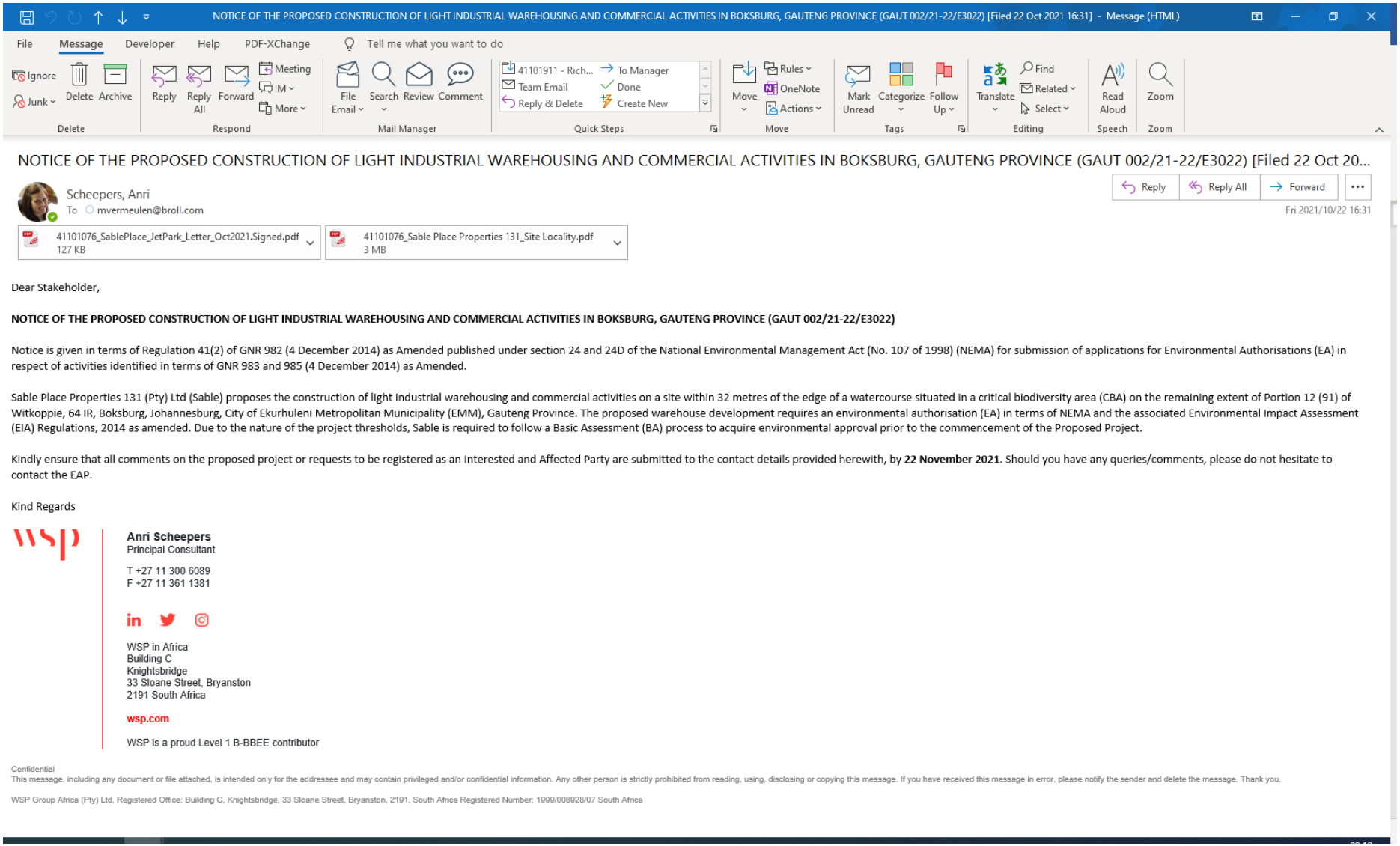
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• Preparation of weekly reports and graphs as required.
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• Daily support on purchasing process.
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• An accounting background would be advantageous.
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ZW028420

0820 GENERAL

CASHIER REQUIRED
For upmarket Adult Store in Kempton Park/ Edenvale. Shift work required. Salary R5 500.00 neg.
Email CV to Decopage2@gmail.com or fax to 086 655 2078
TH120872

0855 SALES / MARKETING

SALES REP We require young motivated male sales reps that have the know-how to sell Imported sweets to Pharmacies and Retail Stores. People skills, independent and presentable. Must be able to do country trips & stay in hotels. The position offers a good commission structure & use of a company vehicle whilst on duty. Hiring Immediately. Email your CV, I.D, Drivers licence and self photograph to buysweets@gmail.com
ZW028443

TAKE THE LEAP TO GREAT FORTUNE

With ambition and discipline, you can lead an executive lifestyle in a few short years! With over 35 years` experience, the multiple award-winning Intro Real Estate offers you world class training and support. **Sales experience a must.** Own vehicle. Over 30 years. Commission based. Join our dynamic team today!

Email recruitment@introrealestate.co.za
RN125335

TRAINEE MANAGERS
Int based Co expanding. Reps/ sales managers needed to start imm. No exp nec. Own car a MUST. **R12000 - R18000 starting package + High comm + Inc & trips + Petrol incentives.** Call 011 609 2119 SMS or WhatsApp name area/age to 064 378 7651
ZW028431

0875 TRADE

DIESEL MECHANIC REQUIRED.

Must have a valid code 10 licence.
Both code 14 and valid PDP would be an added advantage.
Must be of sober habits, reliable and have own transport to work.
To start ASAP.

Email short CV (max 4 pages) to yesmantrucksales@gmail.com
WO649212

Employment

0893 General Employment Wanted
0894 Domestic Employment Agency / Services
0895 Domestic Employment Wanted
0897 Gardener Employment Wanted
0899 Domestic / Gardener Employment Available

Caution:
Be aware of scams targeting job seekers. You do not have to pay money in order to secure a job. Report incidents to your nearest police station.

It remains the readers responsibility to check all credentials of potential employees before making any final employment decisions.

0895 DOMESTIC EMPLOYMENT WANTED

JULIA seeks full/part time Mon to Fri sleep in/out has refs & child care.
060 452 5785
AL061484

WINDY seeks full time domestic work, sleep in/out, child care + refs avail.
072 419 5299.
RN125506

Legals

0910 Auctions
0920 Estates
0950 Legal Notices
0953 Sales In Execution
0954 Title Deeds
0955 Tender
0956 Town Planning

0950 LEGAL NOTICES

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Notice is hereby given in terms of the Environmental Impact Assessment (EIA) Regulations, under sub-regulation 41(1) and sub-regulation 41(4), published in Government Gazette No 38682 of 8 December 2014, of the National Environmental Management Act, 1998 (Act No 107 of 1998) for the proposed storage of dangerous goods at Fuchs Lubricants, Diesel Street, Isando, Gauteng Province.

Geo Pollution Technologies - Gauteng (Pty) Ltd, as the independent Environmental Assessment Practitioner, was appointed to facilitate the Environmental Impact Assessment Process for the proposed storage of dangerous goods at Fuchs Lubricants, Isando, Gauteng Province. The project will be registered with the Gauteng Department of Agriculture and Rural Development (GDARD).

PROJECT DESCRIPTION

Fuchs Lubricants is currently developing a warehouse, on Erf 181 and 184 Isando, Kempton Park. On completion, the warehouse will be used for the storage of lubricants fitted with 5 500 pallet slots. Each pallet will have a storage capacity of 800l of lubricants. The warehouse will be adequately bunded and fitted with sprinkler protection and fire walls.

The need for an Environmental Impact Assessment in terms of NEMA is triggered by the following activity/ies listed in Government Notice Regulations (GNR) 327 of 7 April 2017:

Government Notice
Listing Notice 1
Activity 51
Description of Activity
The expansion and related operation of facilities for the storage, or storage and handling, of a dangerous good, where the capacity of such storage facility will be expanded by more than 80 cubic metres.

The draft Basic Assessment Report will be available for a period of 30 days from the publication of this notice. To obtain further information regarding the project and/or a copy of the BAR Report available for public comment, or register as Interested and Affected Party (I&AP), please contact:

ENVIRONMENTAL ASSESSMENT PRACTITIONER:
Elani Holton, B.Sc. (Hons), Geo Pollution Technologies - Gauteng (Pty) Ltd
Tel:012 804 8120
Fax:012 804 8140
Email: elani@gptglobal.com
GPT Ref.No: PPFUC-20-5669
ZH095401

NOTICE OF THE PROPOSED CONSTRUCTION OF LIGHT INDUSTRIAL WAREHOUSING AND COMMERCIAL ACTIVITIES IN BOKSBURG, GAUTENG PROVINCE
GAUT 002/21-22/E3022

Notice is given in terms of Regulation 41(2) of GNR 982 (4 December 2014) as Amended published under section 24 and 24D of the National Environmental Management Act (No. 107 of 1998) (NEMA) for submission of applications for Environmental Authorisations (EA) in respect of activities identified in terms of GNR 983 and 985 (4 December 2014) as Amended.

BACKGROUND AND LOCATION
Sable Place Properties 131 (Pty) Ltd (Sable) proposes the construction of light industrial warehousing and commercial activities on a site within 32 metres of the edge of a watercourse situated in a critical biodiversity area (CBA) on the remaining extent of Portion 12 (91) of Witkoppie, 64 IR, Boksburg, Johannesburg, City of Ekurhuleni Metropolitan Municipality (EMM), Gauteng Province. The proposed warehouse development requires an environmental authorisation (EA) in terms of NEMA and the associated Environmental Impact Assessment (EIA) Regulations, 2014 as amended. Due to the nature of the project thresholds, Sable is required to follow a Basic Assessment (BA) process to acquire environmental approval prior to the commencement of the Proposed Project.

ENVIRONMENTAL APPLICATION
The following listed activities are triggered:
- NEMA EIA Regulations: Listing Notice 1 GNR 983 (as amended) Activity 12, 19 and 27; and
- NEMA EIA Regulations: Listing Notice 3 GNR 985 (as amended) Activities 12 and 14.

REGISTRATION
WSP Group Africa (Pty) Ltd (WSP) was appointed as the independent Environmental Assessment Practitioner (EAP) by Sable to manage the BA process. Parties wishing to formally register as interested and affected parties in order to receive more information and/ or raise their comment(s) on the proposed project, are requested to forward their full contact details to the EAP and disclose their direct and/or indirect business, financial, personal or other interest in the project. Any comments on the proposed project should be submitted to the EAP via the details provided below. Registered interested and affected parties will be forwarded all future project related correspondence and notified individually of additional opportunities to participate in the process.

DRAFT BASIC ASSESSMENT REVIEW PERIOD
The Draft Basic Assessment Report will be made available at the venues below for review and comment for 30 days from **22 October 2021** to **22 November 2021**.
- Edenvale Library (81 Van Riebeeck Ave, Edenvale).
- Kempton Park Library (CR Swart Dr, Zuurfontein 33-Ir, Kempton Park).
- WSP website (https://www.wsp.com/en-ZA/services/public-documents).

Kindly ensure that all comments on the proposed project or requests to be registered as an Interested and Affected Party are submitted to the contact details provided herewith, by **22 November 2020**. Should you have any queries/comments, please do not hesitate to contact the EAP.

The contact details of the EAP: Anri Scheepers
(T) 011 300 6089 (E) Anri.Scheepers@wsp.com
(A) PO Box 98867, Sloane Park, 2152

APPENDIX

E-4 COMMUNICATION

Only comments from the GDARD and City of Ekurhuleni Metropolitan Municipality was received and is included in Appendix E7

APPENDIX

E-5 MINUTES OF MEETINGS

No public or stakeholder meetings were requested or held

APPENDIX

E-6 COMMENT AND RESPONSE REPORT

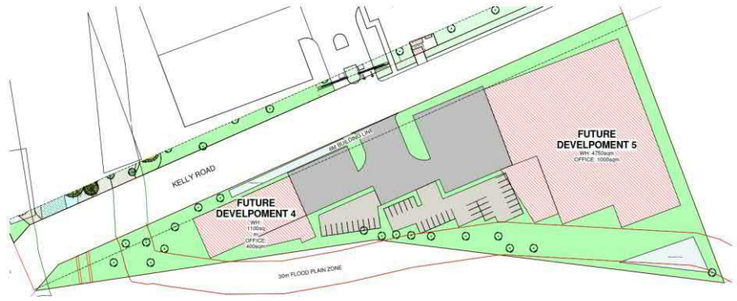
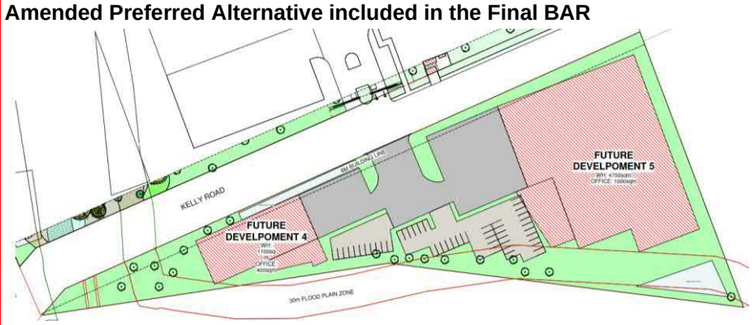
<table>
<tr><th>RAISED BY</th><th>DATE RAISED</th><th>METHOD OF RAISING</th><th>COMMENTS / ISSUE RAISED</th><th>RESPONSE</th><th>REPORT REFERENCE</th></tr>
<tr>
<td rowspan="2">Gauteng Department of Agriculture and Rural Development
Mr Teboho Leku
Control Environmental Officer Grade B: Impact Management</td>
<td rowspan="2">24/11/2021</td>
<td rowspan="2">Formal Letter per Email</td>
<td>1. Description of the site/property/route and development
The proposal entails construction of a light industrial warehouse and commercial township with a total development footprint of 1.59 hectares in extent. The property is zoned 'lndustrial 3' inclusive of warehousing. According to the Departmental Conservation Plan Version 3.3, the site has been identified as an Ecological Support Area, important Area, Threatened Ecosystem Endangered and Primary Vegetation, has a wetland and pan that is within boundary of the site. The applicant applied for Activities 12, 19 and 27 of Listing Notice 1 and Activities 12 and 14 of Listing Notice 3 of the Environmental Impact Assessment Regulations, 2014.</td>
<td>Noted , the property description is outlined in the stakeholder notifications, Draft BAR, Draft EMPr and the Application Form.</td>
<td>Section A – Part 4 of the BAR
Appendix E of the BAR
Chapter 3 of the EMPR</td>
</tr>
<tr>
<td>2. Listed activities applied for
The following listed activities have been applied for-

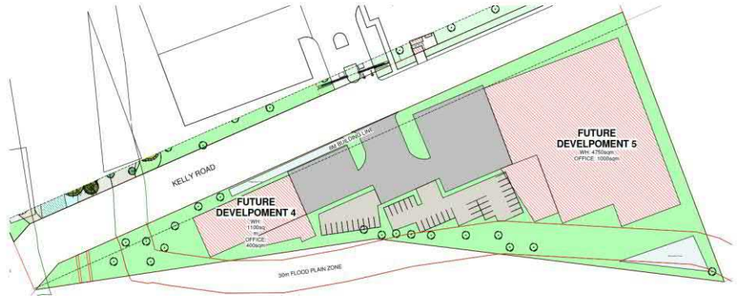
<table>
<tr><th>ACTIVITY NO AND DESCRIPTION</th><th>DESCRIPTION OF THE DEVELOPMENT RELATED TO THE LISTED ACTIVITY</th></tr>
<tr><td>GNR 327: Listing Notice 1 of activity 19
The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</td><td>The proposed warehouse development and commercial facilities are within the riparian zone of a watercourse. This will entail excavation, removal of soil of more than 10 cubic meter from watercourse.</td></tr>
<tr><td>GNR 327: Listing Notice 1 of activity 12
The development of—
(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or</td><td>The proposed warehouse development and commercial facilities are proposed within 32 metres of a watercourse as measured from the edge of the watercourse.</td></tr>
</table>
</td>
<td>Noted, the listed activities were stipulated in the stakeholder notifications, Draft BAR, Draft EMPr and the Application Form.</td>
<td>Section A – Part 2 of the BAR
Appendix E of the BAR
Chapter 2 of the EMPR</td>
</tr>
</table>

Building C
Knightsbridge, 33 Sloane Street
Bryanston, 2191
South Africa

T: +27 11 300 6089
F: +27 11 361 1381
www.wsp.com

RAISED BY	DATE RAISED	METHOD OF RAISING	COMMENTS / ISSUE RAISED		RESPONSE	REPORT REFERENCE
			(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —~			
			GNR 327: Listing Notice 1 of activity 27 The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.	The proposed warehouse development and commercial facilities will require clearance of approximately 1.5600 ha of indigenous vegetation within a CBA area as identified in the Gauteng Conservation Plan.		
			GNR 324: Listing Notice 3 of activity 12 The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.	The proposed warehouse development and commercial facilities will require clearance of approximately 1.56 hectares of indigenous vegetation within a CBA area as identified in the Gauteng Conservation Plan.		
			Listing Notice 3 activity 14 (ii)(c)(iv)- The infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (iv) Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans	The proposed warehouse development and commercial facilities are proposed within 32 metres of a watercourse as measured from the edge of the watercourse.		

RAISED BY	DATE RAISED	METHOD OF RAISING	COMMENTS / ISSUE RAISED	RESPONSE	REPORT REFERENCE
			3. Impacts Identification, Assessment and Mitigation The identification and assessment of impacts is provided in the Draft BAR. This must lead to a conclusion that the associated mitigation measures identified will reduce impacts to an acceptable level. This process of assessment and identification of impacts must also be undertaken for all chosen alternatives and their mitigation measures identified and included in the Final BAR.	The potential impacts, impact ratings and mitigations for the preferred layout and layout alternative 1 are the same. The process of assessment and identifications of impact sand mitigation measures have been undertaken for both alternatives and included in the Final BAR. A statement has been included that "*Following the assessment, it is the opinion of the EAP and the specialist that the impacts associated with the proposed project, with mitigation measures, are reduced to an acceptable level. From a wetland conservation perspective the project is considered viable provided that the essential mitigation measures outlined in the EMPr are adhered to.*"	Section E – Part 2 of the BAR Section E – Part 5 of the BAR
			4. Assessment of alternatives From the information provided in the report, two alternatives (proposal and layout) was considered for the proposed project. It must be also noted that the alterative outlined in the report is not in line with the GDARD Minimum Requirement for Biodiversity as the proposed development layout alternatives encroaches the delineation wetland. This Department requires that the preferred layout alternative be amended to remove parking bays or any other structure located within the 15m buffer and that the disturbed wetland area be rehabilitated. Therefore, an amended/revised layout plan must be submitted to department with the Final Bar observing a 30-meter buffer of the wetland.	The preferred layout alternative has been amended to remove the parking bays and any other structure from within the 30-meter buffer from the wetland. The revised layout has been included in the Final BAR.  **Amended Preferred Alternative included in the Final BAR**  **Preferred Alternative included in the Draft BAR** A Wetland Rehabilitation Plan has been compiled and is detailed in Appendix G of the Final BAR.	Section A – Part 3 of the BAR Appendix G of the BAR

RAISED BY	DATE RAISED	METHOD OF RAISING	COMMENTS / ISSUE RAISED	RESPONSE	REPORT REFERENCE
			5. Maps, layout plans, services route positioning A locality map overlain by a composite sensitivity map, site photographs and a layout plan were all provided in the Draft Basic Assessment Report. it was noted during the review of the report that Wetland Assessment and Rehabilitation Plan was not undertaken in accordance with the GDARD Minimum Requirements for Biodiversity dated March 2014 as the wetland study on page 27 of the report recommended 30m buffer around the valley bottom wetland and 15m buffer around the pan on the northern side of the wetland. However, it must be noted that no reduction of wetland will be considered and no development in the form of buildings and other structures should be constructed within the wetland area or 30 meters buffer zone measured from the edge of the wetland except for the extension and/or the installation of services. The only activities that will occur in the wetland are the rehabilitation of the disturbed wetland.	The preferred layout alternative has been amended to remove the parking bays and any other structure from within the 30-meter buffer from the wetland. The revised layout has been included in the Final BAR.  **Amended Preferred Alternative included in the Final BAR**  **Preferred Alternative included in the Draft BAR** A Wetland Rehabilitation Plan has been compiled and is detailed in Appendix G of the Final BAR.	Section A – Part 3 of the BAR Appendix G of the BAR
			6. Public Participation Process It is noted by the Department that the public participation process is still underway and must taking account the requirement specified in the ElA Regulations, 2014. The communication between interested and affected parties will be included in the Final BAR. it must address any issues raised by interested and affected parties adequately as the report is to be circulated for comments and to Interested and Affected Parties (I&Ps). Please note that the application may be prejudiced by not addressing issues raised by the Interested and affected Parties adequately.	The public participation process was undertaken as per the requirements of the EIA Regulations (2014) and the proof of communication have been included in the Final BAR.	Appendix E of the BAR
			7. Environmental Management Programme (EMPr) A site specific Environmental Management Programme (EMPr) is included in the DEIR. The EMPr must however comply with the content requirements as stipulated in Appendix 4 of the Environmental Impacts	A Section has been included in the Table 7.2 of the EMPR for the management of the untransformed area. Additional training requirements have also been included for the untransformed area.	Chapter 7 of the EMPR Chapter 6.3.5 of the EMPR

RAISED BY	DATE RAISED	METHOD OF RAISING	COMMENTS / ISSUE RAISED	RESPONSE	REPORT REFERENCE
			Assessment (EIA) regulations, 2014. The EMPr will need to address behaviour to preserve the untransformed areas of the site and other sensitivities and thus contribute to the principles of sustainable development. The state of the primary vegetation needs to be assessed, hence aspects such as the habitats should also be considered. The measures to safeguard this habitat as well as general conservation principles must be incorporated into the revised EMPr.		
City of Ekurhuleni Metropolitan Municipality Ms Faith Wotshela Head of Department: Environmental Resource & Waste Management	24 November 2021	Formal Letter per Email	2. The parameters/constraints of the study area were assessed against the following environmental management tools: — Gauteng Provincial Environmental Management Framework (GPEMF), 2015; — The Ekurhuleni Bioregional Plan, 2012; — Specialists' studies conducted for the proposed development and attached to this application; and — Applicable By-Laws, policies and requirements of the Ekurhuleni Metropolitan Municipality.	Noted. This is considered a statement and not a comment to be addressed. The BAR did include this requirement.	
			3. The applicant intends to develop the property for warehousing due to the proximity to the OR Tambo International Airport. The proposed warehousing will assist with the requirement for storage and distribution facilities within close proximity to the OR Tambo International Airport.	Noted. This is considered a statement and not a comment to be addressed. The BAR did include this requirement.	
			4. In terms of the Gauteng Environmental Management Framework, 2015 (GEMF, 2015), the proposed development site falls within Urban Development Zone 2, High Control Zone (within the urban development zone).	Noted. This is considered a statement and not a comment to be addressed. The BAR did include this requirement.	
			5. According to the City of Ekurhuleni's Bioregional Plan 2012, the proposed development site falls within Critical Biodiversity Area 1.	Noted. This is considered a statement and not a comment to be addressed. The BAR did include this requirement.	
			6. No activity must commence without Water Use License authorization from the Department of Water and Sanitation. A copy of the water use license must be submitted to this department.	The Department of Water and Sanitation (DWS) indicated that a Water Use Licence (WUL) is required and the application process is currently underway. A copy of the WUL will be submitted to the City of Ekurhuleni Metropolitan Municipality once received from the DWS,	Section A – Part 1 of the BAR
			7. Kindly note that from appendices E2-E5, there is no attached proof confirming that the proposed development has been advertised on the Provincial newspaper and there is no proof of onsite notices. The abovementioned information must be attached during the submission of Final Basic Assessment Report.	The public participation process was undertaken as per the requirements of the EIA Regulations (2014) and the proof of communication have been included in the Final BAR.	Appendix E of the BAR

RAISED BY	DATE RAISED	METHOD OF RAISING	COMMENTS / ISSUE RAISED	RESPONSE	REPORT REFERENCE
			General Comments:		
			1. Recommendations made in the specialists' reports conducted for this project must form part of the mitigation measures, be implemented and adhered to at all time.	All recommendations contained in specialist reports have been included as mitigation measures in the EMPr and it is a requirement that these be adhered to at all times.	Chapter 7 of the EMPR Chapter 8 of the EMPR
			2. Mitigation measures contained in the Environmental Management Programme (EMPr) attached as Appendix H must be implemented and adhered to at all time. The content of the said EMPr must comply with Annexure 4 of the EIA Regulations, 2014.	The requirement to implement and comply with the management and mitigation measures outlined in the EMPr has been recommended to be included in the EA. The EMPr has been compiled in compliance with Annexure 4 of the EIA Regulations, 2014.	Section E – Part 8 of the BAR Chapter 1.3 of the EMPR
			3. No development related activities should take place within the identified wetland and wet grasslands boundaries or associated buffer zones around delineated sensitive areas.	The requirement that no development related activities should take place within the identified wetland and wet grasslands boundaries or associated buffer zones around delineated sensitive areas has been included in the EMPr. In addition, it has been recommended that this requirement be included in the EA.	Chapter 7 of the EMPR Section E – Part 8 of the BAR
			4. All types of waste generated during operation of the proposed use must be disposed of in accordance with the municipal waste disposal requirements.	Management measures have been included in the EMPr that all types of waste generated during operation of the proposed project must be disposed of in accordance with the municipal waste disposal requirements.	Chapter 7 of the EMPR Chapter 8.1 of the EMPR
			5. Hazardous waste generated on the property must be properly handled and disposed of at an appropriate landfill site designated for such type of waste.	Management measures for the hazardous waste have been included in the EMPr.	Chapter 7 of the EMPR Chapter 8.1 of the EMPR
			6. Provincial noise regulations as outlined in Provincial Notice No. 5479 of 1999: Gauteng Noise Control Regulations must be complied with at all times. During construction phase, construction equipment may only operate between the hours of 08h00 and 17h00 on weekdays, 08h00 and 13h00 on Saturdays, with operation being prohibited on Sundays and Public Holidays.	This requirement has been included as a mitigation measure in the EMPr. In addition, the stipulated hours has been recommended to be included in the EA.	Chapter 7 of the EMPR Section E – Part 8 of the BAR
			7. An emergency response plan must be developed for accidental incidences/emergencies which may occur. The said plan should clearly outline corrective actions to be undertaken and prevention of recurrence thereof.	An emergency response plan has been developed and included in the EMPr, this ERP should however be refined prior to commencement of construction.	Chapter 8.6 of the EMPR
			8. The Stormwater management plan must be approved by the Department of Roads and Stormwater of the CoE. Additional stormwater runoff must be adequately managed.	The EAP has recommended that the requirement that the Stormwater management plan must be approved by the Department of Roads and Stormwater of the CoE is included in the EA.	Section E – Part 8 of the BAR
			9. All activities to be undertaken on the property must be in accordance with the applicable By-Laws, policies and requirements of the City.	The EAP has recommended that compliance to the applicable By-Laws, policies and requirements of the City pf Ekurhuleni Metropolitan Municipality be included in the EA and is a requirement of the EA.	Section E – Part 8 of the BAR

RAISED BY	DATE RAISED	METHOD OF RAISING	COMMENTS / ISSUE RAISED	RESPONSE	REPORT REFERENCE
			10. The rehabilitation plan must be adhered to because the site is a critical biodiversity area and is situated close to a wetland.	The EAP has recommended that compliance to the rehabilitation plan be included in the EA and is a requirement of the EA.	Chapter 7 of the EMPR Section E – Part 8 of the BAR
			11. In addition to the above, all relevant legislation and requirement of other government Departments (i.e. National, Provincial), in particular Section 28 (duty of care) of NEMA, must be complied with. “Duty of care” to the environment, means that every person has a duty to avoid pollution and environmental degradation.	The EMPR requires that 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.	Chapter 6.5.2 of the EMPR
			12. The applicant is reminded of Section 24F of the NEMA, Act No 107 of 1998, as amended, that, no listed activity may commence prior to an environmental authorisation being granted by the competent authority.	Noted. The applicant is aware that no activity may commence prior to an environmental authorisation being granted by the competent authority.	

APPENDIX

E-7 COMMENTS FROM I&APS ON BA REPORT

GAUTENG PROVINCE
AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA

Reference: GAUT 002/21-22/E3022
Enquiries: Teboho Leku
Tel: +27 (0)11 240 3421
Tebo.Leku@gauteng.gov.za

WSP Environmental Pty Ltd
Building C
Knightsbridge
33 Sloane Street
Bryanston
2191

Email: anri.scheepers@wsp.com

Dear Anri Scheepers,

COMMENTS ON THE DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED JET PARK WAREHOUSE DEVELOPMENT, PHASE 3 ON REMAINING EXTENT OF PORTION 12 (PORTION OF PORTION 91) OF FARM WITKOPPIE 64-IR, CITY OF EKURHULENI METROPOLITAN MUNICIPALITY

Regarding the above-mentioned Draft Basic Assessment Report received by the Department on 22 October 2021, herewith receive the comments from the Department.

1. Description of the site/property/route and development

The proposal entails construction of a light industrial warehouse and commercial township with a total development footprint of 1.59 hectares in extent. The property is zoned 'Industrial 3' inclusive of warehousing. According to the Departmental Conservation Plan Version 3.3, the site has been identified as an Ecological Support Area, Important Area, Threatened Ecosystem -Endangered and Primary Vegetation, has a wetland and pan that is within boundary of the site. The applicant applied for Activities 12, 19 and 27 of Listing Notice 1 and Activities 12 and 14 of Listing Notice 3 of the Environmental Impact Assessment Regulations, 2014.

2. Listed activities applied for

The following listed activities have been applied for-

Activity No and description	Description of the development related to the listed activity
GNR 327: Listing Notice 1 of 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 warehouse development and commercial facilities are within the riparian zone of a watercourse. This will entail excavation, removal of soil of more than 10 cubic meter from watercourse.
GNR 327: Listing Notice 1 of activity 12 The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more;	The proposed warehouse development and commercial facilities are proposed within 32 metres of a watercourse as measured from the edge of the watercourse.

where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —	
GNR 327: Listing Notice 1 of activity 27 The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation	*The proposed warehouse development and commercial facilities will require clearance of approximately 1.5600 ha of indigenous vegetation within a CBA area as identified in the Gauteng Conservation Plan.*
GNR 324: Listing Notice 3 of activity 12 The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.	*The proposed warehouse development and commercial facilities will require clearance of approximately 1.56 hectares of indigenous vegetation within a CBA area as identified in the Gauteng Conservation Plan.*
Listing Notice 3 activity 14 (ii)(c)(iv)- *The infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs—* *(a) within a watercourse;* *(iv) Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans*	*The proposed warehouse development and commercial facilities are proposed within 32 metres of a watercourse as measured from the edge of the watercourse.*

3. Impacts Identification, Assessment and Mitigation

The identification and assessment of impacts is provided in the Draft BAR. This must lead to a conclusion that the associated mitigation measures identified will reduce impacts to an acceptable level. This process of assessment and identification of impacts must also be undertaken for all chosen alternatives and their mitigation measures identified and included in the Final BAR.

4. Assessment of alternatives

From the information provided in the report, two alternatives (proposal and layout) was considered for the proposed project. It must be also noted that the alternative outlined in the report is not in line with the GDARD Minimum Requirement for Biodiversity as the proposed development layout alternatives encroaches the delineation wetland. This Department requires that the preferred layout alternative be amended to remove parking bays or any other structure located within the 15m buffer and that the disturbed wetland area be rehabilitated. Therefore, an amended/ revised layout plan must be submitted to department with the Final Bar observing a 30-meter buffer of the wetland.

5. Maps, layout plans, services route positioning

A locality map overlain by a composite sensitivity map, site plan, site photographs and a layout plan were all provided in the Draft Basic Assessment Report. It was noted during the review of the report that Wetland Assessment and Rehabilitation Plan was not undertaken in accordance with the GDARD Minimum Requirements for Biodiversity dated March 2014 as the wetland study on page 27 of the report recommended 30m buffer around the valley bottom wetland and 15m buffer around the pan on the northern side of the wetland. However, it must be noted that no reduction of wetland will be considered and no development in the form of buildings and other structures should be constructed within the wetland area or 30 meters buffer zone measured from the edge of the wetland except for the extension and/or the installation of services. The only activities that will occur in the wetland are the rehabilitation of the disturbed wetland.

6. Public Participation Process

It is noted by the Department that the public participation process is still underway and must taking account the requirement specified in the EIA Regulations, 2014. The communication between interested and affected parties will be included in the Final BAR. It must address any issues raised by interested and affected parties adequately as the report is to be circulated for

comments and to Interested and Affected Parties (I&Ps). Please note that the application may be prejudiced by not addressing issues raised by the Interested and affected Parties adequately.

7. Environmental Management Programme (EMPr)

A site -specific Environmental Management Programme (EMPr) is included in the DEIR. The EMPr must however comply with the content requirements as stipulated in Appendix 4 of the Environmental Impacts Assessment (EIA) regulations, 2014. The EMPr will need to address behaviour to preserve the untransformed areas of the site and other sensitivities and thus contribute to the principles of sustainable development. The state of the primary vegetation needs to be assessed, hence aspects such as the habitats should also be considered. The measures to safeguard this habitat as well as general conservation principles must be incorporated into the revised EMPr.

If you have any queries regarding the contents of this letter, please contact the official of the Department using any of the above indicated contact details.

Yours faithfully,

Date: Mr. Teboho Leku
Control Environmental Officer Grade B: Impact Management
Date: 2021/11/24

Ekurhuleni
METROPOLITAN MUNICIPALITY

Head of Department:
Environmental Resource &
Waste Management

Division: Compliance

Cnr. Van Riebeeck Ave and Hendrik Potgieter Street
PO Box 25
Edenvale
1610

Enquiries: Bongeka Mtyana
Andiswa Majola
Tel: (011) 999 3387
Email: Bongeka.Mtyana@ekurhuleni.gov.za
Andiswa.Majola@ekurhuleni.gov.za

Attention: Ms Anri Scheepers

Building C
Knightsbridge,33 Sloane Street
Bryanston,
2191

Ref: GAUT 002/20-22/E3022
Tel: 011 361 1390
Fax: 011 361 1301
Email: Anri.Scheepers@wsp.com

Dear Sir/Madam,

Subject: COMMENTS FOR THE DRAFT BASIC ASSESSMENT REPORT ON THE PROPOSED CONSTRUCTION OF LIGHT INDUSTRIAL WAREHOUSING AND COMMERCIAL ACTIVITIES IN BOKSBURG, GAUTENG PROVINCE

Your Draft Basic Assessment Report (DBAR) Report dated October 2021 refers.

1. The City of Ekurhuleni hereby comment as follows:

2. The parameters/constraints of the study area were assessed against the following environmental management tools:

   - Gauteng Provincial Environmental Management Framework (GPEMF), 2015;
   - The Ekurhuleni Bioregional Plan, 2012;
   - Specialists' studies conducted for the proposed development and attached to this application; and
   - Applicable By-Laws, policies and requirements of the Ekurhuleni Metropolitan Municipality.

3. The applicant intends to develop the property for warehousing due to the proximity to the OR Tambo International Airport. The proposed warehousing will assist with the requirement for storage and distribution facilities within close proximity to the OR Tambo International Airport.

4. In terms of the Gauteng Environmental Management Framework, 2015 (GEMF, 2015), the proposed development site falls within Urban Development Zone 2, High Control Zone (within the urban development zone).

5. According to the City of Ekurhuleni's Bioregional Plan 2012, the proposed development site falls within Critical Biodiversity Area 1.

6. No activity must commence without Water Use License authorization from the Department of Water and Sanitation. A copy of the water use license must be submitted to this department.

7. Kindly note that from appendices E2-E5, there is no attached proof confirming that the proposed development has been advertised on the Provincial newspaper and there is no proof of onsite notices. The abovementioned information must be attached during the submission of Final Basic Assessment Report.

General Comments:

1. Recommendations made in the specialists' reports conducted for this project must form part of the mitigation measures, be implemented and adhered to at all time.

2. Mitigation measures contained in the Environmental Management Programme (EMPr) attached as Appendix H must be implemented and adhered to at all time. The content of the said EMPr must comply with Annexure 4 of the EIA Regulations, 2014.

3. No development related activities should take place within the identified wetland and wet grasslands boundaries or associated buffer zones around delineated sensitive areas.

4. All types of waste generated during operation of the proposed use must be disposed of in accordance with the municipal waste disposal requirements.

5. Hazardous waste generated on the property must be properly handled and disposed of at an appropriate landfill site designated for such type of waste.

6. Provincial noise regulations as outlined in Provincial Notice No. 5479 of 1999: Gauteng Noise Control Regulations must be complied with at all times. During construction phase, construction equipment may only operate between the hours of 08h00 and 17h00 on weekdays, 08h00 and 13h00 on Saturdays, with operation being prohibited on Sundays and Public Holidays.

7. An emergency response plan must be developed for accidental incidences/emergencies which may occur. The said plan should clearly outline corrective actions to be undertaken and prevention of recurrence thereof.

8. The Stormwater management plan must be approved by the Department of Roads and Stormwater of the CoE. Additional stormwater runoff must be adequately managed.

9. All activities to be undertaken on the property must be in accordance with the applicable By-Laws, policies and requirements of the City.

10. The rehabilitation plan must be adhered to because the site is a critical biodiversity area and is situated close to a wetland.

11. In addition to the above, all relevant legislation and requirement of other government Departments (i.e. National, Provincial), in particular Section 28 (duty of care) of NEMA, must be complied with. “Duty of care” to the environment, means that every person has a duty to avoid pollution and environmental degradation.

12. The applicant is reminded of Section 24F of the NEMA, Act No 107 of 1998, as amended, that, no listed activity may commence prior to an environmental authorisation being granted by the competent authority.

Regards,

_____

MS FAITH WOTSHELA
HEAD OF THE DEPARTMENT:
ENVIRONMENTAL RESOURCE AND WASTE MANAGEMENT

Date: 24 November 2021

Signed by Mr. T Mokoena (DH-Compliance) on behalf of HOD: ER & WM

APPENDIX

E-8 COMMENTS FROM I&APS ON AMENDMENTS TO BA REPORT

No Amendments submittted

APPENDIX

E-9 REGISTER OF I&APS

Organisation	Title	Name	Surname
Client / Applicant			
Sable Place Properties 131 (Pty) Ltd	Mr	MC	Macfarlane
AUTHORITIES			
DFFE	Ms	Bongeka	Mtyana
DFFE	Ms	Sindiswa	Dlomo
DFFE	Ms	Fiona	Grimett
DFFE Biodiversity Conservation Unit	Mr	Stanley	Tshitwamulomoni
DFFE Biodiversity Conservation Unit	Ms	Portia	Makitla
DFFE Biodiversity Conservation Unit	Ms	Thobekile	Zungu
DFFE Biodiversity Conservation Unit	Mr	Seoka	Lekota
Department Of Water and Sanitation	Mr	Pieter	Ackerman
GDARD		Tendani	Rambuda
GDARD		Nkhumeleni	Rammbasa
GDARD		Andani	Ramuhulu

Organisation	Title	Name	Surname
Local Authorities			
Ekurhuleni Metropolitan Municipality	Mr	Stewart	Green
Ekurhuleni Metropolitan Municipality	Mr	Sifiso	Ndwandwe
Ekurhuleni Metropolitan Municipality	Ms	Sibongile	Buthelezi
Ekurhuleni Metropolitan Municipality	Mr	Vhengani	Munyayi
Ekurhuleni Metropolitan Municipality		Faith	Wotshela
Ekurhuleni Metropolitan Municipality	Cllr	Ruhan	Robinson
Ekurhuleni Metropolitan Municipality	Mr	Samukelo	Futshane
Ekurhuleni Metropolitan Municipality	Ms	Precious	Mabogoane
Ekurhuleni Metropolitan Municipality		Samukelo	Shongwe
Surrounding Landowners			
Erf 582 in Jet Park Ext 46 (T34314/2015): Emira Prop Fund Ltd			
Erf 668 in Jet Park Ext 62 (T46045/2018): Khumonetix Pty Ltd	Mr	Michael Nicolas	Georgiou

Organisation	Title	Name	Surname
Erf 666 in Jet Park Ext 62 (T46045/2018): Unknown			
Erf 342 in Jet Park Ext 21 (T3737/1989): Beckprop CC	Mr	Keith Clifton	Beckett
Erf 343 in Jet Park Ext 21 (T9910/1989): Beckprop CC			

APPENDIX

F

WATER USE LICENSE(S) AUTHORISATION, SAHRA INFORMATION, SERVICE LETTERS FROM MUNICIPALITIES, WATER SUPPLY INFORMATION

1 July 2019

Chief Engineer: Water Services Planning
City of Ekurhuleni
P O Box 215
BOKSBURG
1460

Attention: Mr. Lubabalo Matakane

Dear Sir,

PROPOSED WAREHOUSE DEVELOPMENT ON PORTION 12 OF FARM WITKOPPIE 64 (JET PARK X64) AND ON PORTION 191 OF FARM WITKOPPIE 64 AND STAND 487 IN JET PARK (JET PARK X70) - BOKSBURG: ASSESSMENT OF IMPACT ON WATER SUPPLY SYSTEM AND REQUIRED WORKS

As requested by Mr. Mike Macfarlane, on behalf of Abbeydale Building and Civils (Pty) Ltd, we have investigated the capacity of the water supply system to supply the proposed development located on the abovementioned properties and comment as follows:

1. EXTENT OF DEVELOPMENT

As indicated in the information provided to us, the proposed development will comprise of the following land use distribution:

Land use	Area to be developed (m^2)	Total site area (ha)
Jet Park X64: Portion 12 of Farm Witkoppie 64		
Warehousing	15 000	8.987
Jet Park X70: Portion 191 of Farm Witkoppie 64 and Stand 487		
Warehousing	10 620	3.226
Total	**25 620**	**12.213**

GLS Consulting (Pty) Ltd
T +27 21 880 0388 | F +27 21 880 0389
13 Elektron Street, Techno Park, Stellenbosch, 7600 | PO Box 814, Stellenbosch, 7599
Reg no: 2007/003039/07 | *a member of the EOH Group of Companies*
www.gls.co.za

Directors: Z Mayet, JJ Streicher, HA Baartman, MS Mokgosi

This study was based on a minimum required residual pressure of 24 m from the municipal system. Please note that, should any part of the proposed development ultimately have more than two storeys, private boosting to the higher storeys might be required if excess pressure is not available from the municipal system.

The location and layout of existing water supply services in the vicinity of the site are indicated in Figure A included herewith. The future water distribution zones of the area under discussion are indicated in Figure B. We confirm that the site is located within the urban development boundary, as defined in the 2010/2011 Metropolitan Spatial Development Framework (MSDF).

We furthermore confirm that provision was made for the proposed development in the Boksburg water master plan. The development's proposed density and resulting water demand (as calculated below) is higher than the future water demand that was allowed for in the master plan. Therefore, the master plan will be updated accordingly.

2. WATER SYSTEM

2.1 Water demand:

The total water demand for the proposed development is estimated as follows:

Description	Unit	Qty	Unit demand (kl/day)	Total (kl/day)
Jet Park X64: Portion 12 of Farm Witkoppie 64				
Warehousing	100m²	150.0	0.51	76.5
Jet Park X70: Portion 191 of Farm Witkoppie 64 and Stand 487				
Warehousing	100m²	106.2	0.51	54.2
SUB-TOTAL				**130.7 kl/day**
PLUS UAW (15% OF TOTAL AADD)				**23.1 kl/day**
TOTAL AVERAGE DEMAND (AADD)				**153.7 kl/day**
PEAK DEMAND (excl. fire flow) PF = 3				**5.3 l/s**
FIRE FLOW PER HYDRANT (x1) - (Medium risk)				**25 l/s**

2.2 Existing Water Services, Proposed Connection Point and Proposed Upgrading

Water distribution zone (See Figure B)

The proposed development currently falls within the area served directly through the Rand Water 3502 connection via a PRV and peak water demand is drawn from the Rand Water bulk supply system. The PRV setting should be set at 40m (4 Bar).

No change in the Jet Park PRV water distribution zone boundary is proposed between the current- and the future demand scenarios.

Reservoir Capacities

No existing or future planned municipal reservoirs affected by the proposed development.

Water tower capacities

No existing or future planned municipal water towers are affected by the proposed development.

Pump Station Capacities

No existing or future planned municipal pump stations are affected by the proposed development.

Bulk pipe capacities

Existing affected bulk pipes:

With the incorporation of the additional demand from the proposed development, none of the affected main feeder lines will experience an increase in flow velocity to above 2.0 m/s - the maximum allowable flow velocity according to the City of Ekurhuleni's modelling guidelines. We can therefore confirm that all existing affected bulk pipes have sufficient spare capacity available to accommodate the additional demand.

Future planned bulk pipes:

No future planned bulk pipes are required for the development to proceed.

Connection to the existing system, residual network pressures and required works

There is an existing 250mm Ø water pipe in Kelly Road, which divide stand portion 12 of Farm Witkoppie 64 in two portions. The proposed Jet Park X64 development can proceed to connect to this 250mm Ø pipeline with a stand water connection across Kelly Road to the eastern portion of the stand, as indicated in Figure A.

There is an existing 150mm Ø water pipe in Marlin Street, which feeds up to the boundary fence of portion 191 of Farm Witkoppie 64 and Stand 487 in Jet Park X21. The proposed Jet Park X70 development can proceed to connect to this 150mm Ø pipeline or use the existing water meter connection/s to these stands if in use still, as indicated in Figure A.

With the above upgrades and connection in place, the inclusion of the additional demand from the proposed development will not result in any of the affected main feeder pipes or network pipes experiencing an increase in flow velocity beyond the maximum flow velocity of 2.0 m/s nor will it result in other more critical sections of the water supply network experiencing decreases in residual pressures below the minimum of 24 m head.

The static and residual pressures (at ground level) that can be expected at the connection point to the proposed development are as follows:

Scenario	Demand (l/s)	Pressure (m)	Criteria
Jet Park X64: Portion 12 of Farm Witkoppie 64			
Peak flow	3.1	64	24 m minimum
Fire flow	25	62	15 m minimum
Static	0	66	90 m maximum
Jet Park X70: Portion 191 of Farm Witkoppie 64 and Stand 487			
Peak flow	2.2	63	24 m minimum
Fire flow	25	60	15 m minimum
Static	0	65	90 m maximum

Future connections:

No provision has to be made for any future developments to connect to the internal water system of the proposed development site.

3. DEVELOPER CONTRIBUTIONS TO CONSTRUCTION / UPGRADING OF INFRASTRUCTURE

GLS hereby confirms that any contributions of the developer to the required construction of infrastructure and/or the upgrading of the existing infrastructure, whether it be in the form of a cash contribution, or in the form of constructing sections of new infrastructure, is a matter to be discussed and agreed upon between the developer and the City of Ekurhuleni (CoE).

4. SUMMARY OF RECOMMENDATIONS

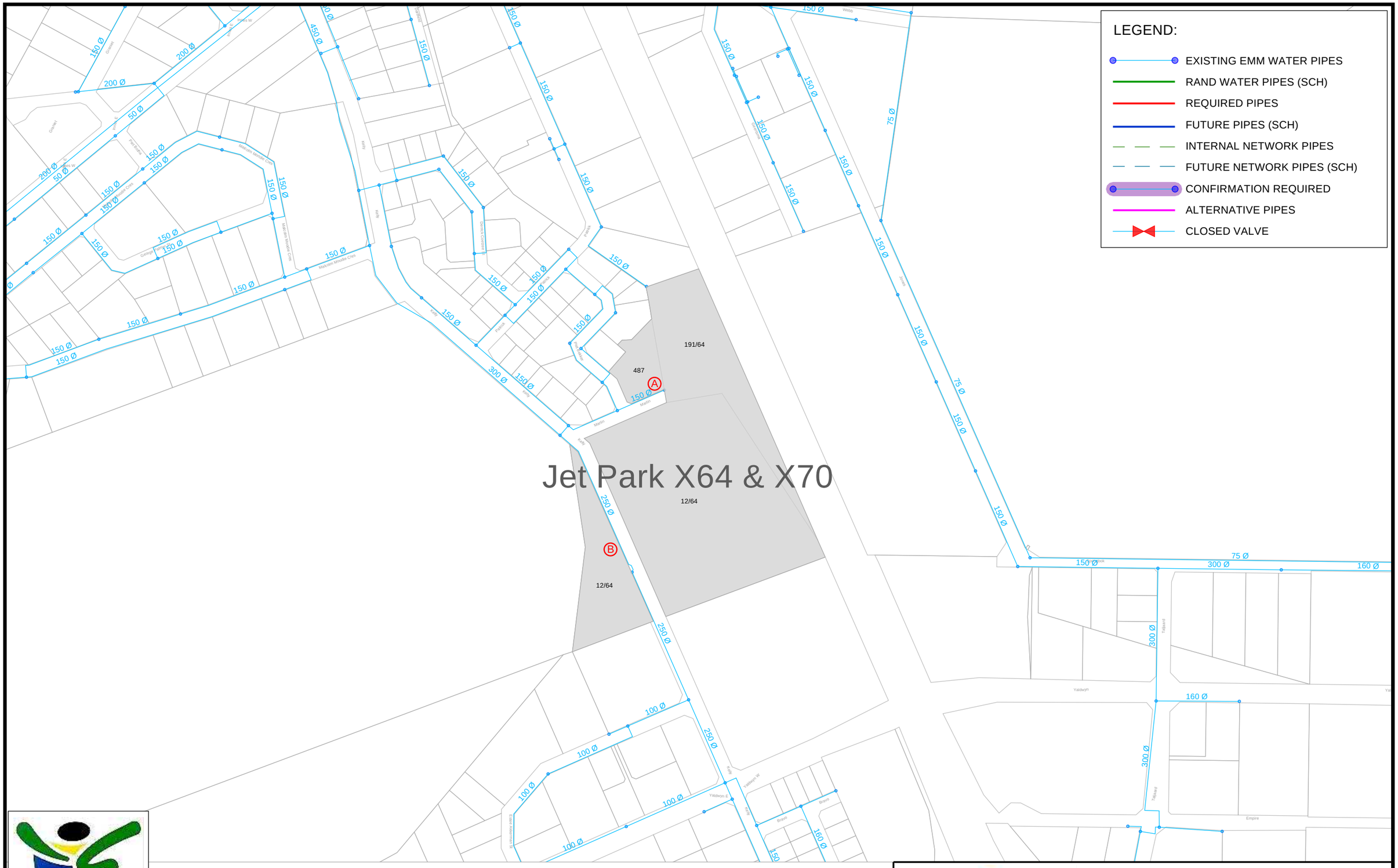
In summary we comment as follows:

- The proposed development can be incorporated into the area served by the existing Jet Park PRV water zone through the RW3502 connection
- No reservoirs are affected. CoE might request the developer to provide its own water storage if the peak demand proves to be higher or for additional fire-fighting purposes
- No water towers are affected
- No pump stations are affected
- No upgrading to any bulk or network water pipes are required
- The development can proceed by making connections to the proposed 150mm Ø and 250mm Ø pipeline in Marlin Str. and Kelly Rd respectively, as indicated in Figure A
- No provision has to be made for any future developments to connect to the internal water distribution system of the development site

We trust you will find the above sufficient in terms of your request. Should you have any further queries, please do not hesitate to contact us. The contact person regarding the above is Bennie vd Westhuyzen.

Yours sincerely,
GLS CONSULTING

_____
Per: JL (LOUIS) STRIJDOM



July 2019

Ad Hoc Water Supply Capacity Investigation
Jet Park X64 & X70 - Boksburg

gls consulting

Figure A

Location and layout of existing water supply services & proposed connection points

RW1643 Direct
Isandovale PRV1
Edenglen PRV1
Isando Booster PS
RW0261 Direct PRV2
RW0261 Direct
RW0261 Direct PRV1
RW1039 Direct
Impala Park Tower
Bulk PRV1
t PRV1
Jet Park X64 & X70
Sunnyridge Tower
eservoir PRV1
Jetpark PRV1
Bardene PRV1
Jetpark Direct
Boksburg North PRV1
Beyerspark PRV1
Sunnyridge Reservoir
Beyerspark PRV2
Sunnyridge Reservoir PRV1
Impala Park Reservoir
Benoni Central
Anderbolt PRV2
RW1933\1934 Direct

July 2019

Ad Hoc Water Supply Capacity Investigation
Jet Park X64 & X70 - Boksburg

gls consulting

Figure B

Layout and location of future water distribution zones

5 March 2021

Chief Engineer: Water Services Planning
City of Ekurhuleni
P O Box 215
BOKSBURG
1460

Attention: Mr. Lubabalo Matakane

Dear Sir,

PROPOSED WAREHOUSE DEVELOPMENT ON PORTION 12 OF FARM WITKOPPIE 64 (JET PARK X64) AND ON PORTION 191 OF FARM WITKOPPIE 64 AND STAND 487 IN JET PARK (JET PARK X70) - BOKSBURG: ASSESSMENT OF IMPACT ON SEWER SYSTEM AND REQUIRED WORKS

This report is a revision of the report dated 5 July 2019 submitted for abovementioned development. The land portion (Portion 3) west of Kelly Road is addressed in more detail in this report. As requested by Mr. Mike Macfarlane, on behalf of Abbeydale Building and Civils (Pty) Ltd, we have investigated the capacity of the sewer system to drain the proposed development located on the abovementioned properties and comment as follows:

1. EXTENT OF DEVELOPMENT

As indicated in the information provided to us, the proposed development will comprise of the following land use distribution:

Land use	Area to be developed (m²)	Total site area (ha)
Jet Park X64: Portion 12 of Farm Witkoppie 64		
Warehousing	15 000	8.987
Jet Park X70: Portion 191 of Farm Witkoppie 64 and Stand 487		
Warehousing	10 620	3.226
Total	**25 620**	**12.213**

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www.gls.co.za

Directors: MS Mokgosi, AG Hingeston, JJ Streicher, HA Baartman

The location and layout of existing sewer services in the vicinity of the site are indicated on Figure A. The current sewer drainage areas of the area under discussion are indicated on Figure B. We confirm that the site is located within the urban development boundary, as defined in the 2010/2011 Metropolitan Spatial Development Framework (MSDF).

We can also confirm that provision was not made for the proposed development in the Benoni sewer master plan. Therefore, the master plan will be updated accordingly.

2. SEWER SYSTEM

2.1 Sewage flow:

The unit water demand and resulting sewage flow for the proposed development are estimated as follows:

Description	Unit	Qty	Unit demand (kl/day)	Total (kl/day)
Jet Park X64: Portion 12 of Farm Witkoppie 64				
Warehousing: East of Kelly Road	100m²	121.1	0.51	61.8
Warehousing: West of Kelly Road	100m²	28.9	0.51	14.7
Jet Park X70: Portion 191 of Farm Witkoppie 64 and Stand 487				
Warehousing	100m²	106.2	0.51	54.2
SUB-TOTAL				**130.7 kl/day**
PLUS UAW (15% OF TOTAL AADD)				**23.1 kl/day**
TOTAL AVERAGE DEMAND (AADD)				**153.8 kl/day**
AVERAGE DAILY DRY WEATHER SEWAGE FLOW (ADDWF)				**115.0 kl/day**
PEAK DAILY DRY WEATHER SEWAGE FLOW				**2.4 l/s**

The unit water demand for each unit of development was combined with a unique sewer unit hydrograph for the specific land use (derived over history for the flow pattern of similar types of developments) and yielded a peak dry weather sewage flow of approximately 2.4 L/s for the total development.

2.2 Existing Sewer Services, Proposed Connection Point and Proposed Upgrading

Sewer drainage area (See Figure B)

The proposed development falls within the area currently draining to the JP Marais- and Welgedacht WWTPs. The sewer flow from this area drains via ERWAT's main Boksburg/Benoni 1050mm Ø outfall sewer with a down-stream diversion structure diverting a portion of the flow towards the JP Marais WWTP and a portion to the Welgedacht WWTP in Springs via ERWAT's main DD5 outfall sewer.

Certain changes in sewer drainage area boundaries are foreseen between the current- and the future drainage scenarios which will affect the proposed development site. These changes include the following:

- Ultimately the JP Marais/Welgedacht diversion structure mentioned above will be abandoned and the total flow upstream of the structure will drain directly towards the Welgedacht WWTP. Note that although JP Marais/Welgedacht diversion structure will ultimately be abandoned, JP Marais WWTP will still be in use by outfall sewers draining from other parts of Benoni.

With the above changes in place the development will ultimately fall within the Welgedacht WWTP drainage area. The bulk sewer infrastructure required for incorporation into the Welgedacht WWTP drainage area is not foreseen to be implemented within the short to medium term future.

Sewage pump station capacities

No existing municipal sewer pump stations are affected by the proposed development.

Main outfall sewers

Existing main outfall sewers:

The most critical affected main outfall sewers for the proposed option are as follows:

- The 300mm Ø Bardene outfall sewer, specifically referring to the section draining from the corner of First Road and the N12 highway along the N12 down towards the start of the 1050/1200mm Ø main in Atlas Road referred to below
- The 1050/1200mm Ø main Boksburg/Benoni outfall sewer that drains in an easterly direction along the N12 freeway and passing New Modder on the northern side
- The 1050mm Ø JP Marais WWTP western inlet
- The 1500mm Ø main ERWAT DD5 outfall sewer draining past Kingsway and Dersley towards the Welgedacht WWTP in Springs.

According to our hydraulic analysis, the most critical main outfall sewer in terms of spare capacity is the 1050mm Ø Boksburg/Benoni outfall sewer that drains in an easterly direction along the N12 freeway. Although this pipeline is currently flowing close to its full capacity, the additional flow from the proposed development will have an insignificant effect on the spare capacity of the pipe.

Network sewer pipes and connections to existing system

Recommended connection point:

The development can proceed by making a connection to the existing 450mm Ø sewer at point A and at point B for the portion located west of Kelly Road as indicated in Figure A.

Existing network pipe capacities:

With the abovementioned connections in place, no existing network sewers will experience decreases in spare capacity to below the minimum requirement of 30% spare capacity.

Future provisions:

Due to the cadastral layout and natural topography of the area, no provision has to be made for any further future development to drain through the development site.

Wastewater treatment plants

JP Marais & Welgedacht:

The JP Marais WWTP currently has a treating capacity of approximately 15 Mℓ/d. The current measured dry weather inflow into the plant is approximately 11 Mℓ/day. The current wet weather flow, however, reaches measured inflow volumes of up to 20 Mℓ/d.

A portion of the inflow that drains towards the JP Marais WWTP comes from a diversion structure to the west of the plant where a portion of the incoming flow is diverted to the JP Marais WWTP and a portion to the Welgedacht WWTP in Springs. Due to the fact that the planned upgrading at the Welgedacht WWTP has recently been completed, we hereby recommend that the flow diversion structure be set to limit the portion draining to the JP Marais WWTP to 3 Mℓ/d. This will effectively create sufficient spare capacity at the JP Marais WWTP to accommodate the peak wet weather inflow volumes including the increased volume due to the proposed development.

3. DEVELOPER CONTRIBUTIONS TO UPGRADING OF INFRASTRUCTURE

GLS hereby confirms that any contributions of the developer to the required construction of infrastructure and/or the upgrading of the existing infrastructure, whether it be in the form of a cash contribution, or in the form of constructing sections of new infrastructure, is a matter to be discussed and agreed upon between the developer and the City of Ekurhuleni (CoE) and ERWAT.

4. SUMMARY RECOMMENDATIONS

In summary we comment as follows:

- The proposed development falls within the area currently draining to the JP Marais- and Welgedacht WWTPs
- No sewage pump stations are affected by the proposed development
- No upgrading to any of the bulk sewer pipes or network sewers are required
- The development can proceed by making a connection to the existing 450mm Ø sewer pipe at point A and B as indicated in Figure A
- Due to the cadastral layout and natural topography of the area, no provision has to be made for any future developments to drain through the development site.

We trust you will find the above sufficient in terms of your request. Should you have any further queries, please do not hesitate to contact us. The contact person regarding the above is Bennie van der Westhuyzen.

Yours sincerely,
GLS CONSULTING

Per: JL (LOUIS) STRIJDOM

LEGEND:

- EXISTING CoE SEWER PIPES
- EXISTING CoE RISING MAIN PIPES
- EXISTING JHB SEWER PIPES
- REQUIRED GRAVITY PIPES (SCH)
- ALTERNATIVE RISING MAIN PIPES (SCH)
- INTERNAL SCHEMATIC PIPES
- FUTURE PIPES (SCH)
- CONFIRMATION / SURVEY REQURIED
- ALTERNATIVE GRAVITY PIPES (SCH)
- UPGRADING REQUIRED

Jet Park
X64 and X70
sewer rev1

Rolfes Pan PS

A

B

March 2021

Ad Hoc Sewer Capacity Investigation
Jet Park X64 and X70 sewer rev1 - Boksburg

gls consulting

Figure A

Location and layout of existing sewer services

Brer

Atlasville PS

Volvo PS

Bosbou PS (Vacant)

Hattingh PS

Jet Park X64 & X70

Malcolm Moodie PS

JP Marais Welgedacht WWTP

Jet Park X44 PS

Jet Park Robertsons PS

Jet Park Hughes PS

BMW PS

Rooibok PS

Denne PS

Beyers Park PS

Atlas Road PS

July 2019

Ad Hoc Sewer Capacity Investigation
Jet Park X64 & X70 - Boksburg

gls consulting

Figure B

Layout and location of existing sewer drainage areas

APPENDIX

G SPECIALIST REPORTS

APPENDIX

G-1 BIODIVERSITY ASSESSMENT

BIODIVERSITY BASELINE ASSESSMENT FOR THE PROPOSED INDUSTRIAL DEVELOPMENT AND STORMWATER CHANNEL UPGRADE

Gauteng, South Africa

October 2018

CLIENT

Prepared for:

WSP

Anri Scheepers

Anri.Scheepers@wsp.com

https://www.wsp.com

Prepared by:

The Biodiversity Company

420 Vale Ave, Ferndale, 2194

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**BIODIVERSITY BASELINE ASSESSMENT FOR THE PROPOSED INDUSTRIAL DEVELOPMENT AND STORMWATER CHANNEL UPGRADE**
Submitted to	**WSP**
Report Writer and Reviewer (Herpetofauna & Fauna)	**Michael Adams**  Michael Adams is Cert Sci Nat registered (118544) and is an experienced natural scientist with a specialisation in herpetofauna. He has over 10 years of experience working with reptiles and amphibians as a consultant and through various conservation initiatives.
Report Writer (Botany and Fauna)	**Martinus Erasmus**  Martinus Erasmus (Cand Sci Nat) obtained his B-Tech degree in Nature Conservation in 2016 at the Tshwane University of Technology. Martinus has been conducting basic assessments and assisting specialists in the field during his studies since 2015.
Report contributor	**Lindi Steyn**  Lindi Steyn has a PhD in Biodiversity and Conservation from the University of Johannesburg. She specialises in avifauna and has worked in this specialisation since 2013.
Report Reviewer	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2014 (as amended). We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principles of science.

DECLARATION

I, Martinus Erasmus, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence and is punishable in terms of Section 24F of the Act.

Martinus Erasmus

Terrestrial Ecologist

The Biodiversity Company

October 2018

DECLARATION

I, Michael Adams, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence and is punishable in terms of Section 24F of the Act.

Michael Adams

Terrestrial Ecologist

The Biodiversity Company

October 2018

EXECUTIVE SUMMARY

The completion of the study, in conjunction with the detailed results from the survey means that there is a high confidence in the information provided. The survey which was completed, and the corresponding studies resulted in good site coverage, within the proposed footprint area, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area has been severely altered from its natural state and only a small section of natural vegetation or habitat remains. The land uses surrounding the project area consist mainly of built up urban and industrial areas. Other impacts within the vicinity of the project area include access roads, dumping, litter, human encroachment, erosion and the presence of alien or invasive plant species.

It is important to note that although much of the area is disturbed and faunal densities were found to be low, field surveys revealed the presence of threatened mammal species occurring on site (namely Cape Clawless Otter). This species is utilising the drainage line and wetland areas as a corridor. It is therefore strongly recommended that these areas not be disturbed, and an appropriate buffer be implemented in order to maintain this corridor for these, and other, species. This corridor is one of the few remaining which link the dam to other natural areas.

The following further conclusions were reached based on the results of this assessment:

- A small portion of the western boundary of the project area intersects marginally with an area classified as an CBA while an ESA runs through the project area;
- According to the Gauteng C-Plan (2014) spatial data, no protected ridges occur in the vicinity of the project area and therefore the likelihood that the development will impact on any of these areas is low;
- The proposed project was superimposed on the terrestrial ecosystem threat status. Based on this, the project area falls within one ecosystem, which is listed as Critically Endangered (CR);
- The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the proposed development. According to this analysis the terrestrial ecosystems associated with the proposed project area are rated as *not protected*;
- The project boundary area does not overlap with any true FEPA or Non-FEPA wetlands;
- The project area is situated within the Soweto Highveld Grassland vegetation type. This vegetation type is listed as Endangered (EN) (Mucina & Rutherford, 2006);
- Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 448 plant species are expected to occur in the project area. Of these, four (4) species is listed as being a Species of Conservation Concern (SCC);
- No Important Bird and Biodiversity Areas (IBAs) occur within, or adjacent to, the proposed project area;

- One (1) amphibian species of conservation concern could be present in the project area, namely the Giant Bullfrog;
    - Although the project area is highly disturbed, there is some adjacent habitat that may be suitable for this species;
    - Bullfrogs spend most of the year underground and are often dug up during construction. Therefore, all staff should be made aware of the possibility that these amphibians may occur on site during the construction phase;
- Nine (9) Category 1b invasive plant species were recorded within the project area;
- Twenty-two (22) bird species were recorded in the project area during the October 2018 survey based on either direct observations, vocalisations, or the presence of visual tracks & signs; and
- Overall, mammal diversity in the project area was low, with only two mammal species (Water Mongoose (*Atilax paludinosus*) and Cape Clawless Otter (*Aonyx capensis*)) being recorded during the October 2018 survey based on direct observations and/or the presence of visual tracks & signs. The lack of mammal diversity was attributed to the disturbed nature of the project area, the lack of natural habitat and the highly urbanised environment.

Recommendations

Due to the presence of an important corridor bisecting the project area and the presence of at least one threatened mammal species which is utilising this area, the following recommendations are provided to ensure the long-term survival of this area and the continued functioning of the corridor.

An alien plant removal process should be undertaken, and all alien invasive plant species should be systematically removed from the project area (most importantly they should be removed from the wetlands and drainage line areas). Removal should be done in an appropriate manner and no excessive damage to surrounding plant species should be allowed. The use of herbicides should be minimised as far as possible or ideally, not used at all, especially in wetland areas.

Areas that are cleared during construction or where alien plant species are removed, should be revegetated with appropriate, indigenous plant species. Species which are endemic to this specific region would be the most preferable.

The primary aim of these recommendations is to reduce and human impact on the wetland and drainage line areas. Once construction is complete, measures can be put in place to reduce the presence of people into this area. Examples could be planting trees or shrubs as a screen, or even the construction of a wildlife-friendly wall (ideally with small openings near the ground so that small animals can move through). Screening of the drainage line and wetland will provide a safer and quieter zone for wildlife to move through. The use of artificial lighting in these areas is not recommended.

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Figures

1 Introduction

The Biodiversity Company (TBC) was appointed to conduct a terrestrial biodiversity baseline assessment for the construction of industrial buildings and the upgrade of the associated stormwater channel in the Ekurhuleni Metropolitan Municipality. The overall project area is situated in Jetpark, south of OR TAMBO International Airport in Johannesburg.

An early wet season terrestrial biodiversity survey was conducted on the 5th October 2018 by two terrestrial ecologists. The survey primarily focussed on the development footprint area, referred to as the project area herein. The identification and description of any sensitive receptors were recorded across the project area, and the manner in which these sensitive receptors may be affected by the activity was also investigated.

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed development.

1.1 Project Description

The proposed activity to commence on site entails the construction of industrial buildings and the upgrade of the stormwater channel in Jetpark, Ekurhuleni Metropolitan Municipality, Gauteng.

The aim of the study was to undertake and compile a biodiversity baseline and impact (risk) assessment for the proposed project. This biodiversity assessment will be informed by the National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004.

1.2 Fieldwork

An early wet season terrestrial biodiversity survey was conducted on the 5th of October 2018 by two terrestrial ecologists. The project area was analysed from a desktop level and was ground-truthed during the field assessments.

2 Project Area

The project area borders the Witkoppie Dam in Jet Park, Gauteng. The land uses surrounding the project area consists predominately of industrial developments, including factories and smaller trade stores as well as various major and secondary roads (Figure 1).

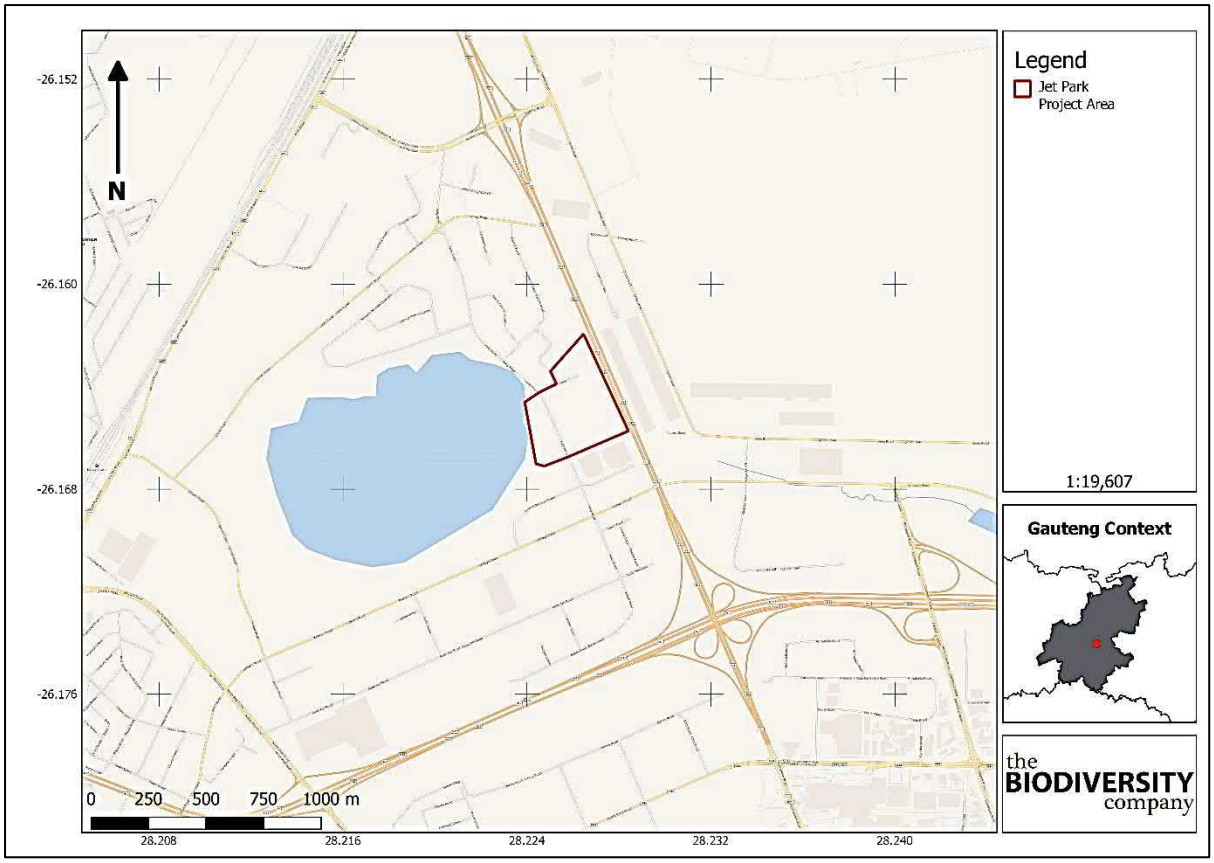

Figure 1:The general location of the project area

3 Scope of Work

The proposed Scope of Work (SoW) aims to meet the minimum requirements of the relevant Gauteng departments to conduct the relevant specialist assessments in support of a Biodiversity Baseline Assessment (BA). The following documents were considered in determining the SoW:

- Gauteng Department of Agriculture and Rural Development (GDARD): Checklist for Biodiversity Assessments; and
- GDARD Requirements for Biodiversity Assessments Version 3 (March 2014).

3.1 Specialist Studies

The selected baseline studies will aim to meet the requirements of GDARD (2014) to conduct a biodiversity assessment in Gauteng. The following studies will be included in the ecological assessment:

- Fauna – Mammals (including bats), birds, reptiles, amphibians & invertebrates;
- Plants and vegetation (including alien vegetation); and
- Habitat features – Caves & ridges.

Specifically, the Terms of Reference (ToR) included the following:

- Desktop description of the baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity) that occur in the study area, and the manner in which these sensitive receptors may be affected by the activity;
- Identify 'significant' ecological, botanical and faunal features within the proposed development areas;
- Site visit to verify desktop information;
- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application; and
- Provide a map to identifying sensitive receptors in the study area, based on available maps, database information & site visit verification.

4 Limitations

The following limitations should be noted for the study:

- As per the scope of work, the fieldwork component of the assessment comprised of one assessment only, which was conducted during the early wet season. During the early wet season many floral species are not flowering yet and thus it is not possible to identify all species present. Also, during this period, faunal activity is lower. This study has not assessed any temporal trends for the respective seasons; and
- Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.

5 Methodologies

5.1 Geographic Information Systems (GIS) Mapping

Existing data layers were incorporated into GIS software to establish how the proposed road upgrade might interact with any ecologically important entities. Emphasis was placed on the following spatial datasets:

- Vegetation Map of South Africa, Lesotho and Swaziland (Mucina *et al.,* 2006);
- Important Bird Areas 2015 – BirdLife South Africa (vector geospatial dataset); and
- Department of Environmental Affairs (DEA) National Landcover 2015.

Field surveys were conducted to confirm (or refute) the presence of species identified in the desktop assessment. The specialist disciplines completed for this study included:

- Botanical;
- Fauna (mammals and avifauna); and
- Herpetology (reptiles and amphibians).

Brief descriptions of the standardised methodologies applied in each of the specialist disciplines are provided below. More detailed descriptions of survey methodologies are available upon request.

5.2 Botanical Assessment

The botanical study encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on an ecological assessment of habitat types as well as identification of any Red Data species within the known distribution of the project area. Due to the survey being conducted in the dry season this represented a limitation to the number of species identified. The methodology included the following survey techniques:

- Sensitivity analysis based on structural and species diversity; and
- Identification of potential floral red-data species.

5.3 Literature Study

A literature review was conducted as part of the desktop study to identify the potential habitats present within the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA), to access distribution records on southern African plants. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution.

The Red List of South African Plants website (SANBI, 2017) was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1997);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk *et al.,* 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification Guide to Southern African Grasses. An identification manual with keys, descriptions and distributions. (Fish *et al.,* 2015).

Additional information regarding ecosystems, vegetation types, and species of conservation concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012);
- Grassland Ecosystem Guidelines: landscape interpretation for planners and managers (SANBI, 2013); and
- Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2016).

5.4 Faunal Assessment (Mammals & Avifauna)

The faunal desktop assessment included the following:

- Compilation of expected species lists;
- Compilation of identified species lists;
- Identification of any Red Data or species of conservation concern (SCC) present or potentially occurring in the area; and
- Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.

The field survey component of the study utilised a variety of sampling techniques including, but not limited to, the following:

- Visual observations; and
- Identification of tracks and signs.

Habitat types sampled included disturbed and semi-disturbed zones, drainage lines and wetlands.

Mammal distribution data were obtained from the following information sources:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Bats of Southern and Central Africa (Monadjem et al., 2010);
- The 2016 Red List of Mammals of South Africa, Lesotho and Swaziland (www.ewt.org.za) (EWT, 2016);
- Animal Demography Unit (ADU) - MammalMap Category (MammalMap, 2017) (mammalmap.adu.org.za); and
- A Field Guide to the Tracks and Signs of Southern, Central and East African Wildlife (Stuart & Stuart, 2013).

5.5 Herpetology (Reptiles & Amphibians)

A herpetofauna assessment of the project area was also conducted. The herpetological field survey comprised the following techniques:

- Diurnal hand searches - are used for reptile species that shelter in or under particular microhabitats (typically rocks, exfoliating rock outcrops, fallen timber, leaf litter, bark etc.);
- Visual searches - typically undertaken for species whose behaviour involves surface activity or for species that are difficult to detect by hand-searches or pitfall trapping. May include walking transects or using binoculars to view the species from a distance without the animal being disturbed;
- Amphibians – many of the survey techniques listed above will be able to detect species of amphibians. Over and above these techniques, vocalisation sampling techniques

are often the best to detect the presence of amphibians as each species has a distinct call;

- Opportunistic sampling - reptiles, especially snakes, are incredibly elusive and difficult to observe. Consequently, all possible opportunities to observe reptiles are taken in order to augment the standard sampling procedures described above.

Herpetofauna distributional data was obtained from the following information sources:

- South African Reptile Conservation Assessment (SARCA) (sarca.adu.org);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Atlas and Red list of Reptiles of South Africa, Lesotho and Swaziland (Bates et al., 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009);
- Animal Demography Unit (ADU) - FrogMAP (frogmap.adu.org.za);
- Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland (Mintner et al., 2004); and
- Ensuring a Future for South Africa's frogs (Measey, 2011).

5.6 Early Wet Season Fieldwork

The early wet season fieldwork and sample sites were placed within targeted areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork.

The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a vegetation and ecological habitat assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with proposed development areas. Due to the relatively small size of the project area, the entire project area was covered by specialists during the field work.

At each sample site notes were made regarding current impacts (e.g. livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area.

5.7 Key Legislative Requirements

The legislation, policies and guidelines listed below are applicable to the current project in terms of biodiversity and ecological support systems (Table 1). The list below, although extensive, may not be exhaustive and other legislation, policies and guidelines may apply in addition to those listed below.

Explanation of certain documents, organisations or legislation is provided (below Table 1) where these have a high degree of relevance to the project and/or are referred to in this assessment.

Table 1: A list of key legislative requirements relevant to biodiversity and conservation in Gauteng

INTERNATIONAL	Convention on Biological Diversity (CBD, 1993)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
NATIONAL	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) National Environmental Management Air Quality Act (No. 39 of 2004)
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act, 1998 (Act 36 of 1998)
	National Freshwater Ecosystem Priority Areas (NFEPA's)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
PROVINCIAL	GDARD Requirements for Biodiversity Assessments (Version 3, 2014a)
	Gauteng Department of Agriculture and Rural Development (GDARD): Checklist for Biodiversity Assessments
	GDARD Mining and Environmental Impact Guide

International Legislation and Policy

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival; and

- The IUCN (World Conservation Union). The IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

National Level

- Constitution of the Republic of South Africa (Act 108 of 1996). The Bill of Rights, in the Constitution of South Africa states that everyone has a right to a nonthreatening environment and requires that reasonable measures be applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development;
- The National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004: specifically, the management and conservation of biological diversity within the RSA and of the components of such biological diversity;
- National Forests Act, 1998 (Act 84 of 1998), specifically with reference to Protected Tree species;
- National Biodiversity Assessment (NBA): The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the Department of Environmental Affairs (DEA) and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Driver *et al.,* 2011). The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Driver *et al.,* 2011).

Provincial and Municipal Level

The Provincial Department responsible for environmental matters in Gauteng is the Gauteng Department of Agricultural and Rural Development (GDARD). Relevant provincial legislation includes, but is not limited to:

- GDARD Requirements for Biodiversity Assessments (Version 3, 2014a): Gauteng's Department of Agriculture and Rural Development's (GDARD) Biodiversity Management Directorate has defined minimum necessary requirements for biodiversity studies.

6 Project Area

6.1 General Land Use and Cover

The land uses surrounding the project area consist mainly of built up urban and industrial areas. Other impacts within the vicinity of the project area include access roads, dumping, litter, human encroachment, erosion and the presence of alien or invasive plant species.

The following infrastructure exists within the project area and surroundings:

- Factories and industrial buildings;

- Urban housing developments;
- Telephone lines;
- Various main roads, secondary tar and gravel access roads; and
- Electrical infrastructure.

6.2 Gauteng Conservation Plan Version 3.3

The Gauteng Conservation Plan (Version 3.3) (GDARD, 2014) (Gauteng C-Plan) classified areas within the province on the basis of its contribution to reach the conservation targets within the province. The Gauteng C-Plan uses the following terms to categorise the various land used types according to their biodiversity and environmental importance:

- Critical Biodiversity Area (CBA);
- Ecological Support Area (ESA);
- Other Natural Area (ONA);
- Protected Area (PA); and
- Moderately or Heavily Modified Areas (MMA's or HMA's).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (GDARD, 2014). Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic (SANBI-BGIS, 2017).

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (SANBI-BGIS, 2017).

Moderately or Heavily Modified Areas (sometimes called 'transformed' areas) are areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets (MTPA, 2014). Some of these areas may still provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly, and in many cases irreversibly, compromised.

As shown in Figure 2, a portion of the western boundary of the project area intersects with an area classified as an CBA and an ESA runs through the central portion of the property.

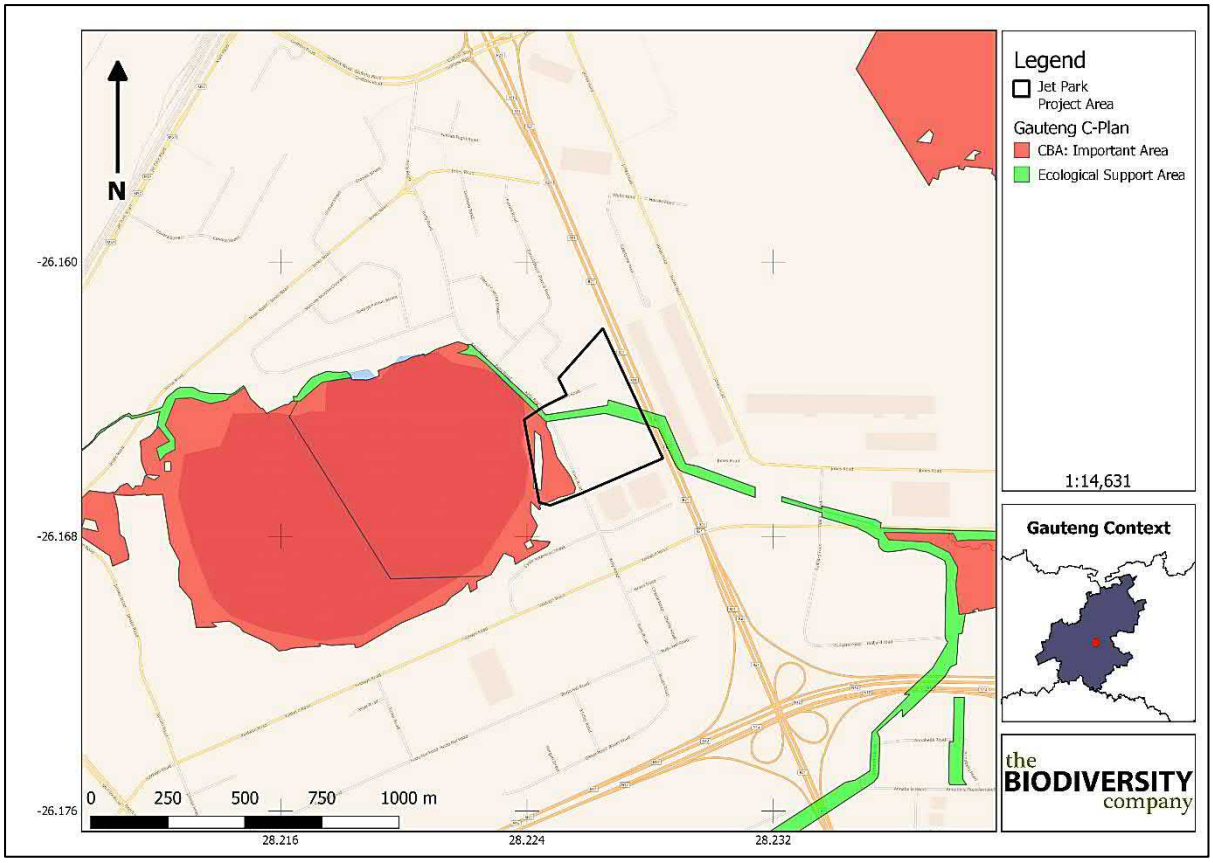

Figure 2: The project area superimposed on the Gauteng C-Plan (2014)

6.3 Rocky Ridges

According to the Gauteng Conservation C-Plan (2014), ridges are characterized by high spatial heterogeneity due to the range of differing aspects, slopes and altitudes all resulting in differing soil, temperature, elevation, light and hydrological conditions. This variation is an especially important predictor of biodiversity.

Ridges are characterized by a particularly high biodiversity and it follows that their protection will contribute significantly to the conservation of biodiversity in Gauteng. The ridges of Gauteng are vital habitat for many threatened plant species. Sixty-five percent of Gauteng's threatened plant species and 71% of Gauteng's endemic plant species have been recorded on ridges.

According to the Gauteng C-Plan (2014) spatial data, the closest protected ridge (Class 4) is found approximately 4 km from the project area (Figure 3). The likelihood that the development will impact on this area is considered to be low.

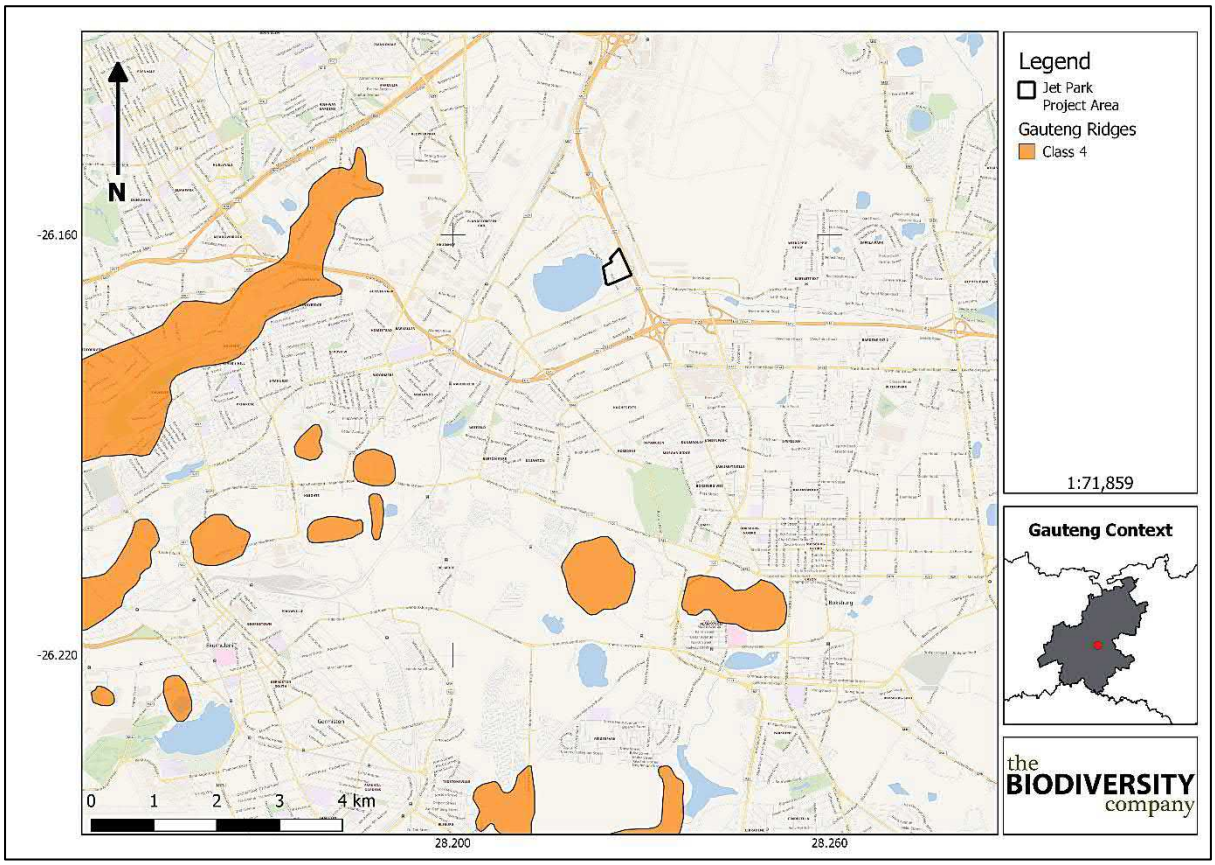

Figure 3: The project area in relation to the rocky ridges (Gauteng C-Plan, 2014)

6.4 National Biodiversity Assessment

The National Biodiversity Assessment (NBA) is a product of high scientific importance led by the South African National Biodiversity Institute (SANBI) in collaboration with the Department of Environmental Affairs and several other partner organisations.

The NBA is central to fulfilling SANBI's mandate to monitor and report regularly on the status of the country's biodiversity, in terms of the National Environmental Management: Biodiversity Act (NEMBA, Act 10 of 2004). The NBA endeavours to capture the challenges and opportunities embedded in South Africa's rich natural heritage by looking at biodiversity in the context of social and economic change and recognising the relationship between people and their environment. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments.

The NBA links closely with the National Biodiversity Monitoring Framework, which establishes a set of core biodiversity indicators for the country. The NBA provides focus and impetus for taking forward a programme of work to measure these indicators and synthesises them periodically at the national scale. The National Biodiversity Monitoring Framework seeks to answer the following high-level policy-relevant questions:

- Status: How is South Africa's biodiversity doing at ecosystem, species and genetic level?
- Trends: Are ecosystem, species and genetic diversity doing better or worse?
- Are we responding effectively to the challenge of managing and conserving biodiversity?
- How is society benefiting from biodiversity?

The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level (Driver *et al.,* 2011).

6.4.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver *et al.,* 2011).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver *et al.,* 2011).

The proposed project area was superimposed on the terrestrial ecosystem threat status (Figure 4). As seen in this figure the project area falls within one ecosystem, which is listed as Critically Endangered (CR).

Figure 4: The project area showing the ecosystem threat status of the associated terrestrial ecosystems (NBA, 2012)

6.4.2 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Driver *et al.,* 2011).

The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 5). Based on this analysis the terrestrial ecosystems associated with the proposed project area are rated as *not protected*. This means that this ecosystem type (and associated habitats) are not well protected anywhere in the country (such as in nationally protected areas).

Figure 5: The project area showing the level of protection of terrestrial ecosystems (NBA, 2012)

6.5 Project Area in Relation to Protected Areas

Figure 6 shows the location of formally protected areas in relation to the project area. Formally protected areas refer to areas protected either by national or provincial legislation. Based on the SANBI (2010) Protected Areas Map and the National Protected Areas Expansion Strategy (NPAES) the proposed project is unlikely to impact upon any formally protected area. The closest protected area from the project area is the Bill Steward Municipal Nature Reserve which is situated approximately 7 km from the project area (Figure 6).

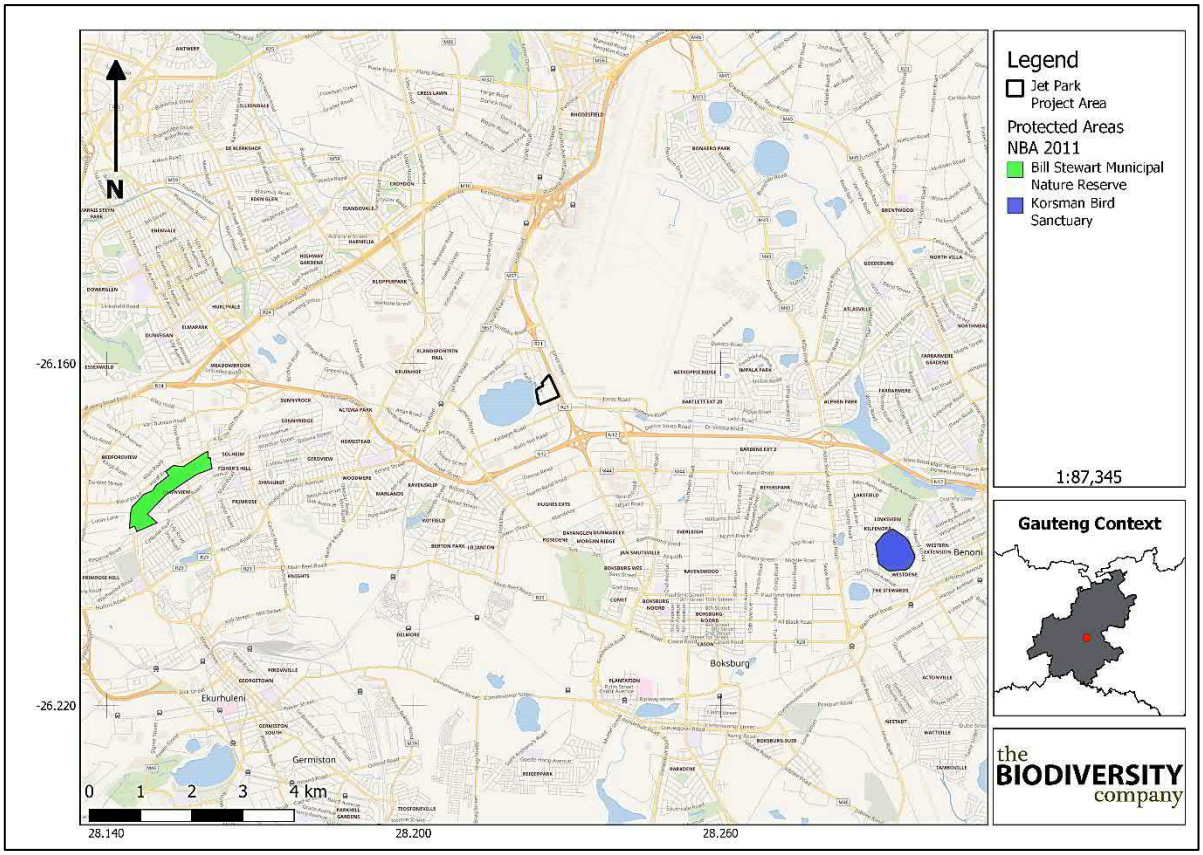

Figure 6: The project area in relation to the formally protected areas (NPAES, 2011)

6.6 National Freshwater Ecosystem Priority Area (NFEPA) Status

In an attempt to better conserve aquatic ecosystems, South Africa has recently categorised its river systems according to set ecological criteria (i.e. ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011). The NFEPA status mapping for the project area is depicted in Figure 7.

Figure 7 shows the location of the project area in relation to wetland and river FEPAs. Based on this information the project boundary area does not overlap with any True-FEPAs but does overlap with three Non-FEPA wetlands and one Non-FEPA river.

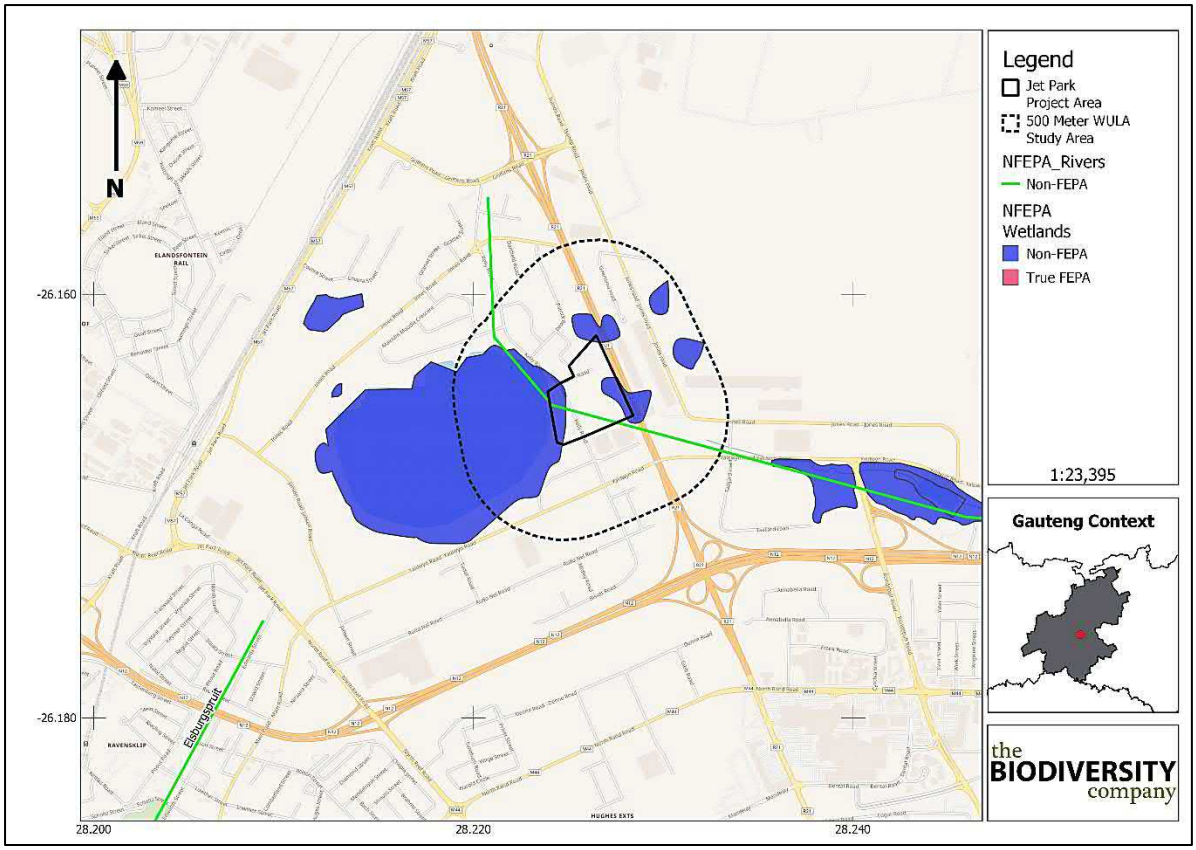

Figure 7: The project area in relation to the National Freshwater Ecosystem Priority Areas (2011)

6.7 Desktop Assessment

6.7.1 Vegetation Assessment

The project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

a) Seasonal precipitation; and
b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

6.7.1.1 Vegetation Types

The Grassland Biome comprises a number of vegetation types. The project area is situated within the *Soweto Highveld Grassland* vegetation type and adjacent to the Eastern Temperate Freshwater Wetlands vegetation type (Figure 8) (Mucina & Rutherford, 2006).

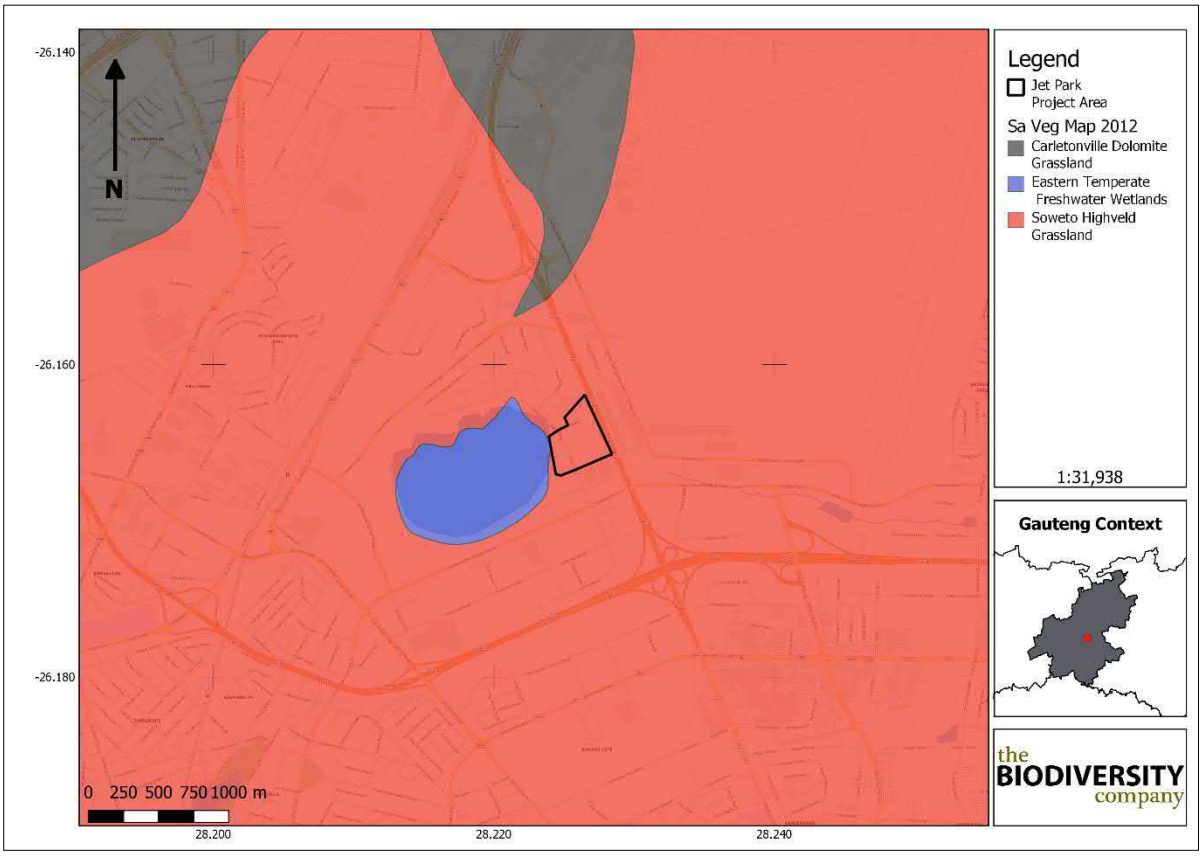

Figure 8: The project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2017)

6.7.1.2 Soweto Highveld Grassland

The Soweto Highveld Grassland vegetation type is found in Mpumalanga, Gauteng and to a little extent also in neighbouring Free State and North-West Provinces. This vegetation type typically comprises of an undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus, Eragrostis racemosa, Heteropogon contortus* and *Tristachya leucothrix*. Scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover (Mucina & Rutherford, 2006).

Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are important in the Soweto Highveld Grassland.

Graminoids: *Andropogon appendiculatus, Brachiaria serrata, Cymbopogon pospischilii, Cynodon dactylon, Elionurus muticus , Eragrostis capensis, E. chloromelas, E. curvula, E.*

plana, E. planiculmis, E. racemosa, Heteropogon contortus, Hyparrhenia hirta, Setaria nigrirostris, S. sphacelata, Themeda triandra, Tristachya leucothrix, Andropogon schirensis, Aristida adscensionis, A. bipartita, A. congesta, A. junciformis subsp. galpinii, Cymbopogon caesius, Digitaria diagonalis, Diheteropogon amplectens, Eragrostis micrantha, E. superba, Harpochloa falx, Microchloa caffra, Paspalum dilatatum (Mucina & Rutherford, 2006).

Herbs: *Hermannia depressa, Acalypha angustata, Berkheya setifera, Dicoma anomala, Euryops gilfillanii, Geigeria aspera var. aspera, Graderia subintegra, Haplocarpha scaposa, Helichrysum miconiifolium, H. nudifolium var. nudifolium, H. rugulosum, Hibiscus pusillus, Justicia anagalloides, Lippia scaberrima, Rhynchosia effusa, Schistostephium crataegifolium, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata* (Mucina & Rutherford, 2006).

***Geophytic Herbs*:** *Haemanthus humilis subsp. hirsutus, H. montanus. Herbaceous Climber: Rhynchosia totta* (Mucina & Rutherford, 2006).

Low Shrubs: *Anthospermum hispidulum, A. rigidum subsp. pumilum, Berkheya annectens, Felicia muricata, Ziziphus zeyheriana* (Mucina & Rutherford, 2006).

6.7.1.2.1 Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006), the Soweto Highveld Grassland vegetation type is classified as Endangered. The national target for conservation protection for both these vegetation types is 24%, but only a few patches are statutorily conserved in Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe's Pan Nature Reserves or privately conserved in Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves and the Heidelberg Natural Heritage Site.

By 2006 nearly half of the area of occupancy of this vegetation type had already been transformed by cultivation, urban sprawl, mining and building of road infrastructure. The amount of area transformed has most likely increased substantially. Some Soweto Grassland areas have been flooded by dams including Grootdraai, Leeukuil, Trichardtsfontein, Vaal and Willem Brummer.

6.7.1.3 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 448 plant species are expected to occur in the project area. Figure 9 shows the extent of the grid that was used to compile the expected species list based on the Plants of Southern Africa (BODATSA-POSA, 2016) database. The list of expected plant species is provided in Appendix A.

Of the 448-plant species, four (4) species is listed as being a Species of Conservation Concern (SCC).

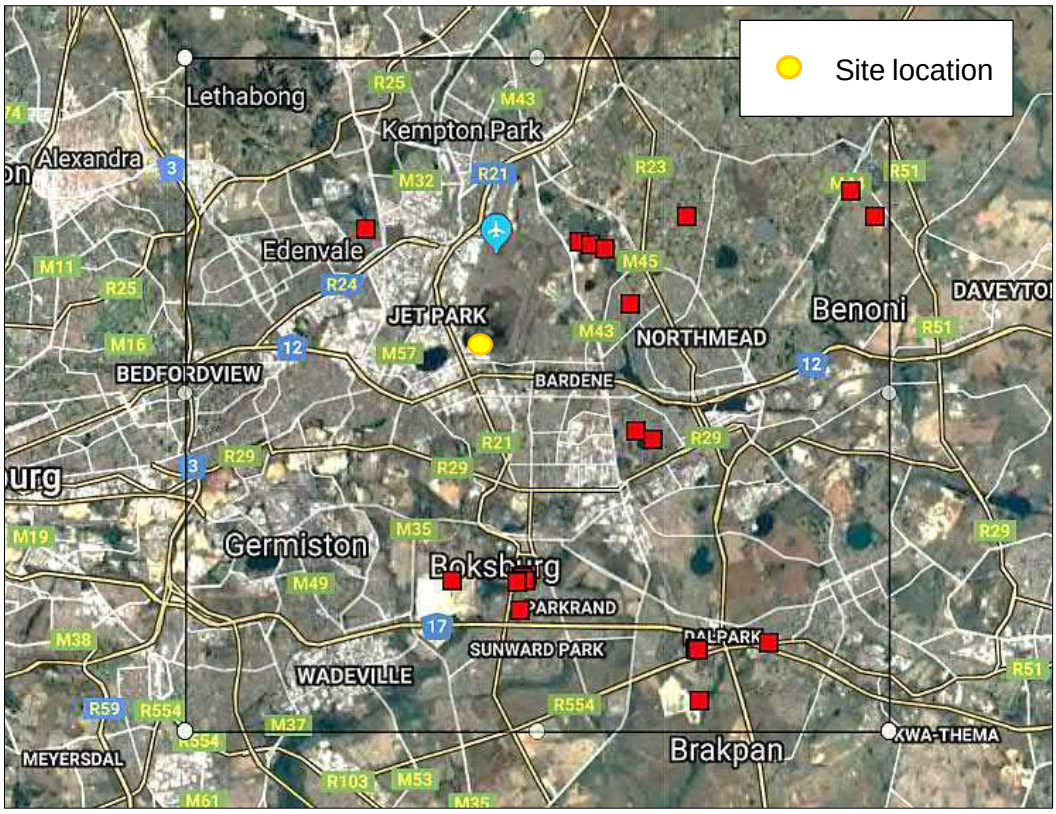

Figure 9: The extent of the grid drawn in order to compile the expected flora species list for the project area

Table 2: Plant Species of Conservation Concern (SCC) expected to occur in the project area (BODATSA-POSA, 2016)

Family	Taxon	Author	IUCN	Ecology
Iridaceae	*Gladiolus robertsoniae*	F. Bolus	NT	Indigenous; Endemic
Orchidaceae	*Habenaria bicolor*	Conrath & Kraenzl.	NT	Indigenous
Fabaceae	*Indigofera hybrida*	N.E.Br.	VU	Indigenous; Endemic
Asphodelaceae	*Kniphofia typhoides*	Codd	NT	Indigenous; Endemic

Gladiolus robertsoniae is listed as Near Threatened according to the Red List of South African Plants (SANBI, 2017) and is endemic to southern Africa, mainly being found in South-eastern Gauteng, northern Free State and south-western Mpumalanga. Land-use within the known range of this species is predominantly agriculture, and about 39% of grasslands within the range are transformed. However, agriculture is unlikely to have affected this species severely as moist rocky areas are unsuitable for ploughing and crop cultivation (Lotter *et al.,* 2017).

Habenaria bicolor is categorized as Near Threatened according to the Red List of South African Plants (SANBI, 2017). This species is not endemic to South Africa but can be found in Gauteng and near Middelburg in Mpumalanga. Major threats to the species are urban expansion, habitat transformation, degradation and destruction.

Indigofera hybrida is categorised as Vulnerable according to the Red List of South African Plants (SANBI, 2017). This species is endemic to South Africa and is fund mainly in Mpumalanga. Some habitat has been transformed to forestry plantations and agriculture and further habitat loss remains a potential threat (Burrows *et al.,* 2018).

Kniphofia typhoides is categorised as Near Threatened according to the Red List of South African Plants (SANBI, 2017). It is a species found in low lying wetlands and seasonally wet areas in climax *Themeda triandra* grasslands on heavy black clay soils. Extensive declines in the population in the last 30 years has been found as a result of habitat loss to coal mining, overgrazing by cattle, urban expansion (especially in Gauteng), crop cultivation in the eastern North West Province and alien plant invasion in western Mpumalanga and North West Province. The full extent of the decline is unknown but is suspected to be over 25%.

6.7.2 Faunal Assessment

6.7.2.1 Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 399 bird species are expected to occur in the vicinity of the project area (pentads 2600_2805; 2600_2810; 2600_2815; 2605_2805; 2605_ 2810; 2605_2815; 2610_2805; 2610_2810; 2610_2815). The full list of potential bird species is provided in Appendix B.

Of the expected bird species, thirty (30) species are listed as SCC either on a regional scale or international scale (Table 3).

The SCC include the following:

- One is listed as critically endangered (CR) on a regional basis;
- Five (5) species that are listed as Endangered (EN) on a regional basis;
- Nine (9) species that are listed as Vulnerable (VU) on a regional basis; and
- Twelve (12) species that are listed as Near Threatened (NT) on a regional basis.

Table 3: List of bird species of regional or global conservation importance that are expected to occur in pentads 2600_2805; 2600_2810; 2600_2815; 2605_2805; 2605_ 2810; 2605_2815; 2610_2805; 2610_2810; 2610_2815 (SABAP2, 2018, ESKOM, 2015; IUCN, 2017)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Alcedo semitorquata	Kingfisher, Half-collared	NT	LC	Moderate
Anthropoides paradiseus	Crane, Blue	NT	VU	Low
Aquila ayresii	Hawk-eagle, Ayres's	NT	LC	Low
Aquila verreauxii	Eagle, Verreaux's	VU	LC	Low
Calidris ferruginea	Sandpiper, Curlew	LC	NT	Moderate
Certhilauda brevirostris	Lark, Agulhas Long-billed	NT	NR	Low
Ciconia abdimii	Stork, Abdim's	NT	LC	Low
Ciconia nigra	Stork, Black	VU	LC	Low
Circus ranivorus	Marsh-harrier, African	EN	LC	Low
Coracias garrulus	Roller, European	NT	LC	Moderate
Ephippiorhynchus senegalensis	Stork, Saddle-billed	EN	LC	Low
Eupodotis caerulescens	Korhaan, Blue	LC	NT	Low
Eupodotis senegalensis	Korhaan, White-bellied	VU	LC	Low

Falco biarmicus	Falcon, Lanner	VU	LC	Low
Falco vespertinus	Falcon, Red-footed	NT	NT	Low
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Moderate
Gyps africanus	Vulture, White-backed	CR	CR	Low
Gyps coprotheres	Vulture, Cape	EN	EN	Low
Limosa lapponica	Godwit, Bar-tailed	LC	NT	Moderate
Mycteria ibis	Stork, Yellow-billed	EN	LC	Moderate
Oxyura maccoa	Duck, Maccoa	NT	NT	High
Pelecanus onocrotalus	Pelican, Great White	VU	LC	Low
Pelecanus rufescens	Pelican, Pink-backed	VU	LC	Low
Phoeniconaias minor	Flamingo, Lesser	NT	NT	Low
Phoenicopterus ruber	Flamingo, Greater	NT	LC	Low
Polemaetus bellicosus	Eagle, Martial	EN	VU	Low
Rostratula benghalensis	Painted-snipe, Greater	NT	LC	Moderate
Sagittarius serpentarius	Secretarybird	VU	VU	Low
Tyto capensis	Grass-owl, African	VU	LC	Low

Alcedo semitorquata (Half-collared Kingfisher) is listed as Near Threatened (NT) on a regional scale and occurs across a large range. This species generally prefers narrow rivers, streams, and estuaries with dense vegetation onshore, but it may also move into coastal lagoons and lakes. It mainly feeds on fish (IUCN, 2017). The possibility of occurrence is moderate due to the fact that the Witkoppie Dam is on the boundary of the project area, and there are various wetland areas nearby, both of which could provide suitable habitat for this species.

Anthropoides paradiseus (Blue Crane) is listed as NT on a regional scale and as VU on a global scale. This species has declined, largely owing to direct poisoning, power-line collisions and loss of its grassland breeding habitat owing to afforestation, mining, agriculture and development (IUCN, 2017). This species breeds in natural grass- and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short. Due to the lack of open grassland areas within the project area and the high levels of anthropogenic disturbance, the likelihood of occurrence is rated as low for this species.

Aquila ayresii (Ayres's Hawk-eagle) is categorised as NT regionally. This species is rare in Southern Africa where it generally prefers dense woodland, forest edges and well-wooded suburbia and often roosting in stands of Eucalyptus trees. Its numbers are declining due to loss and degradation of woodland, especially miombo (Brachystegia). It is also persecuted due to its tendency to kill homing pigeons, and other domestic birds. Due to the lack of suitable habitat the species is considered unlikely to occur in the project area.

*Aquila verreauxii (*Verreaux's Eagle) is listed as VU on a regional scale and LC on a global scale. This species is locally persecuted in southern Africa where it coincides with livestock farms, but because the species does not take carrion, is little threatened by poisoned carcasses. Where hyraxes are hunted for food and skins, eagle populations have declined (IUCN, 2017). Due to the proximity to urbanised areas and the chance of prosecution the likelihood of occurrence is rated as low.

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes,

large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). Due to the presence of some of these habitat types within the project area the likelihood of occurrence of this species was rated as moderate.

Certhilauda brevirostris (Agulhas long-billed lark) is listed as Near Threatened (NT) on a regional scale but has not yet been evaluated by IUCN. The species is endemic to South Africa and generally they prefer recently ploughed fields, shrubland punctuated with Renosterbos (*Dicerothamnus rhinocerotis)* and dwarf Karoo shrubland on clay substrate. Mainly eats insects supplemented with seeds. The lack of suitable foraging area results in the likelihood of occurrence being rated as low.

Ciconia abdimii (Abdim's Stork) is listed as NT on a local scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes. They tend to roost in trees or cliffs (IUCN, 2017). The existence of wet areas creates the potential for this species to occur in the area but due to the proximity of the urban footprint, the high human density and the degraded state of the environment the likelihood of occurrence was rated as low.

Ciconia nigra (Black Stork) is native to South Africa, and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). It is unlikely that this species would occur in the project area due to the lack of forested areas and the proximity to urbanised areas.

Circus ranivorus (African Marsh Harrier) is listed as EN in South Africa (ESKOM, 2014). This species has an extremely large distributional range in sub-equatorial Africa. South African populations of this species are declining due to the degradation of wetland habitats, loss of habitat through over-grazing and human disturbance and possibly, poisoning owing to over-use of pesticides (IUCN, 2017). This species breeds in wetlands and forages primarily over reeds and lake margins. Due to the proximity to urbanised areas and the extent of the disturbance of the area the likelihood of occurrence is rated as low.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a moderate chance of this species occurring in the project area due to the proximity to water.

Ephippiorhynchus senegalensis (Saddle-billed Stork) is listed as Endangered (EN) on a local basis and is known to inhabit extensive fresh, brackish or alkaline wetlands in open, semi-arid areas and savanna, with relatively high abundances of fish and with large trees nearby for nesting and roosting (IUCN, 2017). Suitable habitats include shallow freshwater marshes, wet grasslands, the margins of large or small rivers, lake shores pans and flood-plains. The likelihood of occurrence is rated as low, because of the proximity to urbanization and the skittishness of this species.

Eupodotis caerulescens (Blue Korhaan) is listed as near threatened according to the IUCN (2017). Their moderately rapid decline is accredited to habitat loss that is a result of intensive agriculture. They are found in high grassveld in close proximity to water, usually above an altitude of 1 500m (del Hoyo *et al.,* 1996). The specie nests in bare open ground, situated in thick grass or cropland. Based on the required habitat the likelihood of occurrence of this species is rated as low.

Eupodotis senegalensis (White-bellied Korhaan) is Near-endemic to South Africa, occurring from the Limpopo Province and adjacent provinces, south through Swaziland to KwaZulu-Natal and the Eastern Cape. It generally prefers tall, dense sour or mixed grassland, either open or lightly wooded, occasionally moving into cultivated or burnt land, which doesn't seem present in the project area thus likelihood of occurrence was rated as low (Hockey *et al.,* 2005).

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of occurrence is rated as low due to the large amount of buildings surrounding the project area.

Falco vespertinus (Red-footed Falcon) is known to breed from eastern Europe and northern Asia to north-western China, heading south in the non-breeding season to southern Angola and southern Africa. Within southern Africa it is locally uncommon to common in Botswana, northern Namibia, central Zimbabwe and the area in and around Gauteng, South Africa (Hockey *et al.,* 2005). The habitat it generally prefers is open habitats with scattered trees, such as open grassy woodland, wetlands, forest fringes and croplands. Majority if not all of these habitats are absent in the project area and thus the likelihood of occurrence is rated as low.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to it's migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. There is a small amount of suitable habitat within the project area and adjacent to it and as such the likelihood of occurrence is rated as moderate.

Gyps africanus (White-backed Vulture) has a large range and only occurs throughout sub-Saharan Africa. Primarily a lowland species of open wooded savanna, particularly areas of *Acacia* (*Vachellia*). It requires tall trees for nesting. According to the IUCN (2017) this species faces similar threats to other African vultures, being susceptible to habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning. The likelihood of suitably large trees for nesting for this species is low at the project area.

Gyps coprotheres (Cape Vulture) is listed as Endangered (EN) on both a regional and global scale. Cape Vultures are long-lived carrion-feeders specialising on large carcasses, they fly long distances over open country, although they are usually found near steep terrain, where they breed and roost on cliffs (IUCN, 2017). Individuals may be seen foraging within the area but are unlikely to be resident. Likelihood of occurrence is rated as low due to the proximity to urbanization and the lack of suitable nesting sites.

Limosa lapponica (Bar-tailed Godwit) is listed as Near Threatened on a global scale. This species has an extremely large range, they breed across the Arctic from northern Europe through Siberia to Alaska (U.S.A.), wintering along the coasts of western Europe, Africa, the Middle East, south- and south-east Asia, Australia and New Zealand. When breeding the species feeds on insects, annelid worms, molluscs and occasionally seeds and berries (del

Hoyo *et al.,* 1996). In intertidal areas the species' diet consists of annelids, bivalves and crustaceans, although it will also take crane fly larvae and earthworms on grasslands and occasionally larval amphibians (tadpoles) and small fish (del Hoyo *et al.,* 1996). The likelihood of occurring in the project area is rated as moderate due to the proximity to the dam.

Mycteria ibis (Yellow-billed Stork) is listed as EN on a regional scale and Least Concern (LC) on a global scale. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). The presence of extensive water bodies within the project area creates a moderate possibility that this species may occur there.

Oxyura maccoa (Maccoa Duck) has a large northern and southern range, South Africa is part of its southern distribution. During the species' breeding season, it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds (*Phragmites spp.)* and cattails (*Typha spp.)* on which it relies for nesting (IUCN, 2017). The occurrence of the right plant species combined with the proximity to the Witkoppies dam results in a high likelihood of occurrence.

Pelecanus onocrotalus (Great White Pelican) is listed as Vulnerable in South Africa as its breeding attempts regularly fail due to human disturbance, such as fishing activities and nest robbing. They prefer shallow lakes, estuaries, flood plain pans, dams, sheltered coastal bays and lagoons (IUCN, 2017). The likelihood of occurring in the project area is rated as low due to the proximity to the urban area and high levels of anthropogenic disturbance.

Pelecanus rufescens (Pink-backed Pelican) is listed as Vulnerable on a regional scale. This species is threatened by habitat loss in KwaZulu-Natal, as many suitable pans and flood-plains are being altered through drainage and cultivation, and the natural flooding regime of pans in the Pongolo system has been altered by the Jozini Dam (Barnes, 2000). The likelihood of occurring in the project area is rated as low due to the proximity to urbanization.

Phoeniconaias minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). Due to the absence of its preferred habitat within the project area, combined the proximity of the urban area, the likelihood of occurrence is low.

Polemaetus bellicosus (Martial Eagle) is listed as EN on a regional scale and VU on a global scale. This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017). With the absence of grasslands and tall trees in the project area the likelihood of occurrence is rated as low.
Rostratula benghalensis (Greater Painted-snipe) shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetland, it has a wide range of these freshwater habitats which they occur in, in this case, sewage pools, reservoirs, mudflats

overgrown with marsh grass which may possibly exist within the project area, thus the likelihood of occurrence is moderate.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as low due to the lack of grasslands areas. *Tyto capensis* (African Grass-owl) is rated as Vulnerable (VU) on a regional basis. The distribution of the species includes the eastern parts of South Africa. The species is generally solitary, but it does also occur in pairs, in moist grasslands where it roosts (IUCN, 2017). The species prefers thick grasses around wetlands and rivers which are not present in the project area. Furthermore, this species specifically has a preference for nesting in dense stands of the grass species *Imperata cylindrica*. None of this grass species is evident within the project area and as such the likelihood of occurrence is rated as low.

6.7.2.1.1 Important Bird Areas

Important Bird Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of Important Bird and Biodiversity Areas (IBAs) is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

No IBAs occur within, or adjacent to, the proposed project area. The closest IBA is the Blesbokspruit IBA which is situated 29.13 km away from the project area (Figure 10).

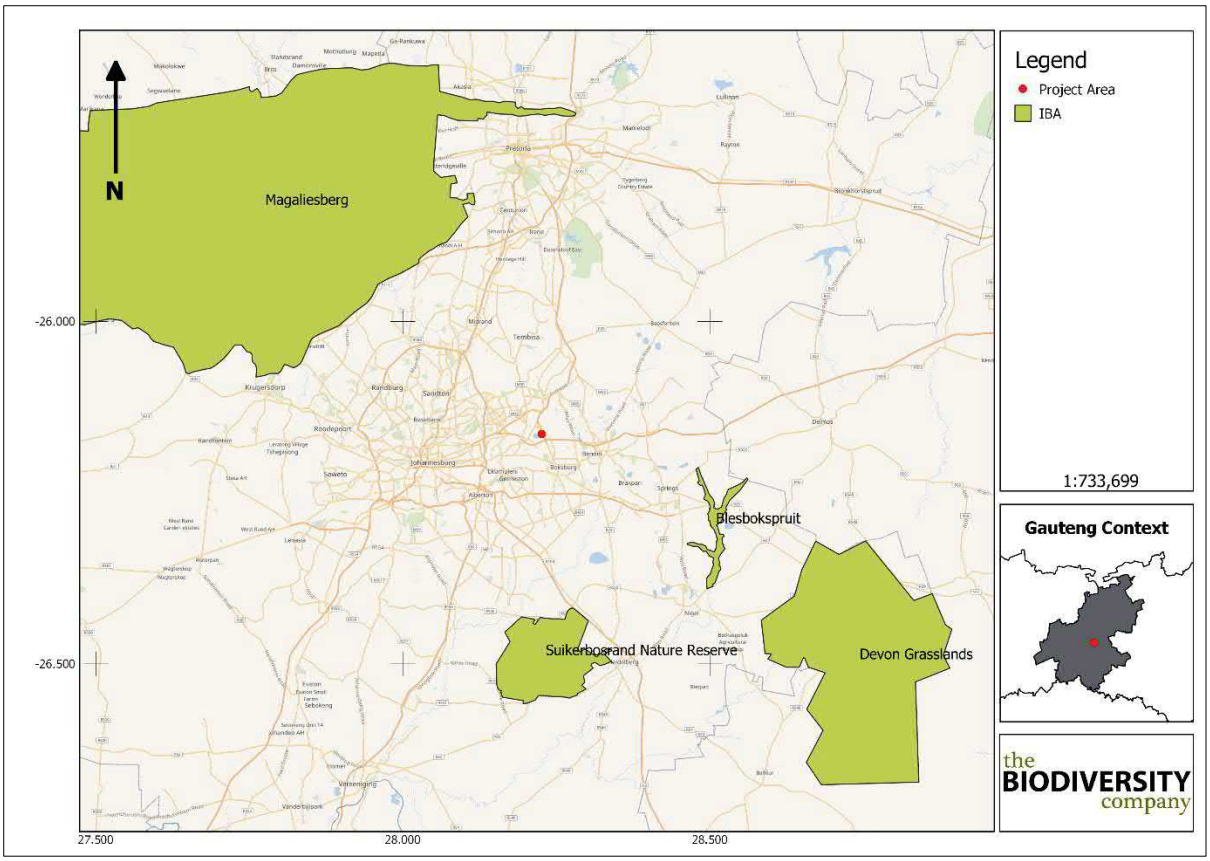

Figure 10: The project area in relation to defined IBAs (Birdlife, 2017)

6.7.2.2 Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 87 mammal species that could be expected to occur within the vicinity of the project area (Appendix C). Of these species, 8 are medium to large conservation-dependant species, such as *Ceratotherium simum* (Southern White Rhinoceros) and *Equus quagga* (Plains Zebra) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area and are removed from the expected SCC list. They are however still included in Appendix C.

Of the remaining 79 small to medium sized mammal species, fifteen (15) are listed as being of conservation concern on a regional or global basis (Table 4).

The list of potential species includes:

- Two (2) that is listed as Endangered (EN) on a regional basis;
- Five (5) that are listed as Vulnerable (VU) on a regional basis; and

Eight (8) that are listed as Near Threatened (NT) on a regional scale (Table 4).

Table 4: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016).

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Aonyx capensis	Cape Clawless Otter	NT	NT	High
Atelerix frontalis	South Africa Hedgehog	NT	LC	Low
Crocidura maquassiensis	Maquassie Musk Shrew	VU	LC	Low
Dasymys incomtus	African Marsh Rat	NT	LC	Low
Felis nigripes	Black-footed Cat	VU	VU	Low
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Moderate
Leptailurus serval	Serval	NT	LC	Low
Mystromys albicaudatus	White-tailed Rat	VU	EN	Low
Ourebia ourebi	Oribi	EN	LC	Low
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Pelea capreolus	Grey Rhebok	NT	LC	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Moderate
Redunca fulvorufula	Mountain Reedbuck	EN	LC	Low
Rhinolophus blasii	Blasius's Horseshoe Bat	NT	LC	Low

Some of the expected mammal SCC are discussed below.

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. Due to the presence of a large water body and the associated vegetation in the project area the likelihood of occurrence is rated as high.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), A. frontalis populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Due to the extensive disturbance in the vicinity of the project area, including dense human habitation, roads, noise, industrial complexes and pollution, the likelihood of occurrence for this species is rated as low.

Crocidura maquassiensis (Maquassie Musk Shrew) is listed as Vulnerable (VU) on a regional basis and is known to be found in rocky, mountain habitats. It may tolerate a wider range of habitats and individuals have been collected in Kwa-Zulu Natal from a garden, and in mixed bracken and grassland alongside a river at 1,500 m (IUCN, 2017). There is a lack of suitable habitat for this species in the project area and therefore the likelihood of occurrence is rated as low.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Due to the extensive disturbance in the vicinity of the project area, including dense human habitation, roads, noise, industrial

complexes, and the shy nature of this species, the likelihood of occurrence for this species is rated as low.

Hydrictis maculicollis (Spotted-necked Otter) inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes (IUCN, 2017). Due to the presence of a large water body and the associated vegetation in the project area the likelihood of occurrence is rated as high, but due to the level of disturbance in the area the likelihood is set to be moderate.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Due to the absence of natural grassland areas in the project area and human disturbance, the likelihood of occurrence for this species is rated as low.

Mystromys albicaudatus (White-tailed Rat) is listed as Vulnerable (VU) on a regional basis and Endangered (EN) on a global scale. It is relatively widespread across South Africa and Lesotho; the species is known to occur in shrubland and grassland areas. A major requirement of the species is black loam soils with good vegetation cover. Although the vegetation type is suitable, no black loam seems to be present on site, therefore the likelihood of occurrence of this species is rated as low.

Mystromys albicaudatus (White-tailed Rat) is listed as Vulnerable (VU) on a regional basis and Endangered (EN) on a global scale. It is relatively widespread across South Africa and Lesotho; the species is known to occur in shrubland and grassland areas. A major requirement of the species is black loam soils with good vegetation cover. Although the vegetation type is suitable, no black loam seems to be present on site, therefore the likelihood of occurrence of this species is rated as moderate.

Ourebia ourebi (Oribi) has a patchy distribution throughout Africa and is known to occur in South Africa. Populations are becoming more fragmented as it is gradually eliminated from moderately to densely settled areas (IUCN, 2017). Due to the lack of suitable habitat in the project area the likelihood is rated as low.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low. The likelihood of occurrence in the Project area which is in such close proximity to an urban area, and where they are likely to be persecuted, is regarded as low.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known ability to persist outside of

formally protected areas the likelihood of occurrence of this species in the project area is moderate to good, but due to the proximity to urbanised areas the likelihood is set as low.

Pelea capreolus (Grey Rhebok) is endemic to a small region in southern Africa, inhabiting montane and plateau grasslands of South Africa, Swaziland, and Lesotho. In South Africa, their distribution is irregular and patchy, and they no longer occur north of the Orange River in the Northern Cape, or in parts of the North-West Province (IUCN, 2017). Grey Rhebok can be found in suitable habitat which has rocky hills, grassy mountain slopes, and montane and plateau grasslands in southern Africa. They are predominantly browsers, and largely water independent, obtaining most of their water requirements from their food. Based on the lack of their favoured habitat within the project area, the likelihood of occurrence of this species is rated as low.

Poecilogale albinucha (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wider habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas where it does occur. There is still some natural habitat for this species in the project area and the likelihood of occurrence of this species is therefore considered to be moderate.

Redunca fulvorufula (Mountain Reedbuck) is listed as EN both regionally and globally. The South African population has undergone a decline of 61-73% in the last three generations (15 years) (IUCN, 2017). Mountain Reedbuck live on ridges and hillsides in broken rocky country and high-altitude grasslands (often with some tree or bush cover). There are no mountainous regions in the project area, as such the likelihood of occurrence for this species is rated as low.

Rhinolophus blasii (Blasius's Horseshoe Bat) is categorised as NT on a regional scale. It typically forages in shrubland and woodland, where it roosts in the summer in natural and artificial underground sites. This species is not very common in South Africa. Threats to the species include loss of woodlands, disturbance and loss of underground habitats, and destruction of roost sites (IUCN, 2017). Due to the lack of suitable roosting areas the likelihood of the species occurring in the project area is rated as low.

6.7.2.3 Herpetofauna (Reptiles & Amphibians)

6.7.2.3.1 Reptiles

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2017) 51 reptile species are expected to occur in the project area (Appendix D). One (1) reptile species of conservation concern is expected to be present in the project area (Table 5).

Table 5: Expected reptile species of conservation concern that may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Homoroselaps dorsalis	Striped Harlequin Snake	NT	NT	Low

Homoroselaps dorsalis (Striped Harlequin Snake) is listed as NT on a global and regional scale (SARCA, 2014; IUCN, 2017). This species is endemic to South Africa and Swaziland. This species occurs mainly in grasslands and one of its greatest threats is veld fires (IUCN, 2017). The likelihood of occurrence in the project area is low due to the high levels of human disturbance and lack of natural grassland vegetation.

6.7.2.3.2 Amphibians

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2017) twenty-two (22) amphibian species are expected to occur in the project area (Appendix E).

One (1) amphibian species of conservation concern could be present in the project area according to the above-mentioned sources (Table 6).

Table 6: Amphibian species of conservation concern which may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Pyxicephalus adspersus	Giant Bullfrog	NT	LC	Moderate

The Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that will possibly occur in the project area. The Giant Bull Frog is listed as Near Threatened on a regional scale. It is a species of drier savannahs. It is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017). Although the project area is highly disturbed, there is some adjacent habitat that may be suitable for this species. Therefore, the likelihood of occurrence for this species is rated as moderate.

6.8 Field Survey

The field survey for the project area was conducted on the 5th of October 2018 by two terrestrial ecologists. During the surveys the floral and faunal communities within the project development footprint, within the project area, were assessed. The project area was ground-truthed on foot, which included spot checks in pre-selected areas to validate desktop data. Photographs were recorded during the site visits and some are provided in this section of the report. All site photographs are available on request.

6.8.1 Vegetation Assessment

The vegetation assessment was conducted throughout the extent of the project area and the following areas were identified based on the results of the fieldwork (Table 7).

The ‘transformed habitat’ are areas that are considered to have been significantly degraded or disturbed (Figure 11). Industrial buildings, roads, homesteads, businesses and informal settlements with associated anthropogenic impacts have had a negative effect on the ecological state of the area. Weeds such as *Bidens pilosa* and *Tagetes minuta* occurred on the site and are most likely to dominate areas of bare soil.

The identified ‘riparian area’ (aligned with the dam and stormwater area) contained various alien or invasive floral species, but the function that this habitat has as a migration corridor is essential to all the species still present. Indigenous species such as *Typha capansis* and *Phragmites australis* occur across this habitat type.

The ‘degraded grassland’ habitats consisted of remaining patches of indigenous vegetation but that have been altered from their natural state due to the impacts from the adjacent transformed habitat and anthropogenic disturbances. This habitat is considered to play an important role in buffering the riparian habitat from further disturbances.

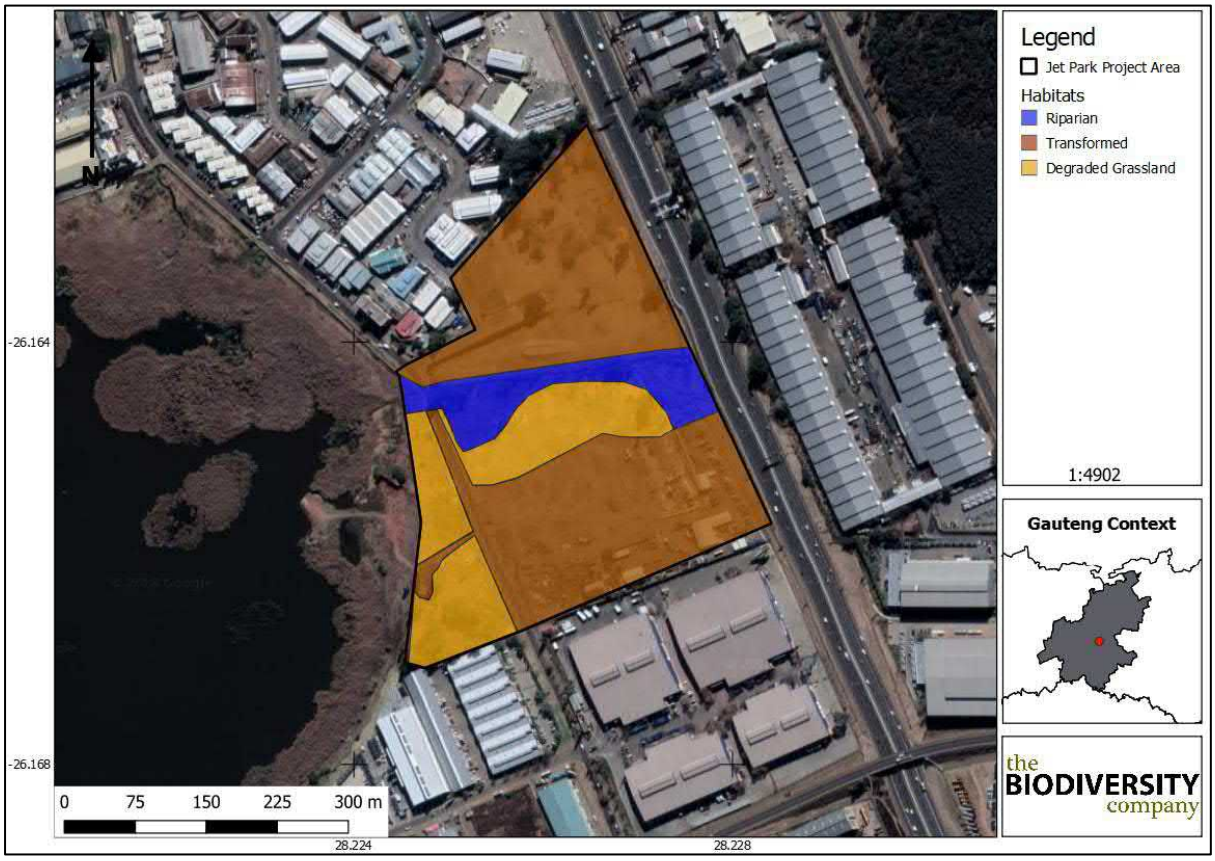

Figure 11:Habitats identified during the field survey

A total of 34 tree, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 7). Plants listed as Category 1 alien or invasive species under the National Environmental Management: Biodiversity Act (NEMBA) appear in green/red text. Plants listed in Category 2 or as ‘not indigenous’ or ‘naturalised’ according to NEMBA, appear in blue text.

Table 7: Trees, shrubs and weeds recorded at the proposed project area

Scientific Name	Common Name	Threat Status (SANBI, 2017)	SA Endemic	NEMBA Category
Acacia mearnsii	**Black Wattle**			**NEMBA Category 2**
Amaranthus hybridus	**Green Amaranth**			**Not indigenous; Naturalised**
Argemone mexicana	**Prickly Poppies**			**NEMBA Category 1b**
Arundo donax	**Giant Reed**			**NEMBA Category 1b**
Bidens pilosa	**Blackjack**			**Not indigenous; Naturalised**
Callistemon sp.	**Bottle Brush**			**Not indigenous; Naturalised**
Celtis africana	White Stinkwood	LC	No	
Conyza bonariensis	**Hairy Fleabane**			**Not indigenous; Naturalised**
Cymbopogon caesius	Turpentine grass	LC	No	
Cynodon dactylon	**Bermuda Grass / Common Couch**			**NEMBA Category 2**
Datura stramonium	**Jimsonweed**			**Not Endemic; Naturalised; Invasive**
Eragrostis lehmanniana	Lehmann Lovegrass	LC	No	
Eucalyptus sp	**Gum Trees**			**NEMBA Category 1b**
Flaveria bidentis	**Smelter's-Bush**			**NEMBA Category 1b**
Gazania krebsiana	Grassland Gazania	LC	No	
Gomphocarpus fruticosus	Cotton Milkweed	LC	No	
Heliotropium amplexicaule	**Clasping Heliotrope**			**Not Indigenous; Naturalised**
Hyparrhenia hirta	Thatching grass	LC	No	
Iris pseudacorus	**Yellow Iris**			**NEMBA Category 1a**
Melia azedarach	**Syringa**			**NEMBA Category 1b and Category 3 in urban areas**
Morus alba	**White Mulberry**			**NEMBA Category 2**
Pennisetum clandestinum	**Kikuyu Grass**			**NEMBA Category 1b in protected areas and wetlands**
Phragmites australis	Common Reed	LC	No	
Plantago lanceolata	Buckhorn Plantain	LC	No	
Populus alba	**White Poplar**			**NEMBA Category 2**
Robinia pseudoacacia	**Black Locust**			**NEMBA Category 1b**
Schinus molle	**Brazilian pepper tree**			**NEMBA Category 1b**
Schkuhria pinnata	**Dwarf Marigold**			**Invasive weed – not listed**
Searsia leptodictya	Rock Karee	LC	No	
Solanum mauritianum	Bugweed			**NEMBA Category 1b**
Stoebe plumosa	Slangbos	LC	No	
Tagetes minuta	**Khaki Weed**			**Not Indigenous; Naturalised**
Typha capensis	Cat's Tail	LC	No	
Vachellia karroo	Sweet thorn	LC	No	
Verbena bonariensis	**Purple Top Verbena**			**NEMBA Category 1b**

6.8.1.1 Alien and Invasive Plants

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of these systems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The National Environmental Management: Biodiversity Act (NEMBA) is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;

- The relevant invasive species management programme developed in terms of regulation 4; and
- Any directive issued in terms of section 73 (3) of the Act.

Nine (9) Category 1b invasive plant species were recorded within the project area and it is recommended that an alien invasive plant management programme be implemented in compliance of section 75 of the Act as stated above. The NEMBA listed species identified within the project area are marked in green (Table 7).

6.8.2 Fauna

6.8.2.1 Avifauna

Twenty-two (22) bird species were recorded in the project area during the October 2018 survey based on either direct observations, vocalisations, or the presence of visual tracks & signs (Table 8) (Figure 12). No avifaunal SCC were recorded during the survey. Based on the absence of suitable avifaunal habitat, there is a low probability that any other bird SCC may occur within the project area.

Table 8: A list of avifaunal species recorded for the project area (species highlighted in red are listed species)

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acridotheres tristis	Myna, Common	Unlisted	LC
Amadina erythrocephala	Finch, Red-headed	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Cisticola lais	Cisticola, Wailing	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Ploceus velatus	Southern Masked-weaver, Southern	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Turdus olivaceus	Thrush, Olive	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC

Figure 12: Some of the avifauna recorded within the project area: A) African Stonechat (Saxicola torquatus), B) Spotted Thick-knee (Burhinus capensis), C) Grey-headed Gull (Larus cirrocephalus), Red-knobbed Coot (Fulica cristata), E) Southern Masked Weaver (Ploceus velatus) and F) Wailing Cisticola (Cisticola lais)

6.8.2.2 Mammals

Overall, mammal diversity in the project area was low, with two mammal species being recorded during the October 2018 survey based on direct observations and/or the presence of visual tracks & signs. The low mammal diversity was attributed to the disturbed nature of the project area and the highly urbanised environment. One species of conservation concern was observed in the project area (Figure 13) (Table 9).

Table 9: Mammal species observed in the project area.

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aonyx capensis	Cape Clawless Otter	NT	NT
Atilax paludinosus	Water Mongoose	LC	LC

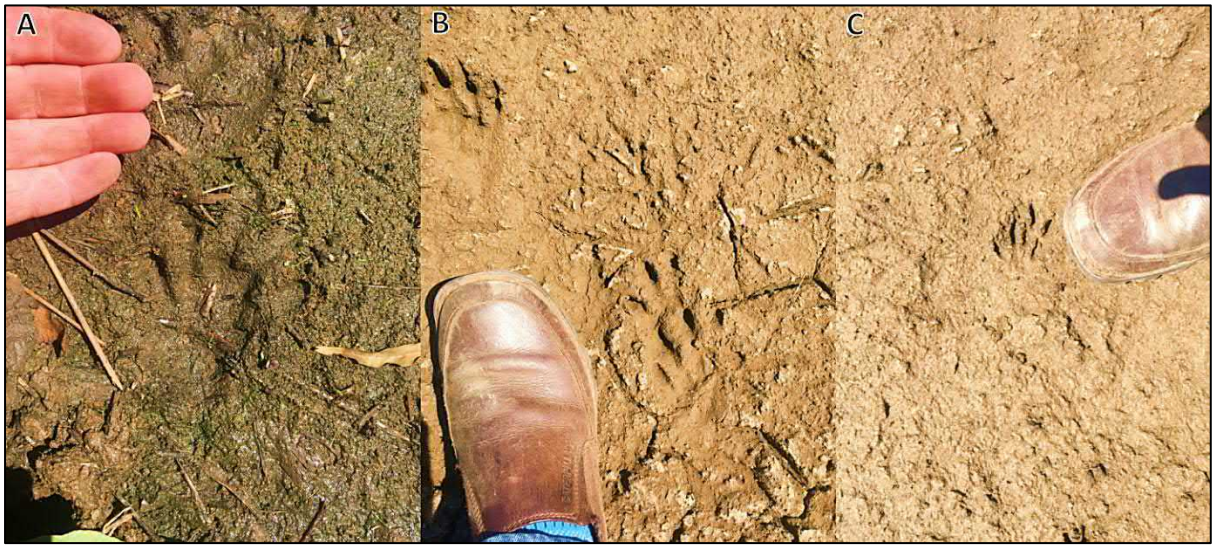

Figure 13: Signs of the mammal species observed in the project area; A & B) Cape Clawless Otter (Aonyx capensis) tracks and C) Water Mongoose (Atilax paludinosus) tracks

6.8.2.3 Herpetofauna (Reptiles & Amphibians)

Herpetofauna diversity was considered to be low with one reptile and zero amphibian species observed or recorded in the project area during the October 2018 survey. The lack of herpetofaunal diversity was attributed to the disturbed nature of the project area, the lack of natural habitat and the highly urbanised environment (Table 10) (Figure 14).

Table 10: Herpetofauna specie recorded in the project area

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Trachylepis striata	Striped Skink	LC	Unlisted

Figure 14: Striped Skink (Trachylepis striata) observed in the project area

7 Habitat Sensitivity Mapping

As per the terms of reference for the project, a GIS sensitivity map is required in order to identify sensitive features in terms of the relevant specialist discipline/s within the study area. Site sensitivities were classified and mapped.

The sensitivity scores identified during the field survey for each habitat were then visually mapped (Figure 15). The habitat sensitivity map does not make any allowances for the recommended buffer areas.

Areas that were classified as having low or low-moderate sensitivities are those areas which were deemed by the specialists to have been most impacted upon and/or were modified from their original condition due to factors such as over-grazing, intensive farming and/or presence of alien invasive species.

It is important to note that this map does not replace any local, provincial or government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

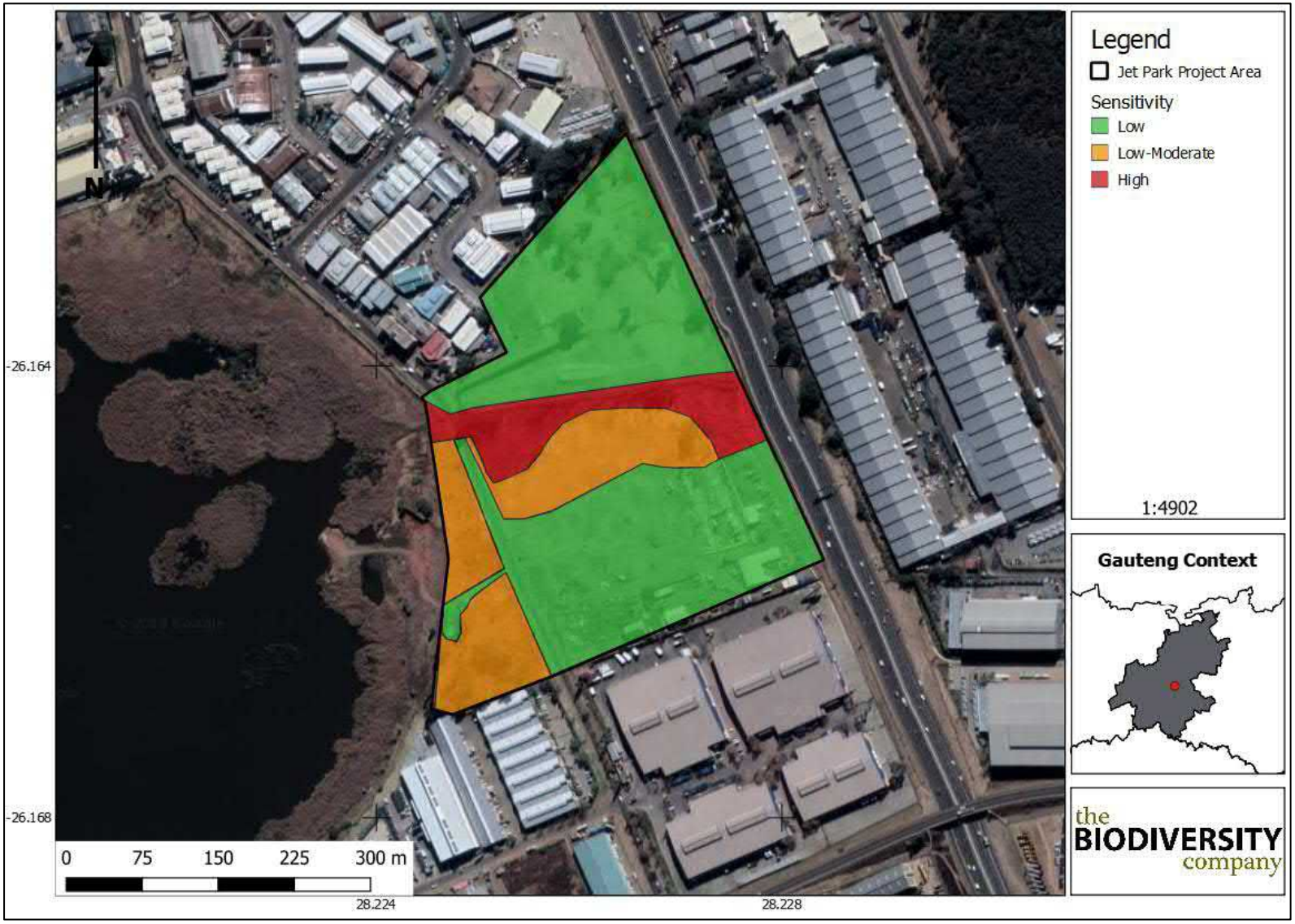

Figure 15: Habitat sensitivity within the project area

8 Impacts

8.1 Current Impacts

During the rapid field survey, the current impacts that are having a negative impact on the area were identified, and are listed below and some are shown in Figure 16;

- Dumping of rubble and litter in the project area;
- Clearing of vegetation;
- Existing industrial complex and associated impacts, such as noise;
- Presence of alien and invasive plant species; and
- Primary and secondary roads.

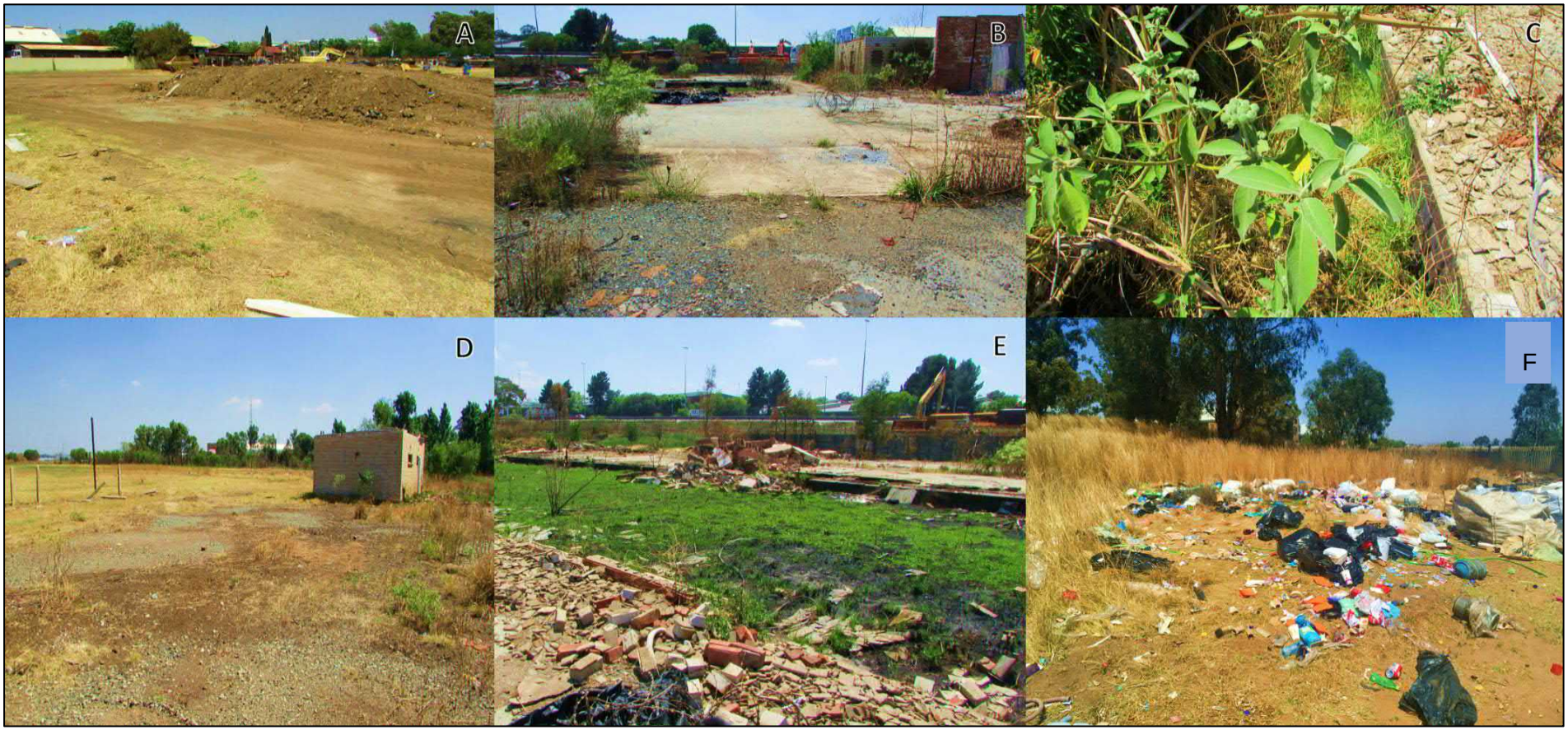

Figure 16: A & D) Clearing of the vegetation, B & E) Building Rubble, C) Invasive plants and F) Rubbish

9 Conclusion

The completion of the study, in conjunction with the detailed results from the survey means that there is a high confidence in the information provided. The survey which was completed, and the corresponding studies resulted in good site coverage, within the proposed footprint area, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area has been severely altered from its natural state and only a small section of natural vegetation or habitat remains. The land uses surrounding the project area consist mainly of built up urban and industrial areas. Other impacts within the vicinity of the project area include access roads, dumping, litter, human encroachment, erosion and the presence of alien or invasive plant species.

It is important to note that although much of the area is disturbed and faunal densities were found to be low, field surveys revealed the presence of threatened mammal species occurring on site (namely Cape Clawless Otter). This species is utilising the drainage line and wetland areas as a corridor. It is therefore strongly recommended that these areas not be disturbed, and an appropriate buffer be implemented in order to maintain this corridor for these, and other, species. This corridor is one of the few remaining which link the dam to other natural areas.

The following further conclusions were reached based on the results of this assessment:

- A small portion of the western boundary of the project area intersects marginally with an area classified as an CBA while an ESA runs through the project area;
- According to the Gauteng C-Plan (2014) spatial data, no protected ridges occur in the vicinity of the project area and therefore the likelihood that the development will impact on any of these areas is low;
- The proposed project was superimposed on the terrestrial ecosystem threat status. Based on this, the project area falls within one ecosystem, which is listed as Critically Endangered (CR);
- The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the proposed development. According to this analysis the terrestrial ecosystems associated with the proposed project area are rated as *not protected*;
- The project boundary area does not overlap with any true FEPA or Non-FEPA wetlands;
- The project area is situated within the Soweto Highveld Grassland vegetation type. This vegetation type is listed as Endangered (EN) (Mucina & Rutherford, 2006);
- Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 448 plant species are expected to occur in the project area. Of these, four (4) species is listed as being a Species of Conservation Concern (SCC);

- No Important Bird and Biodiversity Areas (IBAs) occur within, or adjacent to, the proposed project area;
- One (1) amphibian species of conservation concern could be present in the project area, namely the Giant Bullfrog;
    - Although the project area is highly disturbed, there is some adjacent habitat that may be suitable for this species;
    - Bullfrogs spend most of the year underground and are often dug up during construction. Therefore, all staff should be made aware of the possibility that these amphibians may occur on site during the construction phase;
- Nine (9) Category 1b invasive plant species were recorded within the project area;
- Twenty-two (22) bird species were recorded in the project area during the October 2018 survey based on either direct observations, vocalisations, or the presence of visual tracks & signs; and
- Overall, mammal diversity in the project area was low, with only two mammal species (Water Mongoose (*Atilax paludinosus*) and Cape Clawless Otter (*Aonyx capensis*)) being recorded during the October 2018 survey based on direct observations and/or the presence of visual tracks & signs. The lack of mammal diversity was attributed to the disturbed nature of the project area, the lack of natural habitat and the highly urbanised environment.

10 Recommendations

Due to the presence of an important corridor bisecting the project area and the presence of at least one threatened mammal species which is utilising this area, the following recommendations are provided to ensure the long-term survival of this area and the continued functioning of the corridor.

An alien plant removal plan should be undertaken, and all alien invasive plant species should be systematically removed from the project area (most importantly they should be removed from the wetlands and drainage line areas). Removal should be done in an appropriate manner and no excessive damage to surrounding plant species should be allowed. The use of herbicides should be minimised as far as possible or ideally, not used at all, especially in wetland areas.

Areas that are cleared during construction or where alien plant species are removed, should be revegetated with appropriate, indigenous plant species. Species which are endemic to this specific region would be the most preferable.

The primary aim of these recommendations is to reduce and human impact on the wetland and drainage line areas. Once construction is complete, measures can be put in place to reduce the presence of people into this area. Examples could be planting trees or shrubs as a screen, or even the construction of a wildlife-friendly wall (ideally with small openings near the ground so that small animals can move through). Screening of the drainage line and wetland will provide a safer and quieter zone for wildlife to move through. The use of artificial lighting in these areas is not recommended.

11 References

ADU (Animal Demography Unit). (2017). Virtual Museum. (Accessed: Feb 2018).

Alexander, G. & Marais, J. (2007). A guide to the Reptiles of Southern Africa. Struik, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J & de Villiers, M.S. (Eds). (2014). Atlas and Red List of Reptiles of South Africa, Lesotho and Swaziland. Suricata 1. South African Biodiversity Institute, Pretoria.

BGIS. (Biodiversity GIS) (2017). http://bgis.sanbi.org/. (Accessed: June 2018).

BirdLife (2017). Important Bird Areas Factsheet: Steenkampsberg. http://www.birdlife.org (Accessed: December 2017).

Bonn Convention (1979). Convention on the Conservation of Migratory Species of Wild Animals. www.cms.int/sites/default/files/instrument/CMS-text.en .PDF (Accessed: June 2018).

BODATSA-POSA (2016). Plants of South Africa - an online checklist. POSA ver. 3.0. http://newposa.sanbi.org/. (Accessed: June 2018).

Branch, W.R. (1998) Field Guide to Snakes and Other Reptiles of Southern Africa. Struik, Cape Town.

CBD (convention on Biological Diversity). (1993). https://www.cbd.int/doc/legal/cbd-en.pdf. (Accessed: June 2018).

CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) (1973). www.cites.org. (Accessed: June 2018).

Del Hoyo, J., Collar, N.J., Christie, D.A., Elliott, A., Fishpool, L.D.C., Boesman, P. & Kirwan, G.M. (1996). HBW and BirdLife International Illustrated Checklist of the Birds of the World. Volume 2: Passerines. Lynx Editions and BirdLife International, Barcelona, Spain and Cambridge, UK.

DEA. (2015). National land cover data for SA. https://egis.environment.gov.za/national_land_cover_data_sa (Accessed: June 2018).

Driver, A., Nel, J.L., Snaddon, K., Murray, K., Roux, D.J., Hill, L., Swartz, E.R., Manuel, J., Funke, N. (2011). Implementation Manual for Freshwater Ecosystem Priority Areas. Report to the Water Research Commission, Pretoria.

Du Preez, & Carruthers, V. (2009) A Complete Guide to the Frogs of Southern Africa. Struik Nature, Cape Town.

Eskom (2015). Taylor MR, Peacock F, Wanless RM (Eds). The 2015 Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

EWT. (2016). Mammal Red List 2016. www.ewt.org.za (Accessed: June 2018).

Fish, L., Mashau, A.C., Moeaha, M.J., Nembudani, M.T. (2015). Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions. SANBI, Pretoria.

FrogMap (2017). The Southern African Frog Atlas Project (SAFAP, now FrogMAP). http://vmus.adu.org.za (Accessed in May 2016).

Griffiths, C., Day, J. & Picker, M. (2016). Freshwater Life: A Field Guide to the Plants and Animals of Southern Africa. Struik Nature, Cape Town.

Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. (Eds). (2005). Roberts – Birds of Southern Africa, VIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.

Hockey, P.A.R., Dean, W.R.J. & Ryna, P.G. (eds.) 2005. Roberts – Birds of Southern Africa, VIIth ed. The Trustees of the John Voelker Bird Book Fund, Cape Town.

IUCN (2017). The IUCN Red List of Threatened Species. www.iucnredlist.org (Accessed: November 2017).

Johnson, S. & Bytebier, B. (2015). Orchids of South Africa: A Field Guide. Struik publishers, Cape Town.

MammalMap (2017). http://mammalmap.adu.org.za/ (Accessed: June 2018).

Measey, G.J. (2011). Ensuring a Future for South Africa's Frogs: A Strategy for Conservation Research. South African National Biodiversity Institute, Pretoria.

Minter, L., Burger, M., Harrison, J.A. & Kloepfer, D. (2004). Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. Smithsonian Institute Avian Demography Unit, Washington; Cape Town.

Monadjem, A., Taylor, P.J., Coterrill, F.D.P. & Schoeman, C. (2010). Bats of southern and central Africa: a biogeographic and taxonomic synthesis. Wits University Press, Johannesburg.

Mucina, L. and Rutherford, M.C. (Eds.). (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South African.

Mucina, L., Rutherford, M.C. & Powrie, L.W. (Eds.). (2007). Vegetation map of South Africa, Lesotho and Swaziland. 1:1 000 000 scale sheet maps. 2nd ed. South African National Biodiversity Institute, Pretoria.

NBA. (2011). Terrestrial Formal Protected Areas. http://bgis.sanbi.org/. (Accessed: August 2017).

NBA. (2012). Terrestrial Ecosystem Threat Status 2012. http://bgis.sanbi.org/. (Accessed: September 2017)

NBF (2009). National Biodiversity Framework. www.environment.gov.za (Accessed: June 2018).

Nel, J. L., Driver, A., Strydom, W. F., Maherry, A. M., Petersen, C. P., Hill, L., Roux, D. J., Nienaber, S., van Deventer, H., Swartz, E. R. and Smith-Adao, L. B. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable

development of water resources, WRC Report No. TT 500/11. Water Research Commission, Pretoria.

NPAES (2011). National Protected Areas Expansion Strategy. www.environment.gov.za (Accessed: June 2018).

Raimonde, D. (2009). Red list of South African Plants. SANBI, Pretoria.

RAMSAR. (1971). The RAMSAR convention. www.ramsar.org (Accessed: June 2018).

SABAP2 (Bird Atlas Project). (2018). http://vmus.adu.org.za/. Accessed: June 2018.

SANBI. (2010). SANBI Biodiversity Series 14: National Protected Area Expansion Strategy for 2008. www.sanbi.org/documents/sanbi-biodiversity-series-14-national-protected-area-expansion-strategy-for-2008/ (Accessed: June 2018).

SANBI. (2013). Grassland Ecosystem Guidelines: landscape interpretation for planners and managers. http://biodiversityadvisor.sanbi.org (Accessed: June 2018).

SANBI. (2016). Red List of South African Plants version 2017.1. Redlist.sanbi.org (Accessed: August 2018).

SANBI. (2017). Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. Driver, A., Holness, S. & Daniels, F. (Eds). 1st Edition. South African National Biodiversity Institute, Pretoria.

SARCA (2018). South African Reptile Conservation Assessment. http://sarca.adu.org.za/ (Accessed: June 2018).

Skinner, J.D. & Chimimba, C.T. (2005). The Mammals of the Southern African Subregion (New Edition). Cambridge University Press. South Africa.

Stuart, C. & Stuart, T. (1994). A field guide to the tracks and signs of Southern, Central East African Wildlife. Struik Nature, Cape Town.

Van Oudtshoorn, F. (2004). Gids tot die grasse van Suider-Afrika. Second Edition. Briza Publikasies, Pretoria.

Van Wyk, B. & Van Wyk, P. (1997). Field guide to trees of Southern Africa. Struik Publishers, Cape Town.

Van Wyk, B. & Malan, S. (1997). Field Guide to the Wild Flowers of the Highveld: Also Useful in Adjacent Grassland and Bushveld, Struik Publishers, Cape Town.

Van Wyk, B-E., Van Oudtshoorn, B. & Gericke, N. (2013). Medicinal Plants of South Africa. Briza Publications, Pretoria.

Van Wyk, B-E. & Smith, G.F. (2014). Guide to the Aloes of South Africa. Briza Publishers, Pretoria.

UNFCC. (1994). The United Nations Framework Convention on Climate Change. unfccc.int/resource/docs/convkp/conveng.pdf. (Accessed: June 2018).

APPENDIX A: Floral species expected to occur in the project area

Family	Taxon	Author	IUCN	Ecology
Cyperaceae	*Abildgaardia ovata*	(Burm.f.) Kral	LC	Indigenous
Fabaceae	*Acacia baileyana*	F.Muell.	NE	Not Indigenous; Naturalised; Invasive
Fabaceae	*Acacia dealbata*	Link	NE	Not Indigenous; Naturalised; Invasive
Euphorbiaceae	*Acalypha angustata*	Sond.	LC	Indigenous
Asteraceae	*Acanthospermum glabratum*	(DC.) Wild		Not Indigenous; Naturalised
Amaranthaceae	*Achyranthes aspera var. aspera*	L.		Not Indigenous; Naturalised
Asteraceae	*Afroaster peglerae*	(Bolus) J.C.Manning & Goldblatt	LC	Indigenous; Endemic
Asteraceae	*Afroaster serrulatus*	(Harv.) J.C.Manning & Goldblatt	LC	Indigenous
Apiaceae	*Afrosciadium magalismontanum*	(Sond.) P.J.D.Winter	LC	Indigenous
Poaceae	*Agrostis eriantha var. eriantha*	Hack.	LC	Indigenous
Poaceae	*Agrostis lachnantha var. lachnantha*	Nees	LC	Indigenous
Hyacinthaceae	*Albuca setosa*	Jacq.		Indigenous
Hyacinthaceae	*Albuca shawii*	Baker		Indigenous
Hyacinthaceae	*Albuca sp.*			
Hyacinthaceae	*Albuca virens subsp. arida*	(Ker Gawl.) J.C.Manning & Goldblatt		Indigenous
Hyacinthaceae	*Albuca virens subsp. virens*	(Ker Gawl.) J.C.Manning & Goldblatt		Indigenous
Poaceae	*Alloteropsis semialata subsp. eckloniana*	(R.Br.) Hitchc.	LC	Indigenous
Poaceae	*Alloteropsis semialata subsp. semialata*	(R.Br.) Hitchc.	LC	Indigenous
Asphodelaceae	*Aloe ecklonis*	Salm-Dyck	LC	Indigenous
Asphodelaceae	*Aloe jeppeae*	Klopper & Gideon F.Sm.	LC	Indigenous
Asphodelaceae	*Aloe subspicata*	(Baker) Boatwr. & J.C.Manning		Indigenous
Lythraceae	*Ammannia baccifera subsp. baccifera*	L.		Not Indigenous; Naturalised
Poaceae	*Andropogon appendiculatus*	Nees	LC	Indigenous
Rubiaceae	*Anthospermum rigidum subsp. pumilum*	Eckl. & Zeyh.	LC	Indigenous
Aponogetonaceae	*Aponogeton junceus*	Lehm.	LC	Indigenous
Aponogetonaceae	*Aponogeton natalensis*	Oliv.	LC	Indigenous; Endemic
Asteraceae	*Arctotis arctotoides*	(L.f.) O.Hoffm.	LC	Indigenous
Asteraceae	*Arctotis sp.*			
Fabaceae	*Argyrolobium speciosum*	Eckl. & Zeyh.	LC	Indigenous
Iridaceae	*Aristea torulosa*	Klatt	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	Roem. & Schult.	LC	Indigenous
Poaceae	*Arundinella nepalensis*	Trin.	LC	Indigenous
Apocynaceae	*Asclepias albens*	(E.Mey.) Schltr.	LC	Indigenous
Apocynaceae	*Asclepias aurea*	(Schltr.) Schltr.	LC	Indigenous

Apocynaceae	*Asclepias crispa var. crispa*	P.J.Bergius	LC	Indigenous; Endemic
Apocynaceae	*Asclepias eminens*	(Harv.) Schltr.	LC	Indigenous
Apocynaceae	*Asclepias stellifera*	Schltr.	LC	Indigenous
Apocynaceae	*Aspidoglossum interruptum*	(E.Mey.) Bullock	LC	Indigenous
Apocynaceae	*Aspidoglossum lamellatum*	(Schltr.) Kupicha	LC	Indigenous
Apocynaceae	*Aspidoglossum restioides*	(Schltr.) Kupicha	LC	Indigenous; Endemic
Aspleniaceae	*Asplenium adiantum-nigrum var. adiantum-nigrum*	L.	LC	Indigenous
Asteraceae	*Athrixia elata*	Sond.	LC	Indigenous
Amaranthaceae	*Atriplex suberecta*	I.Verd.	LC	Indigenous
Iridaceae	*Babiana bainesii*	Baker	LC	Indigenous
Rhamnaceae	*Berchemia zeyheri*	(Sond.) Grubov		Indigenous
Elatinaceae	*Bergia decumbens*	Planch. ex Harv.	LC	Indigenous
Asteraceae	*Berkheya insignis*	(Harv.) Thell.	LC	Indigenous
Asteraceae	*Berkheya radula*	(Harv.) De Wild.	LC	Indigenous
Asteraceae	*Berkheya setifera*	DC.	LC	Indigenous
Asteraceae	*Berkheya zeyheri subsp. zeyheri*	Oliv. & Hiern	LC	Indigenous
Poaceae	*Bewsia biflora*	(Hack.) Gooss.	LC	Indigenous
Acanthaceae	*Blepharis stainbankiae*	C.B.Clarke		Indigenous; Endemic
Poaceae	*Brachiaria eruciformis*	(Sm.) Griseb.	LC	Indigenous
Poaceae	*Brachiaria serrata*	(Thunb.) Stapf	LC	Indigenous
Poaceae	*Bromus sp.*			
Orobanchaceae	*Buchnera reducta*	Hiern	LC	Indigenous
Boraginaceae	*Buglossoides arvensis*	(L.) I.M.Johnst.		Not Indigenous; Naturalised
Asphodelaceae	*Bulbine abyssinica*	A.Rich.	LC	Indigenous
Asphodelaceae	*Bulbine favosa*	(Thunb.) Schult. & Schult.f.	LC	Indigenous
Asphodelaceae	*Bulbine narcissifolia*	Salm-Dyck	LC	Indigenous
Cyperaceae	*Bulbostylis burchellii*	(Ficalho & Hiern) C.B.Clarke	LC	Indigenous
Cyperaceae	*Bulbostylis oritrephes*	(Ridl.) C.B.Clarke	LC	Indigenous
Cyperaceae	*Bulbostylis scleropus*	C.B.Clarke	LC	Indigenous
Poaceae	*Calamagrostis epigejos var. capensis*	(L.) Roth	LC	Indigenous
Rubiaceae	*Canthium inerme*	(L.f.) Kuntze	LC	Indigenous
Cyperaceae	*Carex glomerabilis*	V.I.Krecz.	LC	Indigenous
Cyperaceae	*Carex spartea*	Wahlenb.		Indigenous
Apiaceae	*Centella asiatica*	(L.) Urb.	LC	Indigenous
Dipsacaceae	*Cephalaria zeyheriana*	Szabo	LC	Indigenous
Caryophyllaceae	*Cerastium capense*	Sond.		Indigenous
Scrophulariaceae	*Chaenostoma neglectum*	J.M.Wood & M.S.Evans	LC	Indigenous
Fabaceae	*Chamaecrista biensis*	(Steyaert) Lock	LC	Indigenous

Verbenaceae	*Chascanum hederaceum var. hederaceum*	(Sond.) Moldenke		Indigenous
Pteridaceae	*Cheilanthes hirta var. brevipilosa*	Sw.	LC	Indigenous; Endemic
Pteridaceae	*Cheilanthes hirta var. hirta*	Sw.	LC	Indigenous
Pteridaceae	*Cheilanthes viridis var. glauca*	(Forssk.) Sw.	LC	Indigenous
Amaranthaceae	*Chenopodium phillipsianum*	Aellen		Indigenous
Amaranthaceae	*Chenopodium sp.*			
Gentianaceae	*Chironia palustris subsp. palustris*	Burch.	LC	Indigenous
Gentianaceae	*Chironia purpurascens subsp. humilis*	(E.Mey.) Benth. & Hook.f.	LC	Indigenous
Poaceae	*Chloris gayana*	Kunth	LC	Indigenous
Agavaceae	*Chlorophytum cooperi*	(Baker) Nordal		Indigenous
Agavaceae	*Chlorophytum fasciculatum*	(Baker) Kativu		Indigenous
Agavaceae	*Chlorophytum transvaalense*	(Baker) Kativu		Indigenous
Asteraceae	*Cineraria parvifolia*	Burtt Davy	LC	Indigenous; Endemic
Bruchiaceae	*Cladophascum gymnomitrioides*	(Dixon) Dixon		Indigenous
Cleomaceae	*Cleome monophylla*	L.	LC	Indigenous
Colchicaceae	*Colchicum striatum*	(Hochst. ex A.Rich.) J.C.Manning & Vinn.		Indigenous
Commelinaceae	*Commelina africana var. krebsiana*	L.	LC	Indigenous
Commelinaceae	*Commelina africana var. lancispatha*	L.	LC	Indigenous
Commelinaceae	*Commelina livingstonii*	C.B.Clarke	LC	Indigenous
Commelinaceae	*Commelina subulata*	Roth	LC	Indigenous
Convolvulaceae	*Convolvulus farinosus*	L.	LC	Indigenous
Asteraceae	*Conyza podocephala*	DC.		Indigenous
Apocynaceae	*Cordylogyne globosa*	E.Mey.	LC	Indigenous
Caryophyllaceae	*Corrigiola litoralis subsp. litoralis*	L.		Indigenous
Asteraceae	*Cotula coronopifolia*	L.	LC	Indigenous
Crassulaceae	*Cotyledon orbiculata var. oblonga*	L.	LC	Indigenous
Acanthaceae	*Crabbea acaulis*	N.E.Br.		Indigenous
Crassulaceae	*Crassula capitella subsp. nodulosa*	Thunb.		Indigenous
Crassulaceae	*Crassula lanceolata subsp. lanceolata*	(Eckl. & Zeyh.) Endl. ex Walp.		Indigenous; Endemic
Crassulaceae	*Crassula natans var. natans*	Thunb.		Indigenous; Endemic
Crassulaceae	*Crassula setulosa var. setulosa*	Harv.	NE	Indigenous
Asteraceae	*Crepis hypochaeridea*	(DC.) Thell.		Not Indigenous; Naturalised; Invasive
Amaryllidaceae	*Crinum bulbispermum*	(Burm.f.) Milne-Redh. & Schweick.	LC	Indigenous
Amaryllidaceae	*Crinum graminicola*	I.Verd.	LC	Indigenous
Fabaceae	*Crotalaria globifera*	E.Mey.	LC	Indigenous

Poaceae	*Ctenium concinnum*	Nees	LC	Indigenous
Cucurbitaceae	*Cucumis hirsutus*	Sond.	LC	Indigenous
Convolvulaceae	*Cuscuta australis*	R.Br.	LC	Indigenous
Convolvulaceae	*Cuscuta campestris*	Yunck.		Not Indigenous; Naturalised; Invasive
Commelinaceae	*Cyanotis speciosa*	(L.f.) Hassk.	LC	Indigenous
Orobanchaceae	*Cycnium tubulosum subsp. tubulosum*	(L.f.) Engl.	LC	Indigenous
Poaceae	*Cymbopogon caesius*	(Hook. & Arn.) Stapf	LC	Indigenous
Poaceae	*Cynodon hirsutus*	Stent	LC	Indigenous; Endemic
Boraginaceae	*Cynoglossum lanceolatum*	Forssk.	LC	Indigenous
Cyperaceae	*Cyperus congestus*	Vahl	LC	Indigenous
Cyperaceae	*Cyperus denudatus*	L.f.	LC	Indigenous
Cyperaceae	*Cyperus difformis*	L.	LC	Indigenous
Cyperaceae	*Cyperus esculentus var. esculentus*	L.	LC	Indigenous
Cyperaceae	*Cyperus fastigiatus*	Rottb.	LC	Indigenous
Cyperaceae	*Cyperus longus var. tenuiflorus*	L.	NE	Indigenous
Cyperaceae	*Cyperus marginatus*	Thunb.	LC	Indigenous
Cyperaceae	*Cyperus obtusiflorus var. flavissimus*	Vahl	LC	Indigenous
Cyperaceae	*Cyperus obtusiflorus var. obtusiflorus*	Vahl	LC	Indigenous
Cyperaceae	*Cyperus rigidifolius*	Steud.	LC	Indigenous
Cyperaceae	*Cyperus semitrifidus*	Schrad.	LC	Indigenous
Cyperaceae	*Cyperus uitenhagensis*	(Steud.) C.Archer & Goetgh.	LC	Indigenous
Cyperaceae	*Cyperus usitatus*	Burch.	LC	Indigenous
Amaryllidaceae	*Cyrtanthus breviflorus*	Harv.	LC	Indigenous
Asteraceae	*Denekia capensis*	Thunb.	LC	Indigenous
Brassicaceae	*Descurainia sophia*	(L.) Webb ex Prantl		Not Indigenous; Naturalised
Caryophyllaceae	*Dianthus mooiensis subsp. kirkii*	F.N.Williams		Indigenous
Fabaceae	*Dichilus gracilis*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Dichilus lebeckioides*	DC.	LC	Indigenous
Fabaceae	*Dichilus strictus*	E.Mey.	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. anomala*	Sond.	LC	Indigenous
Asteraceae	*Dicoma sp.*			
Poaceae	*Digitaria monodactyla*	(Nees) Stapf	LC	Indigenous
Poaceae	*Digitaria sp.*			
Poaceae	*Digitaria tricholaenoides*	Stapf	LC	Indigenous
Asteraceae	*Dimorphotheca caulescens*	Harv.	LC	Indigenous
Asteraceae	*Dimorphotheca spectabilis*	Schltr.	LC	Indigenous
Ebenaceae	*Diospyros lycioides subsp. guerkei*	Desf.		Indigenous
Hyacinthaceae	*Dipcadi marlothii*	Engl.		Indigenous
Hyacinthaceae	*Dipcadi sp.*			

Hyacinthaceae	*Dipcadi viride*	(L.) Moench		Indigenous
Hyacinthaceae	*Drimia calcarata*	(Baker) Stedje		Indigenous
Hyacinthaceae	*Drimia depressa*	(Baker) Jessop		Indigenous
Hyacinthaceae	*Drimia elata*	Jacq.		Indigenous
Hyacinthaceae	*Drimia multisetosa*	(Baker) Jessop		Indigenous
Poaceae	*Echinochloa jubata*	Stapf	LC	Indigenous
Cyperaceae	*Eleocharis limosa*	(Schrad.) Schult.	LC	Indigenous
Fabaceae	*Elephantorrhiza elephantina*	(Burch.) Skeels	LC	Indigenous
Poaceae	*Eleusine multiflora*	A.Rich.	NE	Not Indigenous; Naturalised
Poaceae	*Elionurus muticus*	(Spreng.) Kunth	LC	Indigenous
Polygonaceae	*Emex australis*	Steinh.	LC	Indigenous
Poaceae	*Eragrostis capensis*	(Thunb.) Trin.	LC	Indigenous
Poaceae	*Eragrostis chloromelas*	Steud.	LC	Indigenous
Poaceae	*Eragrostis cilianensis*	(All.) Vignolo ex Janch.	LC	Indigenous
Poaceae	*Eragrostis curvula*	(Schrad.) Nees	LC	Indigenous
Poaceae	*Eragrostis racemosa*	(Thunb.) Steud.	LC	Indigenous
Poaceae	*Eragrostis sclerantha subsp. sclerantha*	Nees	LC	Indigenous
Poaceae	*Eragrostis stapfii*	De Winter	LC	Indigenous
Poaceae	*Eragrostis tef*	(Zuccagni) Trotter	NE	Not Indigenous; Naturalised
Fabaceae	*Eriosema burkei var. burkei*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Eriosema nutans*	Schinz	LC	Indigenous
Fabaceae	*Eriosema salignum*	E.Mey.	LC	Indigenous
Ruscaceae	*Eriospermum flagelliforme*	(Baker) J.C.Manning	LC	Indigenous
Fabaceae	*Erythrina zeyheri*	Harv.	LC	Indigenous
Hyacinthaceae	*Eucomis autumnalis subsp. clavata*	(Mill.) Chitt.	NE	Indigenous
Orchidaceae	*Eulophia cooperi*	Rchb.f.	LC	Indigenous; Endemic
Orchidaceae	*Eulophia hians var. hians*	Spreng.	LC	Indigenous
Orchidaceae	*Eulophia hians var. nutans*	Spreng.	LC	Indigenous
Orchidaceae	*Eulophia ovalis var. bainesii*	Lindl.	LC	Indigenous
Orchidaceae	*Eulophia ovalis var. ovalis*	Lindl.	LC	Indigenous
Euphorbiaceae	*Euphorbia prostrata*	Aiton	NE	Not Indigenous; Naturalised
Exormothecaceae	*Exormotheca holstii*	Steph.		Indigenous
Convolvulaceae	*Falkia oblonga*	Bernh. ex C.Krauss		Indigenous
Proteaceae	*Faurea rochetiana*	(A.Rich.) Chiov. ex Pic.Serm.	LC	Indigenous
Asteraceae	*Felicia muricata subsp. muricata*	(Thunb.) Nees	LC	Indigenous
Poaceae	*Festuca scabra*	Vahl	LC	Indigenous
Cyperaceae	*Fimbristylis complanata*	(Retz.) Link	LC	Indigenous
Cyperaceae	*Fuirena pubescens var. pubescens*	(Poir.) Kunth	LC	Indigenous
Asteraceae	*Gazania krebsiana subsp. serrulata*	Less.	LC	Indigenous

Asteraceae	*Geigeria burkei subsp. burkei*	Harv.	NE	Indigenous; Endemic
Asteraceae	*Gerbera piloselloides*	(L.) Cass.	LC	Indigenous
Iridaceae	*Gladiolus crassifolius*	Baker	LC	Indigenous
Iridaceae	*Gladiolus dalenii subsp. dalenii*	Van Geel	LC	Indigenous
Iridaceae	*Gladiolus permeabilis subsp. edulis*	D.Delaroche	LC	Indigenous
Iridaceae	*Gladiolus robertsoniae*	F.Bolus	NT	Indigenous; Endemic
Asteraceae	*Gnaphalium confine*	Harv.	LC	Indigenous
Asteraceae	*Gnaphalium filagopsis*	Hilliard & B.L.Burtt	LC	Indigenous
Thymelaeaceae	*Gnidia gymnostachya*	(C.A.Mey.) Gilg	LC	Indigenous
Orchidaceae	*Habenaria bicolor*	Conrath & Kraenzl.	NT	Indigenous
Orchidaceae	*Habenaria dregeana*	Lindl.	LC	Indigenous
Orchidaceae	*Habenaria epipactidea*	Rchb.f.	LC	Indigenous
Orchidaceae	*Habenaria falcicornis subsp. caffra*	(Burch. ex Lindl.) Bolus	LC	Indigenous
Orchidaceae	*Habenaria nyikana subsp. nyikana*	Rchb.f.	LC	Indigenous
Asteraceae	*Haplocarpha scaposa*	Harv.	LC	Indigenous
Poaceae	*Harpochloa falx*	(L.f.) Kuntze	LC	Indigenous
Orobanchaceae	*Harveya speciosa*	Bernh.	LC	Indigenous
Asteraceae	*Helichrysum argyrosphaerum*	DC.	LC	Indigenous
Asteraceae	*Helichrysum aureonitens*	Sch.Bip.	LC	Indigenous
Asteraceae	*Helichrysum aureum var. monocephalum*	(Houtt.) Merr.	NE	Indigenous
Asteraceae	*Helichrysum caespititium*	(DC.) Harv.	LC	Indigenous
Asteraceae	*Helichrysum callicomum*	Harv.	LC	Indigenous
Asteraceae	*Helichrysum lepidissimum*	S.Moore	LC	Indigenous
Asteraceae	*Helichrysum nudifolium var. nudifolium*	(L.) Less.	LC	Indigenous
Asteraceae	*Helichrysum rugulosum*	Less.	LC	Indigenous
Asteraceae	*Helichrysum setosum*	Harv.	LC	Indigenous
Asteraceae	*Helichrysum stenopterum*	DC.	LC	Indigenous
Poaceae	*Helictotrichon turgidulum*	(Stapf) Schweick.	LC	Indigenous
Malvaceae	*Hermannia cordata*	(E.Mey. ex E.Phillips) De Winter	LC	Indigenous; Endemic
Malvaceae	*Hermannia depressa*	N.E.Br.	LC	Indigenous
Malvaceae	*Hermannia grandistipula*	(Buchinger ex Hochst.) K.Schum.	LC	Indigenous
Malvaceae	*Hermannia jacobeifolia*	(Turcz.) R.A.Dyer	LC	Indigenous
Malvaceae	*Hermannia lancifolia*	Szyszyl.	LC	Indigenous; Endemic
Malvaceae	*Hermannia oblongifolia*	(Harv.) Hochr.	LC	Indigenous; Endemic
Malvaceae	*Hermannia sp.*			
Iridaceae	*Hesperantha coccinea*	(Backh. & Harv.) Goldblatt & J.C.Manning	LC	Indigenous
Iridaceae	*Hesperantha longicollis*	Baker	LC	Indigenous
Malvaceae	*Hibiscus microcarpus*	Garcke	LC	Indigenous
Asteraceae	*Hilliardiella elaeagnoides*	(DC.) Swelank. & J.C.Manning		Indigenous
Asteraceae	*Hilliardiella hirsuta*	(DC.) H.Rob.	LC	Indigenous

Hypericaceae	*Hypericum aethiopicum subsp. sonderi*	Thunb.	LC	Indigenous
Hypericaceae	*Hypericum lalandii*	Choisy	LC	Indigenous
Hypoxidaceae	*Hypoxis filiformis*	Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis iridifolia*	Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis rigidula var. rigidula*	Baker	LC	Indigenous
Poaceae	*Imperata cylindrica*	(L.) Raeusch.	LC	Indigenous
Fabaceae	*Indigastrum burkeanum*	(Benth. ex Harv.) Schrire	LC	Indigenous
Fabaceae	*Indigofera confusa*	Prain & Baker f.	LC	Indigenous
Fabaceae	*Indigofera hybrida*	N.E.Br.	VU	Indigenous; Endemic
Fabaceae	*Indigofera oxytropis*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Indigofera sp.*			
Fabaceae	*Indigofera zeyheri*	Spreng. ex Eckl. & Zeyh.	LC	Indigenous
Convolvulaceae	*Ipomoea bathycolpos*	Hallier f.	LC	Indigenous; Endemic
Convolvulaceae	*Ipomoea crassipes var. crassipes*	Hook.	LC	Indigenous
Convolvulaceae	*Ipomoea obscura var. obscura*	(L.) Ker Gawl.	LC	Indigenous
Convolvulaceae	*Ipomoea oenotherae var. oenotherae*	(Vatke) Hallier f.	LC	Indigenous
Convolvulaceae	*Ipomoea ommanneyi*	Rendle	LC	Indigenous
Convolvulaceae	*Ipomoea simplex*	Thunb.	LC	Indigenous
Iridaceae	*Iris pseudacorus*	L.		Not Indigenous; Cultivated; Naturalised; Invasive
Cyperaceae	*Isolepis fluitans var. fluitans*	(L.) R.Br.	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia aurantiaca*	(Burch.) Hilliard	LC	Indigenous
Euphorbiaceae	*Jatropha lagarinthoides*	Sond.	LC	Indigenous; Endemic
Juncaceae	*Juncus lomatophyllus*	Spreng.	LC	Indigenous
Juncaceae	*Juncus oxycarpus*	E.Mey. ex Kunth	LC	Indigenous
Juncaceae	*Juncus rigidus*	Desf.	LC	Indigenous
Acanthaceae	*Justicia anagalloides*	(Nees) T.Anderson		Indigenous
Asphodelaceae	*Kniphofia porphyrantha*	Baker	LC	Indigenous
Asphodelaceae	*Kniphofia typhoides*	Codd	NT	Indigenous; Endemic
Poaceae	*Koeleria capensis*	(Steud.) Nees	LC	Indigenous
Rubiaceae	*Kohautia amatymbica*	Eckl. & Zeyh.	LC	Indigenous
Cyperaceae	*Kyllinga alata*	Nees	LC	Indigenous
Cyperaceae	*Kyllinga erecta var. erecta*	Schumach.	LC	Indigenous
Cyperaceae	*Kyllinga melanosperma*	Nees	LC	Indigenous
Cyperaceae	*Kyllinga pulchella*	Kunth	LC	Indigenous
Asteraceae	*Lactuca inermis*	Forssk.	LC	Indigenous
Hydrocharitaceae	*Lagarosiphon muscoides*	Harv.	LC	Indigenous
Thymelaeaceae	*Lasiosiphon canoargenteus*	C.H.Wright	LC	Indigenous; Endemic
Thymelaeaceae	*Lasiosiphon kraussianus*	(Meisn.) Meisn.		Indigenous

Thymelaeaceae	*Lasiosiphon microcephalus*	(Meisn.) J.C.Manning & Magee		Indigenous
Asteraceae	*Launaea rarifolia var. rarifolia*	(Oliv. & Hiern) Boulos	LC	Indigenous
Hyacinthaceae	*Ledebouria marginata*	(Baker) Jessop	LC	Indigenous
Hyacinthaceae	*Ledebouria ovatifolia*	(Baker) Jessop		Indigenous; Endemic
Hyacinthaceae	*Ledebouria sp.*			
Poaceae	*Leersia hexandra*	Sw.	LC	Indigenous
Fabaceae	*Leobordea arida*	(Dummer) B.-E.van Wyk & Boatwr.	LC	Indigenous; Endemic
Fabaceae	*Leobordea divaricata*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Leobordea eriantha*	(Benth.) B.-E.van Wyk & Boatwr.	LC	Indigenous
Brassicaceae	*Lepidium bonariense*	L.		Not Indigenous; Naturalised
Poaceae	*Leptochloa fusca*	(L.) Kunth	LC	Indigenous
Fabaceae	*Lessertia affinis*	Burtt Davy	LC	Indigenous; Endemic
Fabaceae	*Lessertia frutescens subsp. microphylla*	(L.) Goldblatt & J.C.Manning	LC	Indigenous
Fabaceae	*Lessertia prostata*	DC.	LC	Indigenous
Limeaceae	*Limeum viscosum subsp. viscosum*	(J.Gay) Fenzl	NE	Indigenous
Scrophulariaceae	*Limosella maior*	Diels	LC	Indigenous
Scrophulariaceae	*Limosella sp.*			
Linaceae	*Linum thunbergii*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Listia heterophylla*	E.Mey.	LC	Indigenous
Boraginaceae	*Lithospermum cinereum*	A.DC.	LC	Indigenous
Lobeliaceae	*Lobelia erinus*	L.	LC	Indigenous
Lobeliaceae	*Lobelia flaccida subsp. flaccida*	(C.Presl) A.DC.	LC	Indigenous
Lobeliaceae	*Lobelia sonderiana*	(Kuntze) Lammers	LC	Indigenous
Poaceae	*Lolium perenne*	L.	NE	Not Indigenous; Naturalised
Fabaceae	*Lotononis laxa*	Eckl. & Zeyh.	LC	Indigenous
Poaceae	*Loudetia simplex*	(Nees) C.E.Hubb.	LC	Indigenous
Onagraceae	*Ludwigia palustris*	(L.) Elliott		Not Indigenous; Naturalised
Malvaceae	*Malva parviflora var. parviflora*	L.		Not Indigenous; Naturalised
Scrophulariaceae	*Manulea paniculata*	Benth.	LC	Indigenous
Marsileaceae	*Marsilea capensis*	A.Braun	LC	Indigenous
Marsileaceae	*Marsilea macrocarpa*	C.Presl	LC	Indigenous
Poaceae	*Melinis nerviglumis*	(Franch.) Zizka	LC	Indigenous
Poaceae	*Melinis sp.*			
Fabaceae	*Melolobium wilmsii*	Harms	LC	Indigenous; Endemic
Convolvulaceae	*Merremia verecunda*	Rendle	LC	Indigenous
Aizoaceae	*Mesembryanthemum cordifolium*	L.f.		Indigenous
Poaceae	*Microchloa caffra*	Nees	LC	Indigenous
Phrymaceae	*Mimulus gracilis*	R.Br.	LC	Indigenous
Anemiaceae	*Mohria vestita*	Baker	LC	Indigenous

Geraniaceae	*Monsonia angustifolia*	E.Mey. ex A.Rich.	LC	Indigenous
Iridaceae	*Moraea pallida*	(Baker) Goldblatt	LC	Indigenous
Iridaceae	*Moraea simulans*	Baker	LC	Indigenous
Iridaceae	*Moraea stricta*	Baker	LC	Indigenous
Scrophulariaceae	*Nemesia fruticans*	(Thunb.) Benth.	LC	Indigenous
Scrophulariaceae	*Nemesia umbonata*	(Hiern) Hilliard & B.L.Burtt	LC	Indigenous
Lythraceae	*Nesaea sagittifolia var. sagittifolia*	(Sond.) Koehne		Indigenous
Lythraceae	*Nesaea schinzii*	Koehne		Indigenous
Asteraceae	*Nidorella anomala*	Steetz	LC	Indigenous; Endemic
Asteraceae	*Nidorella hottentotica*	DC.	LC	Indigenous
Asteraceae	*Nolletia rarifolia*	(Turcz.) Steetz	LC	Indigenous; Endemic
Lamiaceae	*Ocimum obovatum subsp. obovatum*	E.Mey. ex Benth.	NE	Indigenous
Onagraceae	*Oenothera rosea*	L'Her. ex Aiton		Not Indigenous; Naturalised; Invasive
Onagraceae	*Oenothera stricta subsp. stricta*	Ledeb. ex Link		Not Indigenous; Naturalised; Invasive
Onagraceae	*Oenothera tetraptera*	Cav.		Not Indigenous; Naturalised; Invasive
Rubiaceae	*Oldenlandia herbacea var. herbacea*	(L.) Roxb.	LC	Indigenous
Asteraceae	*Oncosiphon piluliferus*	(L.f.) Kallersjo	LC	Indigenous
Asteraceae	*Oncosiphon suffruticosus*	(L.) Kallersjo	LC	Indigenous
Hyacinthaceae	*Ornithogalum flexuosum*	(Thunb.) U.Mull.-Doblies & D.Mull.-Doblies		Indigenous
Hyacinthaceae	*Ornithogalum sp.*			
Orchidaceae	*Orthochilus leontoglossus*	(Rchb.f.) Bytebier		Indigenous
Asteraceae	*Osteospermum scariosum var. scariosum*	DC.	NE	Indigenous
Oxalidaceae	*Oxalis corniculata*	L.		Not Indigenous; Naturalised; Invasive
Oxalidaceae	*Oxalis obliquifolia*	Steud. ex A.Rich.	LC	Indigenous
Polygonaceae	*Oxygonum dregeanum subsp. canescens*	Meisn.	NE	Indigenous
Apocynaceae	*Pachycarpus schinzianus*	(Schltr.) N.E.Br.	LC	Indigenous
Rubiaceae	*Pachystigma pygmaeum*	(Schltr.) Robyns	LC	Indigenous
Poaceae	*Panicum natalense*	Hochst.	LC	Indigenous
Poaceae	*Panicum sp.*			
Poaceae	*Panicum stapfianum*	Fourc.	LC	Indigenous
Papaveraceae	*Papaver aculeatum*	Thunb.	LC	Indigenous
Chrysobalanaceae	*Parinari capensis subsp. capensis*	Harv.	LC	Indigenous
Poaceae	*Paspalum dilatatum*	Poir.	NE	Not Indigenous; Naturalised
Poaceae	*Paspalum distichum*	L.	LC	Indigenous
Fabaceae	*Pearsonia cajanifolia subsp. cajanifolia*	(Harv.) Polhill	LC	Indigenous; Endemic
Fabaceae	*Pearsonia sessilifolia subsp. sessilifolia*	(Harv.) Dummer	LC	Indigenous
Geraniaceae	*Pelargonium luridum*	(Andrews) Sweet	LC	Indigenous
Geraniaceae	*Pelargonium pseudofumarioides*	R.Knuth	LC	Indigenous
Geraniaceae	*Pelargonium sidoides*	DC.	LC	Indigenous

Pteridaceae	*Pellaea calomelanos var. calomelanos*	(Sw.) Link	LC	Indigenous
Rubiaceae	*Pentanisia angustifolia*	(Hochst.) Hochst.	LC	Indigenous
Apocynaceae	*Pentarrhinum insipidum*	E.Mey.	LC	Indigenous
Poaceae	*Phalaris arundinacea*	L.	NE	Not Indigenous; Naturalised
Plantaginaceae	*Plantago lanceolata*	L.	LC	Indigenous
Plantaginaceae	*Plantago major*	L.		Not Indigenous; Naturalised
Poaceae	*Poa annua*	L.	NE	Not Indigenous; Naturalised
Caryophyllaceae	*Pollichia campestris*	Aiton		Indigenous
Asteraceae	*Polydora poskeana*	(Vatke & Hildebr.) H.Rob.	LC	Indigenous
Polygalaceae	*Polygala gracilenta*	Burtt Davy	LC	Indigenous
Polygalaceae	*Polygala hottentotta*	C.Presl	LC	Indigenous
Polygalaceae	*Polygala transvaalensis subsp. transvaalensis*	Chodat	LC	Indigenous
Poaceae	*Polypogon monspeliensis*	(L.) Desf.	NE	Not Indigenous; Naturalised
Potamogetonaceae	*Potamogeton nodosus*	Poir.	LC	Indigenous
Potamogetonaceae	*Potamogeton pectinatus*	L.	LC	Indigenous
Molluginaceae	*Psammotropha mucronata var. mucronata*	(Thunb.) Fenzl	LC	Indigenous
Asteraceae	*Pseudognaphalium luteoalbum*	(L.) Hilliard & B.L.Burtt	LC	Not Indigenous; Naturalised
Asteraceae	*Pseudopegolettia tenella*	(DC.) H.Rob., Skvarla & V.A.Funk		Indigenous; Endemic
Cyperaceae	*Pycreus macranthus*	(Boeck.) C.B.Clarke	LC	Indigenous
Rubiaceae	*Pygmaeothamnus chamaedendrum var. setulosus*	(Kuntze) Robyns	LC	Indigenous
Ranunculaceae	*Ranunculus multifidus*	Forssk.	LC	Indigenous
Apocynaceae	*Raphionacme hirsuta*	(E.Mey.) R.A.Dyer	LC	Indigenous
Fabaceae	*Rhynchosia adenodes*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Rhynchosia nervosa var. nervosa*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Rhynchosia sp.*			
Fabaceae	*Rhynchosia totta var. totta*	(Thunb.) DC.	LC	Indigenous
Ricciaceae	*Riccia atropurpurea*	Sim		Indigenous
Ricciaceae	*Riccia okahandjana*	S.W.Arnell		Indigenous
Rubiaceae	*Richardia brasiliensis*	Gomes	NE	Not Indigenous; Naturalised
Lythraceae	*Rotala filiformis*	(Bellardi) Hiern	LC	Indigenous
Lamiaceae	*Rotheca hirsuta*	(Hochst.) R.Fern.		Indigenous
Rosaceae	*Rubus rigidus*	Sm.	LC	Indigenous
Polygonaceae	*Rumex acetosella subsp. angiocarpus*	L.		Not Indigenous; Naturalised
Polygonaceae	*Rumex crispus*	L.		Not Indigenous; Naturalised; Invasive
Polygonaceae	*Rumex lanceolatus*	Thunb.	LC	Indigenous
Aizoaceae	*Ruschia sp.*			
Lamiaceae	*Salvia repens var. transvaalensis*	Burch. ex Benth.	LC	Indigenous

Lamiaceae	*Salvia stenophylla*	Burch. ex Benth.		Indigenous; Endemic
Dipsacaceae	*Scabiosa columbaria*	L.	LC	Indigenous
Asteraceae	*Schistostephium crataegifolium*	(DC.) Fenzl ex Harv.	LC	Indigenous
Cyperaceae	*Schoenoplectus decipiens*	(Nees) J.Raynal	LC	Indigenous
Cyperaceae	*Schoenoplectus muricinux*	(C.B.Clarke) J.Raynal	LC	Indigenous
Cyperaceae	*Schoenoplectus muriculatus*	(Kuk.) Browning	LC	Indigenous
Cyperaceae	*Schoenoplectus pulchellus*	(Kunth) J.Raynal	LC	Indigenous
Cyperaceae	*Scirpoides burkei*	(C.B.Clarke) Goetgh., Muasya & D.A.Simpson	LC	Indigenous
Anacardiaceae	*Searsia discolor*	(E.Mey. ex Sond.) Moffett		Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	(Burch.) Moffett		Indigenous
Gentianaceae	*Sebaea exigua*	(Oliv.) Schinz	LC	Indigenous
Gentianaceae	*Sebaea leiostyla*	Gilg	LC	Indigenous
Selaginellaceae	*Selaginella dregei*	(C.Presl) Hieron.		Indigenous
Scrophulariaceae	*Selago sp.*			
Asteraceae	*Senecio coronatus*	(Thunb.) Harv.	LC	Indigenous
Asteraceae	*Senecio erubescens var. erubescens*	Aiton	NE	Indigenous; Endemic
Asteraceae	*Senecio isatideus*	DC.	LC	Indigenous
Asteraceae	*Senecio laevigatus var. laevigatus*	Thunb.	LC	Indigenous; Endemic
Asteraceae	*Senecio lydenburgensis*	Hutch. & Burtt Davy	LC	Indigenous
Asteraceae	*Senecio othonniflorus*	DC.	LC	Indigenous
Asteraceae	*Senecio oxyriifolius subsp. oxyriifolius*	DC.	LC	Indigenous
Asteraceae	*Senecio sp.*			
Asteraceae	*Senecio venosus*	Harv.	LC	Indigenous
Poaceae	*Setaria sphacelata var. torta*	(Schumach.) Stapf & C.E.Hubb. ex M.B.Moss	LC	Indigenous
Caryophyllaceae	*Silene gallica*	L.		Not Indigenous; Naturalised
Caryophyllaceae	*Silene sp.*			
Solanaceae	*Solanum campylacanthum*	Hochst. ex A.Rich.		Indigenous
Solanaceae	*Solanum capense*	L.	LC	Indigenous; Endemic
Solanaceae	*Solanum lichtensteinii*	Willd.	LC	Indigenous
Solanaceae	*Solanum sisymbriifolium*	Lam.		Not Indigenous; Naturalised; Invasive
Asteraceae	*Sonchus nanus*	Sond. ex Harv.	LC	Indigenous
Orobanchaceae	*Sopubia cana var. cana*	Harv.	LC	Indigenous
Poaceae	*Sporobolus discosporus*	Nees	LC	Indigenous
Poaceae	*Sporobolus pectinatus*	Hack.	LC	Indigenous; Endemic
Poaceae	*Sporobolus sp.*			
Lamiaceae	*Stachys caffra*	E.Mey. ex Benth.	LC	Indigenous; Endemic
Poaceae	*Stiburus conrathii*	Hack.	LC	Indigenous
Orobanchaceae	*Striga bilabiata subsp. bilabiata*	(Thunb.) Kuntze	LC	Indigenous

Orobanchaceae	*Striga gesnerioides*	(Willd.) Vatke	LC	Indigenous
Lamiaceae	*Syncolostemon pretoriae*	(Gurke) D.F.Otieno	LC	Indigenous
Asteraceae	*Tagetes minuta*	L.		Not Indigenous; Naturalised; Invasive
Fabaceae	*Tephrosia capensis var. capensis*	(Jacq.) Pers.	LC	Indigenous
Fabaceae	*Tephrosia elongata var. elongata*	E.Mey.	LC	Indigenous
Lamiaceae	*Teucrium trifidum*	Retz.	LC	Indigenous
Poaceae	*Themeda triandra*	Forssk.	LC	Indigenous
Santalaceae	*Thesium transvaalense*	Schltr.	LC	Indigenous; Endemic
Acanthaceae	*Thunbergia natalensis*	Hook.	LC	Indigenous
Asteraceae	*Tolpis capensis*	(L.) Sch.Bip.	LC	Indigenous
Asphodelaceae	*Trachyandra asperata var. macowanii*	Kunth	LC	Indigenous
Asphodelaceae	*Trachyandra saltii var. saltii*	(Baker) Oberm.	LC	Indigenous
Fabaceae	*Trifolium africanum var. africanum*	Ser.	NE	Indigenous
Fabaceae	*Trifolium africanum var. lydenburgense*	Ser.	NE	Indigenous
Poaceae	*Tristachya leucothrix*	Trin. ex Nees	LC	Indigenous
Poaceae	*Tristachya rehmannii*	Hack.	LC	Indigenous
Iridaceae	*Tritonia nelsonii*	Baker	LC	Indigenous
Alliaceae	*Tulbaghia acutiloba*	Harv.	LC	Indigenous; Endemic
Alliaceae	*Tulbaghia leucantha*	Baker	LC	Indigenous
Asteraceae	*Ursinia nana subsp. leptophylla*	DC.	LC	Indigenous
Lentibulariaceae	*Utricularia stellaris*	L.f.	LC	Indigenous
Verbenaceae	*Verbena aristigera*	S.Moore		Not Indigenous; Naturalised
Fabaceae	*Vicia sativa subsp. sativa*	L.	NE	Not Indigenous; Naturalised
Fabaceae	*Vigna unguiculata subsp. stenophylla*	(L.) Walp.	LC	Indigenous
Solanaceae	*Withania somnifera*	(L.) Dunal	LC	Indigenous
Xyridaceae	*Xyris capensis*	Thunb.		Indigenous
Apocynaceae	*Xysmalobium brownianum*	S.Moore	LC	Indigenous
Potamogetonaceae	*Zannichellia palustris*	L.	LC	Indigenous
Rhamnaceae	*Ziziphus zeyheriana*	Sond.		Indigenous
Fabaceae	*Zornia capensis subsp. capensis*	Pers.	LC	Indigenous
Fabaceae	*Zornia linearis*	E.Mey.	LC	Indigenous
Fabaceae	*Zornia milneana*	Mohlenbr.	LC	Indigenous

APPENDIX B: *Avifaunal species expected to occur in the project area*

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Accipiter badius	Shikra	Unlisted	LC
Accipiter melanoleucus	Sparrowhawk, Black	Unlisted	LC
Accipiter minullus	Sparrowhawk, Little	Unlisted	LC
Accipiter ovampensis	Sparrowhawk, Ovambo	Unlisted	LC
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus arundinaceus	Reed-warbler, Great	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Unlisted	LC
Acrocephalus palustris	Warbler, Marsh	Unlisted	LC
Acrocephalus schoenobaenus	Warbler, Sedge	Unlisted	LC
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC
Actophilornis africanus	Jacana, African	Unlisted	LC
Afrotis afraoides	Korhaan, Northern Black	Unlisted	LC
Agapornis roseicollis	Lovebird, Rosy-faced	Unlisted	LC
Alcedo cristata	Kingfisher, Malachite	Unlisted	Unlisted
Alcedo semitorquata	Kingfisher, Half-collared	NT	LC
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Amadina erythrocephala	Finch, Red-headed	Unlisted	LC
Amandava subflava	Waxbill, Orange-breasted	Unlisted	Unlisted
Amaurornis flavirostris	Crake, Black	Unlisted	LC
Amblyospiza albifrons	Weaver, Thick-billed	Unlisted	LC
Anas capensis	Teal, Cape	Unlisted	LC
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC
Anas hottentota	Teal, Hottentot	Unlisted	LC
Anas platyrhynchos	Duck, Mallard	Unlisted	LC
Anas smithii	Shoveler, Cape	Unlisted	LC
Anas sparsa	Duck, African Black	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Anomalospiza imberbis	Finch, Cuckoo	Unlisted	LC
Anser anser	Goose, Domestic	Unlisted	LC
Anthropoides paradiseus	Crane, Blue	NT	VU
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus leucophrys	Pipit, Plain-backed	Unlisted	LC
Anthus lineiventris	Pipit, Striped	Unlisted	LC
Anthus similis	Pipit, Long-billed	Unlisted	LC
Anthus vaalensis	Pipit, Buffy	Unlisted	LC
Apalis thoracica	Apalis, Bar-throated	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC
Apus apus	Swift, Common	Unlisted	LC
Apus barbatus	Swift, African Black	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC

Apus horus	Swift, Horus	Unlisted	LC
Aquila ayresii	Hawk-eagle, Ayres's	NT	LC
Aquila pennatus	Eagle, Booted	Unlisted	LC
Aquila verreauxii	Eagle, Verreaux's	VU	LC
Aquila wahlbergi	Eagle, Wahlberg's	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea goliath	Heron, Goliath	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Ardeola ralloides	Heron, Squacco	Unlisted	LC
Arenaria interpres	Turnstone, Ruddy	Unlisted	LC
Asio capensis	Owl, Marsh	Unlisted	LC
Aviceda cuculoides	Hawk, African Cuckoo	Unlisted	LC
Batis molitor	Batis, Chinspot	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bradornis mariquensis	Flycatcher, Marico	Unlisted	LC
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC
Bradypterus sylvaticus	Warbler, Knysna	VU	VU
Bubo africanus	Eagle-owl, Spotted	Unlisted	LC
Bubo lacteus	Eagle-owl, Verreaux's	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Buteo rufofuscus	Buzzard, Jackal	Unlisted	LC
Buteo vulpinus	Buzzard, Steppe	Unlisted	Unlisted
Butorides striata	Heron, Green-backed	Unlisted	LC
Bycanistes bucinator	Hornbill, Trumpeter	Unlisted	LC
Calandrella cinerea	Lark, Red-capped	Unlisted	LC
Calendulauda sabota	Lark, Sabota	Unlisted	LC
Calidris alba	Sanderling	Unlisted	LC
Calidris ferruginea	Sandpiper, Curlew	LC	NT
Calidris minuta	Stint, Little	LC	LC
Camaroptera brevicaudata	Camaroptera, Grey-backed	Unlisted	Unlisted
Campephaga flava	Cuckoo-shrike, Black	Unlisted	LC
Campethera abingoni	Woodpecker, Golden-tailed	Unlisted	LC
Caprimulgus europaeus	Nightjar, European	Unlisted	LC
Caprimulgus pectoralis	Nightjar, Fiery-necked	Unlisted	LC
Caprimulgus rufigena	Nightjar, Rufous-cheeked	Unlisted	LC
Caprimulgus tristigma	Nightjar, Freckled	Unlisted	LC
Cecropis senegalensis	Swallow, Mosque	Unlisted	LC
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted
Centropus superciliosus	Coucal, White-browed	Unlisted	LC
Cercomela familiaris	Chat, Familiar	Unlisted	LC
Cercotrichas leucophrys	Scrub-robin, White-browed	Unlisted	LC
Cercotrichas paena	Scrub-robin, Kalahari	Unlisted	LC
Certhilauda benguelensis	Lark, Benguela Long-billed	Unlisted	Unlisted
Certhilauda brevirostris	Lark, Agulhas Long-billed	NT	NR

Certhilauda curvirostris	Lark, Cape Long-billed	Unlisted	LC
Certhilauda semitorquata	Lark, Eastern Long-billed	Unlisted	LC
Certhilauda subcoronata	Lark, Karoo Long-billed	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Chalcomitra amethystina	Sunbird, Amethyst	Unlisted	LC
Charadrius hiaticula	Plover, Common Ringed	Unlisted	LC
Charadrius pecuarius	Plover, Kittlitz's	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chersomanes albofasciata	Lark, Spike-heeled	Unlisted	LC
Chlidonias hybrida	Tern, Whiskered	Unlisted	LC
Chlidonias leucopterus	Tern, White-winged	Unlisted	LC
Chloropeta natalensis	Warbler, Dark-capped Yellow	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Chrysococcyx klaas	Cuckoo, Klaas's	Unlisted	LC
Ciconia abdimii	Stork, Abdim's	NT	LC
Ciconia ciconia	Stork, White	Unlisted	LC
Ciconia nigra	Stork, Black	VU	LC
Cinnyricinclus leucogaster	Starling, Violet-backed	Unlisted	LC
Cinnyris afer	Sunbird, Greater Double-collared	Unlisted	LC
Cinnyris mariquensis	Sunbird, Marico	Unlisted	LC
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC
Circaetus cinereus	Snake-eagle, Brown	Unlisted	LC
Circaetus pectoralis	Snake-eagle, Black-chested	Unlisted	LC
Circus aeruginosus	Marsh-harrier, Western	Unlisted	LC
Circus ranivorus	Marsh-harrier, African	EN	LC
Cisticola aberrans	Cisticola, Lazy	Unlisted	LC
Cisticola aridulus	Cisticola, Desert	Unlisted	LC
Cisticola ayresii	Cisticola, Wing-snapping	Unlisted	LC
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC
Cisticola fulvicapilla	Neddicky, Neddicky	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Cisticola lais	Cisticola, Wailing	Unlisted	LC
Cisticola textrix	Cisticola, Cloud	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Clamator glandarius	Cuckoo, Great Spotted	Unlisted	LC
Clamator jacobinus	Cuckoo, Jacobin	Unlisted	LC
Clamator levaillantii	Cuckoo, Levaillant's	Unlisted	LC
Coccopygia melanotis	Waxbill, Swee	Unlisted	LC
Colius colius	Mousebird, White-backed	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Columba arquatrix	Olive-pigeon, African	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Coracias caudatus	Roller, Lilac-breasted	Unlisted	LC
Coracias garrulus	Roller, European	NT	LC
Coracias naevius	Roller, Purple	Unlisted	LC

Corvinella melanoleuca	Shrike, Magpie	Unlisted	LC
Corvus albus	Crow, Pied	Unlisted	LC
Corvus capensis	Crow, Cape	Unlisted	LC
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Cossypha humeralis	Robin-chat, White-throated	Unlisted	LC
Coturnix coturnix	Quail, Common	Unlisted	LC
Creatophora cinerea	Starling, Wattled	Unlisted	LC
Crecopsis egregia	Crake, African	Unlisted	LC
Crex crex	Crake, Corn	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Crithagra flaviventris	Canary, Yellow	Unlisted	LC
Crithagra gularis	Seedeater, Streaky-headed	Unlisted	LC
Crithagra mozambica	Canary, Yellow-fronted	Unlisted	LC
Cuculus canorus	Cuckoo, Common	Unlisted	LC
Cuculus clamosus	Cuckoo, Black	Unlisted	LC
Cuculus gularis	Cuckoo, African	Unlisted	LC
Cuculus solitarius	Cuckoo, Red-chested	Unlisted	LC
Cursorius temminckii	Courser, Temminck's	Unlisted	LC
Cyanomitra veroxii	Sunbird, Grey	LC	Unlisted
Cypsiurus parvus	Palm-swift, African	Unlisted	LC
Delichon urbicum	House-martin, Common	Unlisted	LC
Dendrocygna bicolor	Duck, Fulvous	Unlisted	LC
Dendrocygna viduata	Duck, White-faced Whistling	Unlisted	LC
Dendroperdix sephaena	Francolin, Crested	Unlisted	LC
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC
Dendropicos namaquus	Woodpecker, Bearded	Unlisted	LC
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC
Dryoscopus cubla	Puffback, Black-backed	Unlisted	LC
Egretta alba	Egret, Great	Unlisted	LC
Egretta ardesiaca	Heron, Black	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Egretta intermedia	Egret, Yellow-billed	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Emberiza capensis	Bunting, Cape	Unlisted	LC
Emberiza flaviventris	Bunting, Golden-breasted	Unlisted	LC
Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC
Ephippiorhynchus senegalensis	Stork, Saddle-billed	EN	LC
Eremomela icteropygialis	Eremomela, Yellow-bellied	Unlisted	LC
Eremopterix leucotis	Sparrowlark, Chestnut-backed	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Estrilda erythronotos	Waxbill, Black-faced	Unlisted	LC
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC
Euplectes ardens	Widowbird, Red-collared	Unlisted	LC

Euplectes axillaris	Widowbird, Fan-tailed	Unlisted	LC
Euplectes capensis	Bishop, Yellow	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Eupodotis caerulescens	Korhaan, Blue	LC	NT
Eupodotis senegalensis	Korhaan, White-bellied	VU	LC
Falco amurensis	Falcon, Amur	Unlisted	LC
Falco biarmicus	Falcon, Lanner	VU	LC
Falco naumanni	Kestrel, Lesser	Unlisted	LC
Falco peregrinus	Falcon, Peregrine	Unlisted	LC
Falco rupicoloides	Kestrel, Greater	Unlisted	LC
Falco rupicolus	Kestrel, Rock	Unlisted	LC
Falco subbuteo	Hobby, Eurasian	Unlisted	LC
Falco vespertinus	Falcon, Red-footed	NT	NT
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinago nigripennis	Snipe, African	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Glareola nordmanni	Pratincole, Black-winged	NT	NT
Glaucidium perlatum	Owlet, Pearl-spotted	Unlisted	LC
Granatina granatina	Waxbill, Violet-eared	Unlisted	LC
Gyps africanus	Vulture, White-backed	**CR**	**CR**
Gyps coprotheres	Vulture, Cape	EN	EN
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC
Halcyon senegalensis	Kingfisher, Woodland	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC
Hippolais icterina	Warbler, Icterine	Unlisted	LC
Hirundo abyssinica	Swallow, Lesser Striped	Unlisted	LC
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Hirundo dimidiata	Swallow, Pearl-breasted	Unlisted	LC
Hirundo fuligula	Martin, Rock	Unlisted	Unlisted
Hirundo rustica	Swallow, Barn	Unlisted	LC
Hirundo semirufa	Swallow, Red-breasted	Unlisted	LC
Hirundo spilodera	Cliff-swallow, South African	Unlisted	LC
Indicator indicator	Honeyguide, Greater	Unlisted	LC
Indicator minor	Honeyguide, Lesser	Unlisted	LC
Ixobrychus minutus	Bittern, Little	Unlisted	LC
Ixobrychus sturmii	Bittern, Dwarf	Unlisted	LC
Jynx ruficollis	Wryneck, Red-throated	Unlisted	LC
Kaupifalco monogrammicus	Buzzard, Lizard	Unlisted	LC
Lagonosticta rhodopareia	Firefinch, Jameson's	Unlisted	LC
Lagonosticta rubricata	Firefinch, African	Unlisted	LC
Lagonosticta senegala	Firefinch, Red-billed	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Laniarius atrococcineus	Shrike, Crimson-breasted	Unlisted	LC

Laniarius ferrugineus	Boubou, Southern	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lanius minor	Shrike, Lesser Grey	Unlisted	LC
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC
Larus dominicanus	Gull, Kelp	Unlisted	LC
Larus fuscus	Gull, Lesser Black-backed	Unlisted	LC
Larus heuglini	Gull, Heuglin's	Unlisted	LC
Larus pipixcan	Gull, Franklin's	Unlisted	LC
Leptoptilos crumeniferus	Stork, Marabou	Unlisted	LC
Limosa lapponica	Godwit, Bar-tailed	LC	NT
Locustella fluviatilis	Warbler, River	Unlisted	LC
Lophaetus occipitalis	Eagle, Long-crested	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC
Malaconotus blanchoti	Bush-shrike, Grey-headed	Unlisted	LC
Melaenornis pammelaina	Flycatcher, Southern Black	Unlisted	LC
Melierax canorus	Goshawk, Southern Pale Chanting	Unlisted	LC
Melierax gabar	Goshawk, Gabar	Unlisted	LC
Merops apiaster	Bee-eater, European	Unlisted	LC
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC
Merops hirundineus	Bee-eater, Swallow-tailed	Unlisted	LC
Merops persicus	Bee-eater, Blue-cheeked	Unlisted	LC
Merops pusillus	Bee-eater, Little	Unlisted	LC
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted
Milvus migrans	Kite, Black	Unlisted	LC
Mirafra africana	Lark, Rufous-naped	Unlisted	LC
Mirafra apiata	Lark, Cape Clapper	Unlisted	LC
Mirafra cheniana	Lark, Melodious	LC	LC
Mirafra fasciolata	Lark, Eastern Clapper	Unlisted	LC
Mirafra marjoriae	Lark, Agulhas Clapper	Unlisted	Unlisted
Monticola explorator	Rock-thrush, Sentinel	Unlisted	LC
Monticola rupestris	Rock-thrush, Cape	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Motacilla flava	Wagtail, Western Yellow	Unlisted	LC
Muscicapa striata	Flycatcher, Spotted	Unlisted	LC
Mycteria ibis	Stork, Yellow-billed	EN	LC
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Nectarinia famosa	Sunbird, Malachite	Unlisted	LC
Netta erythrophthalma	Pochard, Southern	Unlisted	LC
Nilaus afer	Brubru	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Nycticorax nycticorax	Night-Heron, Black-crowned	Unlisted	LC
Oena capensis	Dove, Namaqua	Unlisted	LC
Oenanthe monticola	Wheatear, Mountain	Unlisted	LC

Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Onychognathus morio	Starling, Red-winged	Unlisted	LC
Oriolus larvatus	Oriole, Black-headed	Unlisted	LC
Oriolus oriolus	Oriole, Eurasian Golden	Unlisted	LC
Ortygospiza atricollis	Quailfinch, African	Unlisted	LC
Otus senegalensis	Scops-owl, African	Unlisted	LC
Oxyura maccoa	Duck, Maccoa	NT	NT
Parisoma subcaeruleum	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer griseus	Sparrow, Northern Grey-headed	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Pavo cristatus	Peacock, Common	Unlisted	LC
Pelecanus onocrotalus	Pelican, Great White	VU	LC
Pelecanus rufescens	Pelican, Pink-backed	VU	LC
Peliperdix coqui	Francolin, Coqui	Unlisted	LC
Pernis apivorus	Honey-buzzard, European	Unlisted	LC
Petronia superciliaris	Petronia, Yellow-throated	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	LC
Phalacrocorax carbo	Cormorant, White-breasted	LC	LC
Phalaropus fulicarius	Phalarope, Red	Unlisted	Unlisted
Philomachus pugnax	Ruff	Unlisted	LC
Phoeniconaias minor	Flamingo, Lesser	NT	NT
Phoenicopterus ruber	Flamingo, Greater	NT	LC
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC
Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC
Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Ploceus intermedius	Masked-weaver, Lesser	Unlisted	LC
Ploceus velatus	Southern Masked-weaver, Southern	Unlisted	LC
Pluvialis squatarola	Plover, Grey	Unlisted	LC
Podiceps cristatus	Grebe, Great Crested	Unlisted	LC
Podiceps nigricollis	Grebe, Black-necked	Unlisted	LC
Pogoniulus chrysoconus	Tinkerbird, Yellow-fronted	Unlisted	LC
Polemaetus bellicosus	Eagle, Martial	EN	VU
Polyboroides typus	Harrier-Hawk, African	Unlisted	LC
Porphyrio madagascariensis	Swamphen, African Purple	Unlisted	Unlisted
Porzana porzana	Crake, Spotted	Unlisted	LC
Prinia flavicans	Prinia, Black-chested	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Prionops plumatus	Helmet-shrike, White-crested	Unlisted	LC

Prodotiscus regulus	Honeybird, Brown-backed	Unlisted	LC
Psittacula krameri	Parakeet, Rose-ringed	Unlisted	LC
Psophocichla litsipsirupa	Thrush, Groundscraper	Unlisted	Unlisted
Pternistis natalensis	Spurfowl, Natal	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Ptilopsus granti	Scops-owl, Southern White-faced	Unlisted	Unlisted
Pycnonotus nigricans	Bulbul, African Red-eyed	Unlisted	LC
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted
Pytilia melba	Pytilia, Green-winged	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Rallus caerulescens	Rail, African	Unlisted	LC
Recurvirostra avosetta	Avocet, Pied	Unlisted	LC
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Riparia riparia	Martin, Sand	Unlisted	LC
Rostratula benghalensis	Painted-snipe, Greater	NT	LC
Rynchops flavirostris	Skimmer, African	NA	NT
Sagittarius serpentarius	Secretarybird	VU	VU
Sarkidiornis melanotos	Duck, Comb	Unlisted	LC
Sarothrura rufa	Flufftail, Red-chested	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Scleroptila levaillantii	Francolin, Red-winged	LC	LC
Scleroptila levaillantoides	Francolin, Orange River	Unlisted	LC
Scleroptila shelleyi	Francolin, Shelley's	Unlisted	LC
Scopus umbretta	Hamerkop, Hamerkop	Unlisted	LC
Serinus canicollis	Canary, Cape	Unlisted	LC
Sigelus silens	Flycatcher, Fiscal	Unlisted	LC
Spermestes cucullatus	Mannikin, Bronze	Unlisted	Unlisted
Sphenoeacus afer	Grassbird, Cape	Unlisted	LC
Spizocorys conirostris	Lark, Pink-billed	Unlisted	LC
Sporopipes squamifrons	Finch, Scaly-feathered	Unlisted	LC
Spreo bicolor	Starling, Pied	Unlisted	LC
Stenostira scita	Flycatcher, Fairy	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC
Sturnus vulgaris	Starling, Common	Unlisted	LC
Sylvia borin	Warbler, Garden	Unlisted	LC
Sylvia communis	Whitethroat, Common	Unlisted	LC
Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Tachymarptis melba	Swift, Alpine	Unlisted	LC
Tadorna cana	Shelduck, South African	Unlisted	LC
Tchagra australis	Tchagra, Brown-crowned	Unlisted	LC

Tchagra senegalus	Tchagra, Black-crowned	Unlisted	LC
Telophorus sulfureopectus	Bush-shrike, Orange-breasted	Unlisted	LC
Telophorus zeylonus	Bokmakierie, Bokmakierie	Unlisted	LC
Terpsiphone viridis	Paradise-flycatcher, African	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Thamnolaea cinnamomeiventris	Cliff-chat, Mocking	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Tockus leucomelas	Hornbill, Southern Yellow-billed	Unlisted	LC
Tockus nasutus	Hornbill, African Grey	Unlisted	LC
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Treron calvus	Green-pigeon, African	Unlisted	LC
Tricholaema leucomelas	Barbet, Acacia Pied	Unlisted	LC
Tringa glareola	Sandpiper, Wood	Unlisted	LC
Tringa nebularia	Greenshank, Common	Unlisted	LC
Tringa ochropus	Sandpiper, Green	Unlisted	LC
Tringa stagnatilis	Sandpiper, Marsh	Unlisted	LC
Trochocercus cyanomelas	Crested-Flycatcher, Blue-mantled	Unlisted	LC
Turdoides jardineii	Babbler, Arrow-marked	Unlisted	LC
Turdus libonyanus	Thrush, Kurrichane	Unlisted	Unlisted
Turdus olivaceus	Thrush, Olive	Unlisted	LC
Turdus smithi	Thrush, Karoo	Unlisted	LC
Turnix sylvaticus	Buttonquail, Kurrichane	Unlisted	LC
Turtur chalcospilos	Wood-dove, Emerald-spotted	Unlisted	LC
Tyto alba	Owl, Barn	Unlisted	LC
Tyto capensis	Grass-owl, African	VU	LC
Upupa africana	Hoopoe, African	Unlisted	LC
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua chalybeata	Indigobird, Village	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
Vidua paradisaea	Paradise-whydah, Long-tailed	Unlisted	LC
Vidua purpurascens	Indigobird, Purple	Unlisted	LC
Zosterops pallidus	White-eye, Orange River	Unlisted	LC
Zosterops virens	White-eye, Cape	Unlisted	LC

APPENDIX C: *Mammals species expected to occur in the project area*

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Alcelaphus buselaphus	Hartebeest	LC	LC
Antidorcas marsupialis	Sclater's Shrew	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Ceratotherium simum	White Rhinoceros	NT	NT
Connochaetes gnou	Black Wildebeest	LC	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura maquassiensis	Makwassie musk shrew	VU	LC
Crocidura silacea	Lesser Grey-brown Musk Shrew	LC	LC
Cryptomys hottentotus	Common Mole-rat	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus pygargus	Blesbok	LC	LC
Dasymys incomtus	African Marsh rat	NT	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Diceros bicornis	Black Rhinoceros	EN	CR
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	NT
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hydrictis maculicollis	Spotted-necked Otter	VU	NT
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ichneumia albicauda	White-tailed Mongoose	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Kerivoula lanosa	Lesser Woolly Bat	LC	LC
Leptailurus serval	Serval	NT	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC

Mastomys natalensis	Natal Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Myotis tricolor	Temminck's Hairy Bat	LC	LC
Myotis welwitschii	Welwitsch's Hairy Bat	LC	LC
Mystromys albicaudatus	White-tailed Rat	VU	EN
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia nana	Banana Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Ourebia ourebi	Oribi	EN	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	NT	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Procavia capensis	Rock Hyrax	LC	LC
Pronolagus randensis	Jameson's Red Rock Rabbit	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC
Redunca fulvorufula	Mountain Reedbuck	EN	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus blasii	Blasius's horseshoe bat	NT	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Sauromys petrophilus	Flat-headed Free-tail Bat	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Steatomys krebsii	Krebs's Fat Mouse	LC	LC
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Suricate	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Syncerus caffer	African Buffalo	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC
Tragelaphus oryx	Eland	LC	LC
Vulpes chama	Cape Fox	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

APPENDIX D: *Reptile species expected to occur within the project area*

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afroedura nivaria	Drankensberg Flat Gecko	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Bradypodion ventrale	Eastern Cape Dwarf Chameleon	LC	LC
Causus defilippii	Snouted Night Adder	LC	Unlisted
Causus rhombeatus	Rhombic Night Adder	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Common egg eater	LC	LC
Duberria lutrix	Common Slug-eater	LC	LC
Elapsoidea sundevallii sundevallii	Sundevall's Garter Snake	LC	Unlisted
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Hemachatus haemachatus	Rinkhals	LC	LC
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Homoroselaps dorsalis	Striped Harlequin Snake	NT	NT
Homoroselaps lacteus	Spotted Harlequin Snake	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Leptotyphlops scutifrons scutifrons	Peters' Thread Snake	LC	Unlisted
Lycodonomorphus inornatus	Olive House Snake	LC	LC
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lygodactylus capensis capensis	Common Dwarf Gecko	LC	Unlisted
Naja mossambica	Mozambique Spitting Cobra	LC	Unlisted
Nucras lalandii	Delalande's Sandveld Lizard	LC	LC
Pachydactylus affinis	Transvaal Gecko	LC	LC
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pedioplanis burchelli	Burchell's Sand Lizard	LC	LC
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Pelomedusa subrufa	Central Marsh Terrapin	LC	Unlisted
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Prosymna sundevallii	Sundevall's Shovel-snout	LC	LC

Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis crucifer	Cross-marked Grass Snake	LC	LC
Psammophis subtaeniatus	Stripe-bellied Sand Snake	LC	LC
Psammophylax rhombeatus rhombeatus	Spotted Grass Snake	LC	Unlisted
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Pseudocordylus melanotus melanotus	Common Crag Lizard	LC	LC
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis varia	Variable Skink	LC	LC

APPENDIX E: *Amphibian species expected to occur within the project area*

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Amietia angolensis	Angola River Frog	LC	LC
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Amietia fuscigula	Cape River Frog	LC	LC
Amietia fuscigula	Cape River Frog	LC	LC
Amietia poyntoni	Poynton's River Frog	LC	LC
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	NT	LC
Schismaderma carens	African Red Toad	LC	LC
Schismaderma carens	Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys poweri	Power's Toad	LC	LC
Semnodactylus wealii	Rattling Frog	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC

APPENDIX

G-2 WETLAND HABITAT IMPACT ASSESSMENT

WSP GROUP AFRICA

JET PARK DEVELOPMENT

WETLAND HABITAT IMPACT ASSESSMENT

11 DECEMBER 2018 (UPDATED 25 MARCH 2019)

CONFIDENTIAL

JET PARK DEVELOPMENT

WETLAND HABITAT IMPACT ASSESSMENT

WSP GROUP AFRICA

DRAFT
CONFIDENTIAL

PROJECT NO.: 41101076_002
DATE: DECEMBER 2018 (UPDATED 25 MARCH 2019)

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QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Draft	Updated Risk Assessment		
Date	December 2018	March 2019		
Prepared by	C Holmes	A Husted		
Signature				
Checked by	K King			
Signature				
Authorised by	K King			
Signature				
Project number	41101076			
Report number	01			
File reference	41101076_002_Jet Park Development_Wetland Assessment_20181210			

This Wetland Habitat Assessment Report has been prepared by WSP Environmental Proprietary Limited (WSP) on behalf and at the request of WSP Group Africa (Client), to provide the Client an understanding of the potential impacts the Jet Park Development may have on wetland habitat.

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 and except where otherwise indicated in the Report.

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1 INTRODUCTION

Abbeydale Building and Civils (Pty) Ltd ('Abbeydale') proposes to construct industrial warehousing and commercial offices ('proposed development') on Jet Park Extension 46 in Boksburg. The majority of the site is currently highly disturbed from previously development and commercial activities. Abbeydale propose to re-develop the property, potentially incorporating any identified freshwater habitat into the design.

WSP was commissioned by Abbeydale to undertake a Freshwater Habitat Assessment relating to the proposed development to provide information during design phase of the project and to determine legislative requirements in terms of Section 21 of the National Water Act (NWA) (36 of 1998).

2 TERMS OF REFERENCE

The objective of the Freshwater Habitat Assessment is to identify freshwater habitats (wetland and riparian systems) present on the site and within a 500 m radius of the proposed development. This is to determine whether the proposed development may infringe on the regulated area of a watercourse (i.e. the outer edge of the 1:100-year flood line or delineated riparian habitat; and/or 500 m radius from the delineated boundary of a wetland, as defined in GN 509 of 2016). Once these have been identified, an assessment is undertaken using the methodology outlined in **Chapter 7** of this report and a Risk Matrix Assessment as per the requirements of GN509 of 2016, was undertaken in order to determine the applicability of a General Authorisation (GA) or Water Use License (WUL) application for the project. The potential impacts of the proposed development on any identified watercourses were assessed and associated mitigation recommendations provided.

3 KNOWLEDGE GAPS

Key assumptions and limitations relevant to the assessment included:

- The location and associated infrastructure were determined from information provided Abbeydale
- Wetlands identified for delineation were based on a desktop review of available information and a site inspection.
- Whilst the desktop review and site investigation aimed to identify and assess all wetlands within the study area, wetlands not identified during this process did not form part of this study.
- The wetland boundary comprises a gradually changing gradient of wetland indicators and varies both temporally and spatially; the wetland delineation thus occurs within a certain degree of tolerance.
- It should be recognised that there are several confounding effects on the interpretation of the historic and current extent, and functioning of the respective systems such as the historic and current industrial practices, roads, infilling, excavations/erosion, illegal dumping, etc.
- It is assumed that a biodiversity specialist has assessed the proposed site and the mitigation measures proposed will be implemented to ensure the impacts to biodiversity, especially to species of special concern and avifauna, are limited and are of low risk.
- The wetland/riparian boundaries within the specific study area in relation to the proposed development were accurately delineated based on the initial desktop review. The remaining watercourses were delineated at a desktop level and broadly verified in the field to obtain an extent of the wetland/riparian areas.
- The findings, results, observations, conclusions and recommendations given in this report are based on WSP's best scientific and professional knowledge as well as available information.

4 STUDY AREA

4.1 LOCATION

The proposed development site is located within the Jet Park Extension 46 in Boksburg, within the City of Ekurhuleni Metropolitan Municipality of the Gauteng Province (**Figure 1**). The site is located approximately 14 km northwest of the Boksburg CBD and 21 km east of the city of Johannesburg (Latitude: -26.1650; Longitude: 28.2265).

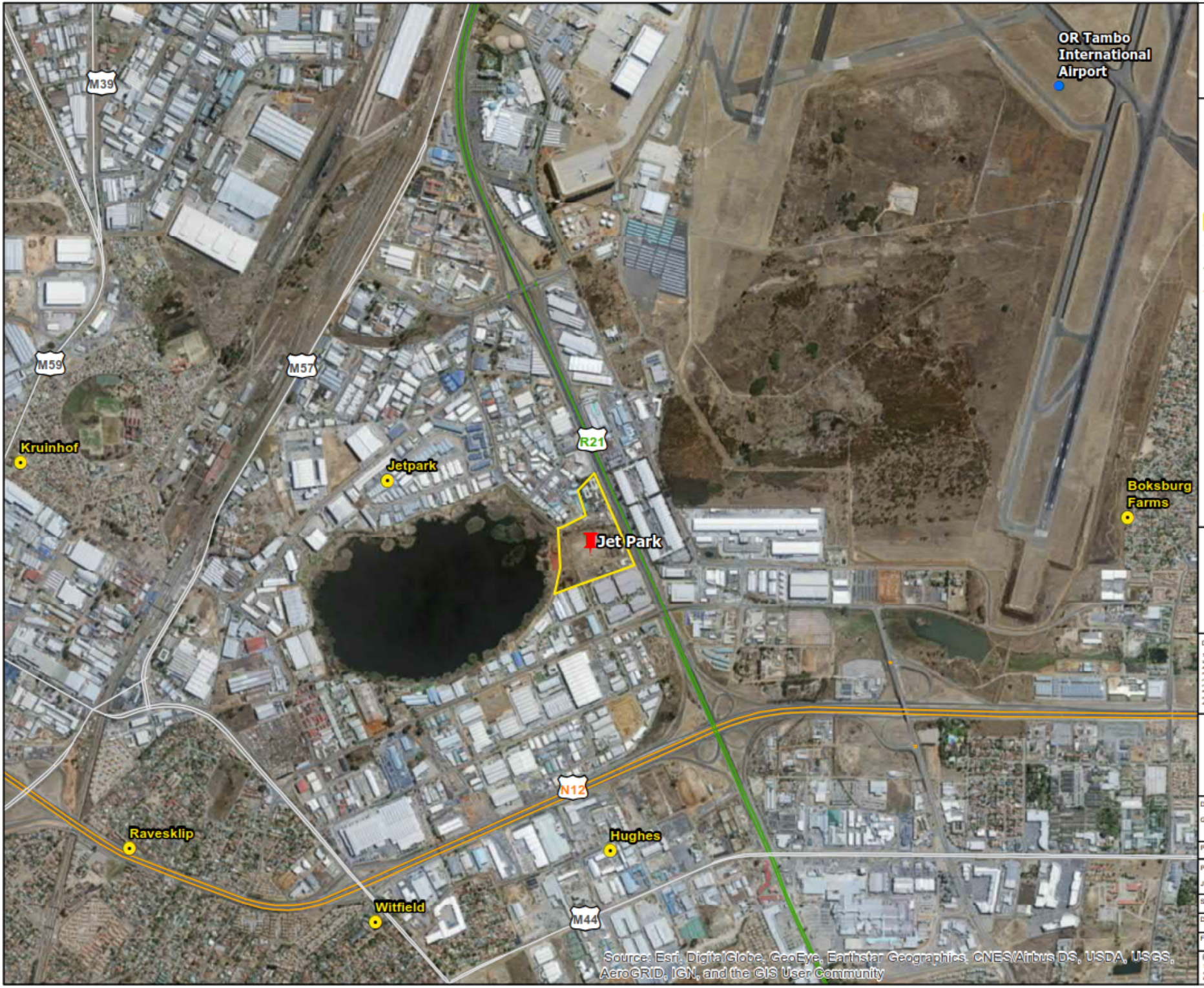
The study site is located within the Vaal Water Management Area (WMA), specifically the C21D quaternary catchment. Immediately upstream of the development site (to the west) is the Carlos Rolfes Pan, which is a formally protect area (Ekurhuleni Metropolitan Municipality, 2008). The pan drains in an easterly direction through an existing canal, which passes through the proposed development site.

4.2 ENVIRONMENTAL SETTING

The environmental setting of the proposed development site area is summarised in **Table 1**.

Table 1: Environmental Setting

Aspect	Description
Climate	Rainfall Season- October to March, where 80% of rainfall typically occurs. Mean Annual Precipitation (MAP) – 698 mm Mean Annual Evaporation (MAE) – 1 625 mm Summer months are characterised with mild temperatures of around 30°C with temperatures of above 30°C seldom recorded. Winter months experience temperatures of below 0°C, with severe frost occurring.
Land Cover	The study area falls within the Soweto Highveld Grassland (Gm8) vegetation type (Mucina & Rutherford 2006). The area is highly developed and characterised by various economic land uses, including residential and urban industrial.
Topography	The study site area is approximately 1 700 masl and lies on fairly level terrain with a slight slope toward the east.
Hydrology	To the west of the site lies a perennial depression, the Carlos Rolfes Pan. The pan has an outflow into an unformalised earthen canal in an easterly direction through the proposed development site.
Geology and Soils	The underlain geology of the study site is dominated by Quartzite. Soils within the study area consist of soils from the Avalon (Av 26), Ruston (Av16) and Soetmelk (Av36) soil series. These soils are characterised by their red/yellow colour with a sandy clay loam texture. The soils are structureless, with a plinthic horizon. The soils have favourable water-holding properties, with drainage being unfavourable in areas of high rainfall.
Hydrogeology	The study area is dominated by dolomite of the Chuniespoort Group (part of the Transvaal Sytem) and tillites of the Dwyka Group (part of the Karoo System), both of which carry water. The presence of various geological structures, such as faults, fissures, and fracture zones, as well as contact zones of intrusions such as dykes and sills, dictate the occurrence of groundwater (Ekurhuleni Metropolitan Municipality, 2008). Karst, Intergranular and Fractured Aquifers are the dominant aquifer types in the EMM. The Karst Aquifers occur in the dolomites of the Chuniespoort Group.



ABBEYDALE BUILDING AND CIVILS (PTY) LTD

LOCATION OF THE PROPOSED DEVELOPMENT

Legend

- Site Location
- OR Tambo International Airport
- Place Names
- Properties
- Metropolitan Routes
- Regional Route
- National Route

N

0 210 420 630 840

Metres

DISCLAIMER

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DATA SOURCE:
GARMIN STREETS

PROJECTION: GCS_WGS_1984

PROJECT TITLE:
JET PARK DEVELOPMENT

SCALE: 1:24,000	DRAWN BY: SINENHLANHLA RADEBE
DATE: 2019/01/24	REVIEWED BY: PFARELO SIEBANI
FIGURE NO: 1	PROJECT NO: 41101076 REV:

4.3 HYDROLOGICAL SETTING

The site is bounded by the following:

- Industrial activities to the South;
- R21 Regional Route Freeway to the East;
- Prepared area (recently demolished commercial buildings) to the North; and,
- Carlos Rolfes Pan to the West.

The R21 Freeway serves as a cut off drain to the natural flow path of stormwater within the catchment. The commercial building areas to the North of the earth lined channel currently drain into existing storm water networks as shown in **Figure 2** below. The site is very flat with a slight fall in the south easterly direction.

The run-off through the properties considered originate from two sources. The overflow of Carlos Rolfes Pan as well as a 900mm diameter concrete storm water pipe alongside Kelly Road discharge into the natural earth canal drain running through the properties. **Figure 2** provides and illustration of the current water flows through the property.

5 EXPERTISE OF THE SPECIALIST

The assessment was conducted by Colin Holmes with support from various specialists as summarised in **Table 2**. CVs can be provided on request.

Table 2: Expertise of the Specialists

Name	Qualification	Professional Registration	Experience
Colin Holmes	Environmental Scientist and Wetland Specialist (MSc)	*Pr.Sci.Nat*.	Colin is a Senior Environmental Consultant at WSP with an MSc in Applied Environmental Science and 7 years' experience. Additionally, he has completed wetland management and flood hydrology courses through the University of Free State and Pretoria respectively. Colin has managed numerous largescale projects relating to environmental authorisations, water use licence applications, wetland and riparian delineations, Present Ecological State and Ecological Importance and Sensitivity assessments, Risk Matrix Assessments. He has compiled Integrated Water and Waste Management Plans, Basic Assessments, Scoping and EIRs, including environmental management programmes, specialising in Freshwater Habitat Assessment. He is registered as a Professional Natural Scientist (*Pr.Sci.Nat*).
Andrew Husted	Wetland and Aquatic Ecologist (MSc)	*Pr Sci Nat*	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Karen King	Soil Scientist and Hydrologist (MSc)	*Pr.Sci.Nat*.	Karen is a professional hydrologist and soil scientist (Pr.Sci.Nat, M.Sc.) with WSP. She has 13 years' work experience and specialises in mining/development

			hydrology, water resources planning, catchment-scale hydrological modelling, flood studies, storm water management planning, wetland delineation, water research, agricultural studies, soil science and related risk assessments and management plans. She has been primarily involved in the engineering hydrology and soil science fields, initially as a soil science lecturer at UKZN for 3 years, and then as a hydrologist in various engineering and environmental consultancies.

ABBEYDALE BUILDING AND CIVILS (PTY) LTD

CURRENT WATER FLOWS THROUGH THE PROPERTY

Legend

- Canals - (On Site)
- Stormwater Networks
- Properties

Wetlands

- CVB
- Depression

N

0 100 200 300 400

Metres

DISCLAIMER

The information on this figure was derived from various digital databases available to WSP Environmental (Pty) Ltd. All information is provided "as is" and it must be acknowledged that data, information, and maps are dynamic and in a constant state of maintenance, correction and update. WSP Environmental (Pty) Ltd cannot accept any responsibility for errors, omissions, or positional accuracy where it has not been directly responsible for the production of the data referenced. There are no warranties, expressed or implied, as to the use of this information, including the warranty of merchantability or fitness for a particular purpose. Notification of any errors will be appreciated.

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DATA SOURCE:

GARMIN STREETS

PROJECTION: GCS_WGS_1984

PROJECT TITLE:

JET PARK DEVELOPMENT

SCALE: 1:11,057	DRAWN BY: SINENHLANHLA RADEBE
DATE: 2019/01/24	REVIEWED BY: PFARELO SIEBANI
FIGURE NO: 2	PROJECT NO: 41101076 / REV:

6 AIMS AND OBJECTIVES

The aim of this assessment is to determine the extent, health and functionality of freshwater habitats located within 500m of the proposed development activities that have a potential risk of being impacted on by the proposed development activities. The assessment was guided by the following objectives:

- Desktop delineation of all watercourses within a 500m radius of the proposed development activities utilising available site-specific data;
- A risk/impact probability screening of the identified watercourses to determine which have any risk of being impacted upon by the construction and operation of the proposed development infrastructure;
- Infield delineation and classification of the identified freshwater habitats;
- Determination of the freshwater habitats that have the potential to be impacted on by the proposed development construction and operational activities;
- Assessment of the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and functional importance (wetland only) of the delineated wetland habitats;
- Determination of appropriate buffers; and
- Compilation of the Risk Matrix Assessment as per GN509 of 2016, to determine the applicability of a GA or WULA.

7 METHODOLOGY

The methods and tools utilised to conduct the freshwater habitat assessments within the study area were determined utilising desktop and in-field assessments together with professional opinion. An in-depth description of each method is provided in the sections that follow. National and provincial datasets were utilised to supplement the information gathered on site.

7.1 WETLAND IDENTIFICATION AND MAPPING

To identify the wetland types present, using Kotze *et al.* (2009) and Ollis *et al.* (2013), a characterisation of hydrogeomorphic (HGM) types was conducted. These have been defined based on the geomorphic setting of the wetland in the landscape (e.g. hillslope or valley bottom wetlands, whether drainage is open or closed), water source (surface water dominated or sub-surface water dominated), how water flows through the wetland (diffusely or channelled) and how water exits the wetland (see **Figure 3** from Ollis *et al.* 2013).

7.2 WETLAND DELINEATION

Wetland delineation includes the confirmation of the occurrence of a wetland and the determination of the outermost edge of the wetland. The outer boundary of the wetlands present at the site were identified and delineated according to the Department of Water and Sanitation (DWS) wetland delineation manual, 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005a). The wetland indicators that are utilised in the detailed field delineation of wetlands:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Wetness Indicator identifies the morphological 'signatures' developed in the soil profile as a result of prolonged and frequent saturation(determined through soil sampling with a soil auger and examining the degree of soil mottling and gleying);

- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils; and,
- The Soil Form Indicator.

According to the wetland definition used in the NWA, vegetation is the primary indicator, which must be present under normal circumstances. However, in practice, the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role. The reason for this is that vegetation responds relatively quickly to changes in the soil moisture regime or management and may be transformed, whereas the morphological indicators in the soil are far more permanent and will hold the signs of frequent saturation long after a wetland has been drained (perhaps for several centuries).

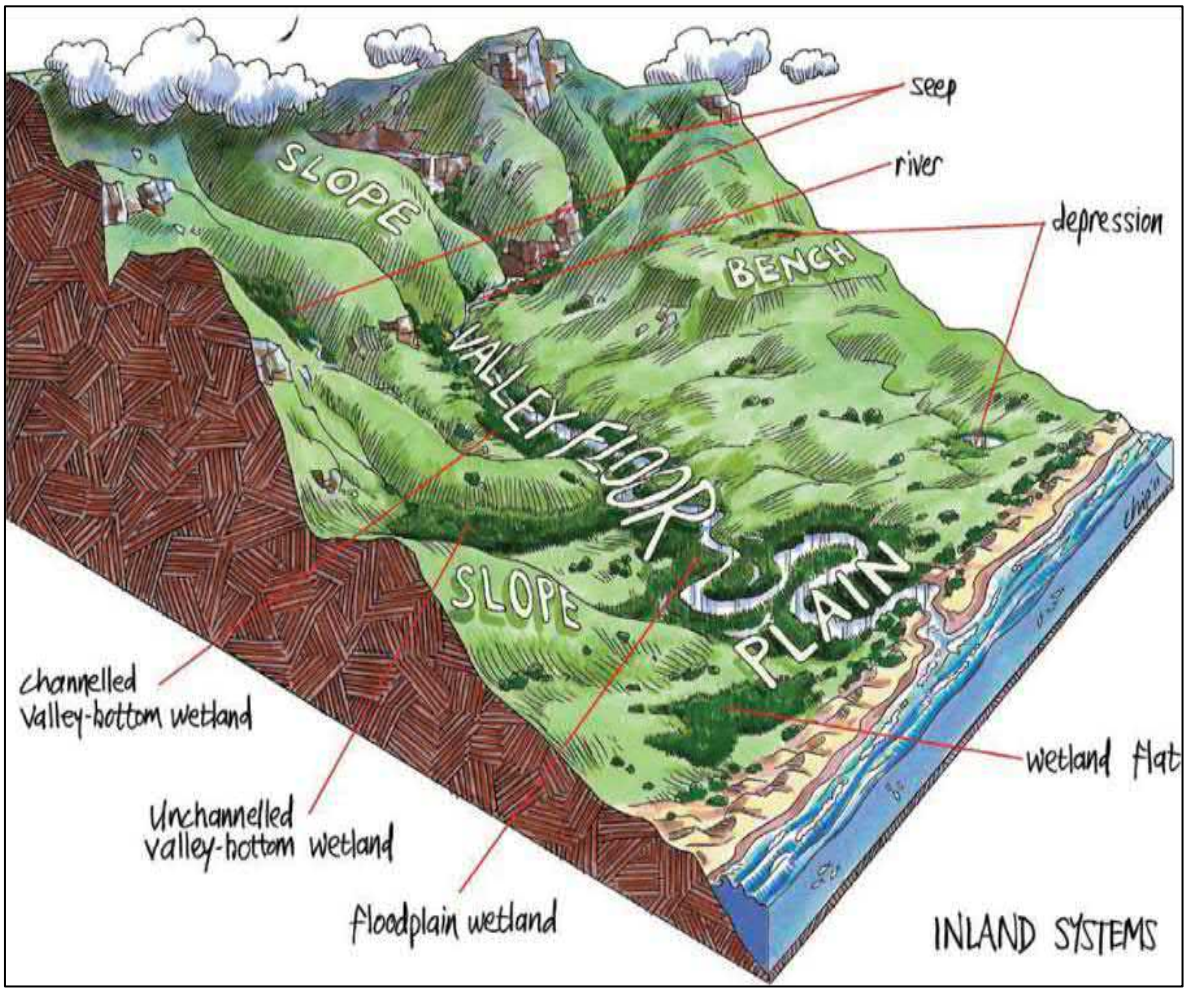

Figure 3: Illustration of wetland types and their typical landscape setting

7.3 WETLAND FUNCTIONAL ASSESSMENT

Functional assessments were developed principally for evaluating the potential impacts of developments which threaten wetland ecosystems, and are used to assess the success of wetland rehabilitation projects, by evaluating the change in wetland functioning over time (DWAF, 2004).

These protocols are usually designed to estimate the change in functioning resulting from the alteration of a wetland (either positive or negative). Minimally-impacted wetlands (within each wetland class) are used as a reference or benchmark. Each function is scored relative to that of reference wetlands in the same locality and

class/type and subclass/subtype. The index value of each variable is accompanied by descriptions of estimates and measurements.

WET-Health (described below) is designed for the rapid assessment of the integrity of wetlands. It focuses on the question of how far a system has deviated from its historical, undisturbed reference condition, and does not assess ecosystem services. WET-EcoServices (Kotze *et al*., 2007), is designed for the rapid assessment of the delivery of ecosystem services by a wetland in its current state. It does not assess how far this state is from the reference condition (i.e., its integrity).

The WET-EcoServices tool (Kotze *et al*., 2005) allows measurement of ecosystem goods and services (eco-services) provided by a wetland system. Eco-services refer to the benefits obtained from ecosystems. These benefits may be derived from outputs that can be consumed directly, indirectly (which arise from functions or attributes occurring within the ecosystem), or possible future direct or indirect uses (Howe *et al.*, 1991).

The WET-EcoServices tool provides structured guidelines that allow the importance of the wetland to be scored according to its ability to deliver various ecosystem services, shown in **Table 3**.

Table 3: Ecosystem Services

Direct Benefits	Indirect Benefits
Cultural benefits — Cultural heritage — Tourism and recreation — Education and research	**Regulating and supporting benefits** — Flood attenuation — Streamflow regulation — Carbon storage
Provisioning benefits — Provision of cultivated foods — Provision of harvestable resources — Provision of water for human use — Biodiversity maintenance	**Water quality enhancement benefits** — Sediment trapping — Phosphate assimilation — Nitrate assimilation — Toxicant assimilation — Erosion control

7.4 DETERMINING THE PRESENT ECOLOGICAL STATE (INTEGRITY) OF THE WETLANDS

WET-Health is a tool designed to assess the health (present state) or integrity of a wetland. Wetland health is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition (Macfarlane *et al*. 2009). This tool is utilised to assess hydrological, geomorphological and vegetation health in three separate modules.

Hydrology is defined in this context as the distribution and movement of water through a wetland and its soils. This module focuses on changes in water inputs as a result of changes in catchment activities and characteristics that affect water supply and its timing, as well as on modifications within the wetland that alter the water distribution and retention patterns within the wetland.

Geomorphology is defined in this context as the distribution and retention patterns of sediment within the wetland. This module focuses on evaluating current geomorphic health through the presence of indicators of excessive sediment inputs and/or losses for clastic (minerogenic) and organic sediment (peat).

Vegetation is defined in this context as the vegetation structural and compositional state. This module evaluates changes in vegetation composition and structure as a consequence of current and historic onsite transformation and/or disturbance.

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present State score. The tool attempts to standardise the way that impacts

are calculated and presented across each of the modules. This takes the form of assessing the spatial extent of impact of individual activities and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact.

An overall wetland health score is calculated by weighting the scores obtained for each module and combining them to give an overall combined score using the following formula:

Overall health rating = [(Hydrology*3) + (Geomorphology*2) + (Vegetation*2)] / 7

This overall score assists in providing an overall indication of wetland health/functionality which can in turn be used for recommending appropriate management measures.

Impact scores obtained for each of the modules reflect the degree of change from natural reference conditions. Resultant health scores fall into one of six health categories (A-F) on a gradient from "unmodified/natural" (Category A) to "severe/complete deviation from natural" (Category F) as depicted in **Table 4**.

Table 4: Health categories used by WET-Health for describing the integrity of wetlands

Impact Category	Description	Range	PES Category
None	Unmodified, natural.	0 – 0.9	A
Small	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1 – 1.9	B
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2 – 3.9	C
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4 – 5.9	D
Serious	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6 – 7.9	E
Critical	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 – 10	F

7.5 DETERMINING THE ECOLOGICAL IMPORTANCE AND SENSITIVITY OF WETLANDS

The Ecological Importance and Sensitivity of the wetlands present was determined by utilising a rapid scoring system. The system has been developed to provide a scoring approach for assessing the Ecological and Hydrological Functions, and the Direct Human Benefits of importance and sensitivity of wetlands. These scoring assessments for these three aspects of wetland importance and sensitivity have been based on the requirements of the NWA, the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999), and the work conducted by Kotze *et al.* (2008) on the assessment of wetland ecological goods and services from the WET-EcoServices tool (Rountree, 2010).

The aspects which are assessed in terms of their importance/sensitivity are indicated in **Table 5**. A rating of 0 (low sensitivity / low importance) to 4 (very high) is allocated to each aspect. An overall score is based on the highest score out of the three categories.

Table 5: Elements assessed to determine the Ecological Importance and sensitivity

Ecological/Biological Importance	Hydrological/Functional Importance	Importance of Direct Human Benefits
Biodiversity support — Presence of Red Data species — Populations of unique species — Migration/breeding/feeding sites **Landscape scale** — Protection status of the wetland — Protection status of the vegetation type — Regional context of the ecological integrity — Size and rarity of the wetland type/s present — Diversity of habitat types **Sensitivity of the wetland** — Sensitivity to changes in floods — Sensitivity to changes in low flows/dry season — Sensitivity to changes in water quality	**Regulating and supporting benefits** — Flood attenuation — Streamflow regulation **Water Quality Enhancement** — Sediment trapping — Phosphate assimilation — Nitrate assimilation — Toxicant assimilation — Erosion control **Carbon Storage**	**Subsistence benefits** — Water for human use — Harvestable resources — Cultivated foods **Cultural benefits** — Cultural heritage — Tourism and recreation — Education and research
OVERALL IMPORTANCE ***(highest out of the three categories)***		

7.6 ECOLOGICAL CLASSIFICATION AND DESCRIPTION

EcoClassification - the term used for the Ecological Classification process - refers to the determination and categorisation of the Present Ecological State (PES; health or integrity) of various biophysical attributes of watercourses relative to or close to the natural reference condition. The purpose of the EcoClassification process is to gain insights and understanding into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition. This provides the information needed to derive desirable and attainable future ecological objectives for the watercourse.

The procedure of EcoClassification describes the health of a water resource and derives and formulates management targets / objectives / specifications for the resource. This provides the context for monitoring the water resource within an adaptive environmental management framework.

8 RESULTS

8.1 WETLAND DELINEATION

An in-depth desktop assessment, utilising aerial imagery (1952 – 2017) and available datasets, was conducted to determine potential freshwater habitats. The in-field assessment was conducted on the 12th September 2018 to delineate and assess the desktop-identified systems, in addition to other systems identified during the assessment.

A total of three wetland systems were identified during the infield assessment that was undertaken.

8.2 WETLAND UNIT IDENTIFICATION

The identified systems were classified into respective HGM units (**Figure 4; Table 6**).

The study area has a low drainage density with surface water drainage being relatively poorly defined due to the flat terrain. The identified systems are located within these relatively poorly-defined low lying areas which leads to a defined channel further downstream where the channel has been formalised through canalisation. The systems currently form part of the regional stormwater management.

An impact probability assessment[1] determined that, of the above-mentioned systems, the Depression and Channelled Valley-bottom (CVB) systems required further investigation in terms of Section 21(c) and (i) of NWA as the proposed development may potentially impact on the habitat, biota, water quality and/or flow regime (i.e. characteristics) of these systems (**Table 6**).

Table 6: Initial Risk Assessment (Watercourses within 500m of Proposed Development)

HGM Unit	Description	Water Use	Justification
Depression	This system was historically a non-perennial/seasonal exorheic depression with channelled (current) outflow. Historically water within this system would have exited the system via diffuse flow into the unchannelled valley-bottom (UVB) on a seasonal basis (see below).	**Yes**	There is no proposed construction activities within the extent of this system. However, due to the proximity of proposed construction activities to the system there is a potential for the resource characteristics to be impacted upon and therefore the system was assessed further.
Channelled Valley-bottom (CVB)	This system previously functioned as an UVB as evident in the historical imagery. Excavations and infilling within this system started to occur in the early 1950's resulting in the transformation of the system to function more as a CVB than a UVB. The system is currently significant canalised carrying concentrated flow within a well-defined channel and distinct channel banks.	**Yes**	The CVB runs through the proposed development. Due to the proximity of proposed construction activities to the system there is a potential for the resource characteristics to be impacted upon and therefore the system was assessed further.

1 The impact/risk probability rating is a rapid risk screening exercise to determine where a watercourse would potentially be impacted upon by the proposed development, i.e. could it constitute a water use or not. It is not a risk matrix assessment and therefore the rating is not a calculated representative of the severity and likelihood that a watercourse may be impacted.

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IDENTIFIED WETLAND UNITS WITHIN THE STUDY AREA

Legend

15m Buffer

Wetlands

CVB

Depression

N

0 100 200 300 400

Metres

DISCLAIMER

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DATA SOURCE:

GARMIN STREETS

PROJECTION: GCS_WGS_1984

PROJECT TITLE:

JET PARK DEVELOPMENT

SCALE: 1:12,000	DRAWN BY: SINENHLANHLA RADEBE
DATE: 2019/01/24	REVIEWED BY: PFARELO SIEBANI
FIGURE NO: 4	PROJECT NO: 41101076
REV:	

8.3 WETLAND UNIT SETTING

The setting of the identified wetland units were classified as per **Table 7** below.

Table 7: Wetland Unit Setting

Unit	Regional Setting (Level 2)	Landscape Setting (Level 3)	HGM Unit (Level 4)
Depression	Mesic Highveld Grassland Group 3	Valley Floor	Depression (Exorheic)
CVB			Channelled valley-bottom wetland

8.4 WETLAND SOILS

The soil colours and wetness throughout the site were assessed (determined through augured soil sampling and examining the degree of mottling, if present). An example of the soils seen on site is presented in **Table 8**.

Table 8: Soils Identified within the Site Area

Setting	General Indicators	Example	HVC
Terrestrial	— No grey background matrix — No mottles — No prolonged periods of wetness		7.5YR 5/3
Temporary / Seasonal (CVB)	— Grey background matrix (<10%) — Few high chroma mottles / Many low chroma mottles — Prolonged periods of saturation		Gley 2 4/5B
Permanent (CVB)	— Prominent grey background matrix — Few to no high chroma mottles — Wetness all year round		Gley 2 8/5PB

8.5 DESCRIPTION OF WETLAND TYPE

DEPRESSION

A depression is a wetland or aquatic ecosystem with closed (or near-closed) elevation contours, which increases in depth from the perimeter to a central area of greatest depth and within which water typically accumulates. Depressions may be flat-bottomed (in which case they are often referred to as pans) or round-bottomed and may have any combination of inlets and outlets or lack these completely.

Most depressions occur either where the water table intercepts the land surface, or in semi-arid settings where a lack of sufficient water inputs prevents areas where water accumulates from forming a connection with the open drainage network. The dominant water inputs and outputs of a depression are dictated primarily by the outflow and inflow drainage characteristics. The hydrodynamics of a depression are, however, typically dominated by vertical water level fluctuations. Many depressions do not have any outward (downstream) drainage or any inflow channels. These types of aquatic ecosystems are not connected to a river network and are sometimes referred to as 'isolated depressions'. However the depression wetland unit identified on site is characterised by its exorheic character (outward downstream drainage) and is circular to oval in shape.

CHANNELLED VALLEY-BOTTOM

Channelled valley-bottom wetlands are characterised by their location on valley floors, the absence of characteristic floodplain features and the presence of a river channel flowing through the wetland (Ollis *et al* 2013).

Dominant water inputs to these wetlands are from the river channel flowing through the wetland, either as surface flow resulting from flooding or as sub surface flow, and/or from adjacent valley-side slopes (as overland flow or interflow). Water generally moves through the wetland as diffuse surface flow, although occasional, short-lived concentrated flows are possible during flooding events. Water generally exits a channelled valley-bottom wetland in the form of diffuse surface or subsurface flow into the adjacent river, with infiltration into the ground and evapotranspiration of water from these wetlands also being potentially significant (Ollis *et al* 2013).

8.6 GENERAL FUNCTIONAL DESCRIPTION OF WETLAND TYPES

DEPRESSION

The typical functionality of depression wetlands tends to contribute less towards flood attenuation, but would supply this benefit to a certain extent and would be limited by the position of the system in the landscape. They naturally capture runoff during stormflow conditions due to their inward-draining characteristics, and therefore to some extent aid in reducing the volume of surface water that would otherwise enter the natural systems in the area unattenuated. However, this inward draining also means these systems don't typically provide a streamflow regulation function. The potential for removal of nutrients and toxicants would generally be expected to some degree.

Nitrogen cycling is likely to be important with some losses due to de-nitrification and volatilization in the case of high pH values. Water quality in pans is influenced by the pedology, geology, and local climate. These factors, in turn, also influence the response of these systems to nutrient inputs. In pans that dry out completely at some stage or another (non-perennial pans), some of the accumulated salts and nutrients (such as organic nitrogen and various phosphate and sulphate salts) can be transported out of the system by wind and be deposited on the surrounding slopes. Those remaining may dissolve again when water enters the system again as the pan fills after rainfall events (Kotze *et al.* 2009).

CHANNELLED VALLEY-BOTTOM

The typical functionality of channelled valley-bottom wetlands tend to contribute less towards flood attenuation and sediment trapping compared to that of typical floodplain wetland types, but would supply these benefits to a

certain extent. The potential for removal of nutrients and toxicants would generally be expected to some degree, particularly from diffuse water inputs from adjacent hillslopes (Kotze *et al.* 2009).

The erosion of a channel through the wetland, indicates that sediment trapping is not always an important function of this wetland type. Under low and medium flows, transport of sediment through, and out, of the system are more likely to be the dominant processes. Erosion is vertical and reflect the attempts of a system to reach equilibrium with the imposed hydrology. As flows become more channel bound through vertical incision and lateral erosion of the channel, the ability of the wetlands to trap sediments decreases.

8.7 THE PES ASSESSMENT OF THE WETLANDS

The assessment of the condition or PES (Present Ecological State) of the HGM's is based on an understanding of both catchment and on-site impacts and the impact that these aspects have on system hydrology, geomorphology and the structure and composition of wetland vegetation. WET-Health (Macfarlane et al. 2007) works by comparing a wetland in its current state with baseline/reference conditions for the site.

All the wetland units within the study area are considered to be largely and seriously modified due to historic excavations and infilling. The hardening of the surfaces within the catchment of the systems has resulted in increased flood peaks and water inputs into the systems.

The excavations with the valley-bottom system has resulted in the system no longer functioning as an unchannelled system (natural state) but rather as a channelled system. The system is still functioning and providing goods and services within the natural environment.

The PES of each of the systems are provided in **Table 9**.

8.8 WETLAND ECOLOGICAL FUNCTIONAL ASSESSMENT

The overall goods and services provided by the Depression was assessed as being mostly very low and moderate as the system has been significantly impacted upon by anthropogenic activities (**Table 10**). The noteworthy regulating service was carbon storage and erosion control; the only functions rated as moderately-high, even though this type of wetland unit does not typically provide this service. This is attributed to factors such as no significant evidence of erosion and the low level of current soil disturbance within the Depression.

The CVB was assessed as being mostly very low and moderately-low as the system has been significantly impacted upon by anthropogenic activities, as with the Depression system (**Table 10**). The only regulating services rated as moderate was flood attenuation, streamflow regulation and erosion control. This is attributed to factors such as no significant evidence of erosion, the low level of current soil disturbance within the system and changes in runoff intensity due to changes in catchment land-uses.

8.9 ECOLOGICAL IMPORTANCE AND SENSITIVITY

The Depression was assessed as having an overall Moderate EIS (**Table 11**) driven by the ecological/ biological importance, i.e. the protection status of the systems, red data species habitat, breeding/migration sites, the current ecological states and the size/rarity of the systems.

The CVB system was assessed as having an overall Moderately-Low importance (**Table 11**) driven by the hydrological functional importance (i.e. flood attenuation, streamflow regulation and erosion control). The ecological importance and sensitivity (biodiversity) is Moderately-Low with the direct benefits to society being considered very low. This is due to the current state of the system, associated lack of reference habitat representation, the lack of important biodiversity features, no presence of red data or unique species and the unit not being considered important in any conservation plans.

Neither of the systems are not classified as 'Wetland FEPA' (CSIR, 2011) and is thus not considered important in meeting national wetland conservation targets. The systems has low direct benefits to society mainly due to the lack of harvestable resources and the lack of direct water use.

Table 9: PES Assessment of the Identified Systems

Unit	Hydrology	Geomorphology	Vegetation	Overall	Justification (Impact Description)
Depression	6.0 E: Seriously Modified	4.4 D: Largely Modified	7.4 E: Seriously Modified	**5.92** **D: Largely Modified**	The system is affected by increased water inputs from concentrated stormwater within the systems catchment. Flood peaks have increased due to hardened surfaces within the catchment resulting in reduced infiltration. The increased surface water input has resulted in the perenniality of the system being altered from historically non-perennial to currently, perennial. The change in perenniality has resulted in continual inundation with subsequent changes of the natural vegetation community composition in terms of species and cover density. Currently there is the presence of the indigenous *Cyperus papyrus*. There is a moderate level of alien plant species infestation in the system consisting of species such as *Solanum mauritianum, Ricinus communis* and *Chromolaena odorata*. The hydrological, geomorphological and vegetation integrity of the system is assessed to remain constant over the next 5 years.
CVB	7.0 E: Seriously Modified	5.6 D: Largely Modified	6.6 E: Seriously Modified	**6.46** **E: Seriously Modified**	The system is affected by increased water inputs from concentrated stormwater within the systems catchment. Flood peaks have increased due to hardened surfaces within the catchment resulting in reduced infiltration. The formalised roads in the catchment contain stormwater infrastructure, concentrating flows leaving the road surfaces enter the system through a point source, without any energy dissipating structures. Therefore resulting in erosion to the banks and beds of the system, lowering the base flow levels. The infilling from material dumped into the system to create building platforms has significantly modified the geomorphological characteristics of the system. There is low species richness due to the transformed nature of the vegetative cover and high levels of alien species infestation resulting in the system being transformed significantly from its reference state. The high level of anthropogenic activities within and around the system have resulted in the removal of vegetation through infilling, erosion, concentrated stormwater input and incorrect burning regime within the system. The hydrological, geomorphological and vegetation integrity of the system is assessed to remain constant over the next 5 years.

Table 10: EcoServices of the Assessed Units

Ecosystem Goods & Services	Overall Score (out of 4)	
	Depression	CVB
Flood attenuation	2.3	**1.8**
Streamflow regulation	1.7	1.7
Sediment trapping	1.2	1.2
Phosphate trapping	1.3	1.3
Nitrate removal	1.4	1.1
Toxicant removal	1.4	1.4
Erosion control	**2.6**	**1.9**
Carbon storage	**2.7**	1.7
Maintenance of biodiversity	1.8	1.2
Water supply for human use	1.1	0.9
Natural resources	0.0	0.0
Cultivated foods	0.0	0.0
Cultural significance	0.0	0.0
Tourism and recreation	1.6	0.1
Education and research	0.8	0.5

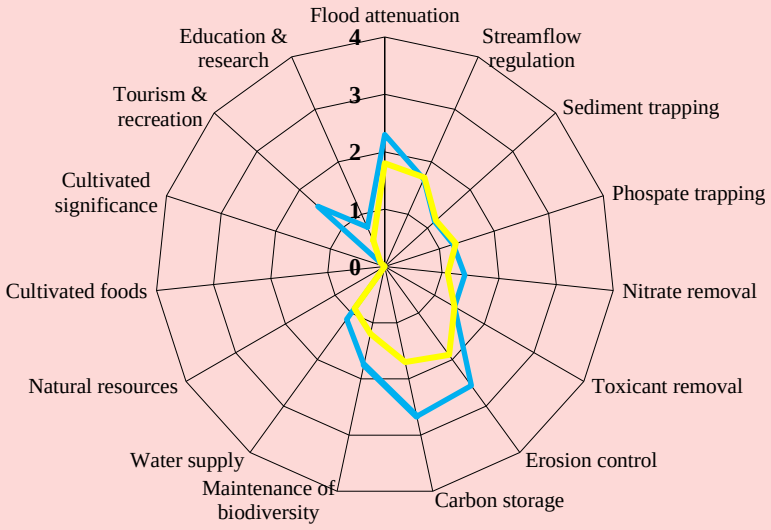

Table 11: The EIS Assessment for the Wetland Units

Unit	Ecological/ Biological Importance	Functional/ Hydrological Importance	Direct Benefits to Society	Overall Importance (/4)	
Depression	**2.30**	1.83	0.58	**2.30**	**Moderate**
CVB	1.50	**1.51**	0.25	**1.51**	**Moderately - Low**

8.10 RECOMMENDED ECOLOGICAL CATEGORY (REC)

The Recommended Ecological Category (REC) (i.e. management objectives) is a recommendation from an ecological viewpoint which is considered within the decision-making process in the National Water Resource Classification System (NWRCS). This recommendation is based on either maintenance of the PES or an improvement thereof. According to the DWS (2007), the PES and EIS of water resources must drive management objectives when there is no water resource classification available. Therefore, for water resources that do not have a REC allocated for the system, information contained in **Table 7** may be utilised, indicating that the management objective for both the systems is to '**Maintain**' the present state.

Table 12: Management Objectives for the Assessed Water Resources (DWAF 2007).

PES	Ecological Importance and Sensitivity (EIS)			
	Very High	High	Moderate	Low
A	Maintain	Maintain	Maintain	Maintain
B	Improve	Improve	Maintain	Maintain
C	Improve	Improve	Maintain	Maintain
D	Improve	Improve	**Maintain**	Maintain
E/F	Improve	Improve	**Maintain**	Maintain

9 IMPACT ASSESSMENT DISCUSSIONS

9.1 IMPACTS

The proposed development may potentially impact the identified systems, however the area where the proposed activities are proposed to occur has already been significantly modified by the current and past land use activities. The majority of the potential impacts will occur during the construction phase. The long-term impacts that are likely to occur relate to the onsite stormwater management during the operational phase of the proposed development.

There is no foreseen direct loss of wetland habitat or biota relating to the construction and operational activities; this is based on the assumption that the determined buffer will be demarcated as a 'No-Go' area and adhered to.

The significant hardening of surfaces associated with the development footprint would decrease infiltration, alter flow patterns and increase concentration runoff towards the systems, mostly the CVB system. This would increase peak flows and the potential for erosion (i.e. increase in flow velocity) and potential lowering of the base flow levels. Effective stormwater management would allow for the release of the surface water runoff in a controlled manner, with minimal impact on the systems. Additional options such as a stepdown weir system will mitigate the proposed hardened surfaces by allowing for flow attenuation, sediment settling and growth of hydrophytes.

The quality of the surface water runoff from the proposed development may result in the degradation of water quality entering the systems and downstream of the site. Again an effective stormwater management plan for the proposed development, including structures such as grease traps, would mitigate against this impact.

9.2 MITIGATIVE MEASURES

The mitigation of negative impacts on biodiversity and ecosystem goods and services is a legal requirement for authorisation purposes. It requires proactive planning that is enabled through a mitigation hierarchy, which strive to first avoid disturbance of ecosystems and loss of biodiversity, then, to minimise, rehabilitate and finally offset any remaining significant residual negative impacts on biodiversity (Department of Environmental Affairs, 2013).

There are generic best practice mitigation measures that are required to be implemented with every potential development to ensure the application of the most appropriate combination of environmental control measures and strategies, to protect water resources and the surrounding environment. These measures are generally defined within a project-specific Environmental Management Programme (EMPr), however, in the absence of an EMPr, the best practice specifications within the DWS 'Integrated Environmental Management Series – Environmental Best Practice Specifications': 'Construction' (DWAF 2005b) & 'Operation' (DWAF 2005c) guidelines should be implemented, along with the project-specific mitigation measures outlined below.

BUFFER DETERMINATION

The Buffer Zone Guidelines for Rivers, Wetlands and Estuaries (buffer tool) was utilised to determine the buffer zone requirements for the aquatic systems located within the study site that may potentially be impacted upon by the proposed development. The objective of the buffer zone is to identify the exclusion area and thereby limit/prevent any further degradation of the existing system. A buffer can potentially reduce the impacts to aquatic resources and, in so doing, protect the range of goods and services that these resources provide to society (MacFarlane et al. 2014).

The DWS and Water Research Commission-developed buffer tool was utilised to determine the appropriate width of the buffer for the CVB system as it is the main system within the study area and is in close proximity to the proposed construction site. The tool determined that the minimum of a 15 metre buffer from the delineated edge of the system be maintained, during both the construction and operation phases. This buffer is required to be extended around the portion of the Depression due to the proximity of the proposed site to these systems.

To further define the area of exclusion, a flood risk assessment was undertaken to calculate the 1:100-year floodline (**Appendix A**), which includes mitigation measures, which must be implemented. The extent of the exclusion area, which factors in both the buffer tool and 1:100-year floodline (at operational phase), is depicted in **Figure 5.**

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EXCLUSION (BUFFER) AREA

Legend

- Site Location
- 15m Buffer

N

0 100 200 300 400

Metres

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PROJECT TITLE:

JET PARK DEVELOPMENT

SCALE: 1:12,000	DRAWN BY: SINENHLANHLA RADEBE
DATE: 2019/01/24	REVIEWED BY: PFARELO SIEBANI
FIGURE NO: 5	PROJECT NO: 41101076 / REV:

9.3 RISK MATRIX ASSESSMENT

The Integrated Water Resource Management (IWRM) approach is an internationally-accepted approach to sustainable Water Resource Management. It recognises the inter-relatedness and relationship between watercourse-level processes and components (resource quality characteristics). An activity associated with the proposed development can impact any of the resource ecosystem drivers (flow regime, water quality, geomorphological) or responses (habitat, biota) and this will have a knock-on effect on potentially all the other drivers and/or responses. Therefore, in general, any activity that has the ***potential to pose a risk*** to the resource quality characteristics constitutes a water use in terms of Section 21(c) and (i).

The impacts are determined by looking at the impact the proposed development may have on the habitat, biota, water quality and/or flow regime of a watercourse. These are broad categories that encapsulate the impacts that could potentially affect the functioning of a watercourse. The majority of the activities will affect more than one characteristic due to their complex interrelatedness and therefore the impact each specific activity may have is rated independently for each characteristic.

The risk-based management approach developed by the DWS is required to be undertaken to determine whether the proposed development would require a WULA or if it would fall within the ambit of the General Authorisation for Section 21(c) and (i) water uses.

The approach was utilised to assess potential impacts of the proposed development on associated freshwater habitats. The mitigation measures are considered during scoring - scores are thus based on residual impacts after mitigation. If any of the impacts receive a Moderate score (56 – 80) then additional control measures may be implemented to potentially decrease the score to Low.

Considering the aforementioned construction mitigation measures, a risk matrix assessment was conducted, a summary of which is provided in **Table 17,** with the full Risk Matrix available in **Appendix B**. All risk ratings associated with the assessment were low. However, it must be noted that standard and accepted management and operational processes will be implemented.

Table 17: Summary of DWS Risk Matrix Assessment

Activity		Aspect	Impact	Consequence	Likelihood	Risk Score	Risk Rating	Control Measures
Depression & CVB: **Proposed commercial mixed use development and associated infrastructure**	Construction	– Clearing of vegetation and excavations, infilling associated with the construction activities within the catchment.	– Increase runoff sediment input that may potentially enter the systems	4.75	10	47.5	**L**	– Implementation of the recommended buffer zone for the systems. – The site should contoured to allow for surface water to readily drain away and to prevent ponding of water. – An appropriate operational stormwater management plan must be developed. – The stormwater management system for the proposed development must be designed to ensure that runoff regimes post-construction activities matches that regimes pre-construction (i.e. without resulting in increased peak discharge to water resources, soil saturation in non-wetland areas and erosion/ sedimentation). – The use of sediment curtains. – Intrusion into the buffer must be limited and minimised to ensure the construction footprint and time is minimised as far as possible. – The use of open, grass-lined channels/swales and stone-filled infiltration ditches is recommended for consideration rather than closed culvert type piped systems or impermeable concrete V-drains within the development footprint. – The use of multiple smaller outlets must be considered over one/few larger stormwater outlets. This will result in diffuse surface flow and minimise flow concentration and erosion. As far as possible, all stormwater detention and attenuation and outlet structures must be located outside of systems and their respective buffer/exclusion zones with some allowance for outlet protection e.g. reno-mattresses or rock packs). – All outlets must be designed to dissipate the energy of outgoing flows to levels that present a low erosion risk. – All stormwater generated by the medium to high risk contamination 'dirty' areas (parking areas, commercial/retail area, etc.) must receive basic filtering and treatment prior to discharge into the surrounding environment. Ideally all treatment should occur within the development footprint. Such measures include oil-water separators (grease traps) and/or sand filter traps that will require regular maintenance during operation. – (Operational) Limit disturbance to identified systems and surrounding environment (buffers). Implementation of an operational management plan. – The CVB system should undergo rehabilitation to improve the functionality and current state of the system. This will also provide an opportunity for aesthetic and recreational improvements for the occupancies of the proposed development. – Therefore there is a need for the development and implementation of a wetland rehabilitation and management plan. The plan should be completed prior to construction commencing.
		– Stormwater management	– Alterations of flow patterns	5.25	10	52.5	**L**	
	Operational	– Stormwater management	– Scouring/erosion due to increased volumes and patterns of flow	4.5	9	40.5		
		– Stormwater management	– Alterations of flow patterns/volumes – Scouring/erosion due to increased volumes and patterns of flow (increased floodpeaks)	5.25	9	47.25	**L**	
		– Run-off from dirty areas (e.g. parking lots)	– Contamination (e.g. hydrocarbons) entering the artificial system	5	11	55	**L**	

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 RECOMMENDATIONS

The following are additional recommendations, which should be considered during the design and construction phases to further limit the potential impact to any water resource:

- A site layout plan must be compiled indicating the limits of disturbance associated with the proposed development in relation to the identified sensitive areas (i.e. wetland and floodlines). No-Go areas and any stormwater infrastructure must be indicated on this plan along with environmental management plans, particularly erosion and sediment, controls and measures.
- An alien invasive management plan must be compiled and implemented to prevent further encroachment of alien plant species into the disturbed areas caused by construction activities.
- Dust suppression measures (e.g. water cart) should ideally be implemented during construction to prevent sediment particles being deposited within the identified systems. This is dependent of water supply levels within the area as and when construction commences.
- A Work Method Statement must be compiled by the client and/or responsible contractor. And should include aspects such as:
    - Proposed construction works;
    - Materials and equipment to be utilised;
    - Procedures for transporting materials to/from site (entry/exit points and turning areas would be indicated on the site plan);
    - Method and location of storage of material (this would be required to be indicated on a site plan);
    - Procedures for containment of leaks/spills as well as associated Emergency Response Plan/Spill Contingency Plan;
    - Establishment and management of construction camps including location and extent (this would be indicated on a site plan);
    - Management of stormwater;
    - Recommendations outlined within this freshwater habitat assessment report;
    - Sensitive area demarcation (this would be indicated on the site plan in agreement with the wetland specialist);
    - Management of construction materials (movement, storage, preparation/handling);
    - Waste management;
    - Erosion control/s;
    - Equipment maintenance; and,
    - Roles and responsibilities of key personnel (e.g. project manager, contractor/site manager, ECO).
- An operational monitoring programme should be put in place to monitor any long-term changes in integrity and functionality of the identified systems. Any changes to their state should be reported and mitigated. The major aspects requiring monitoring include: alien plant invasion, erosion and altered hydrology or geomorphology.

10.2 REHABILITATION GUIDELINES

Rehabilitation requires that there is an attempt to imitate natural processes and reinstate natural ecological driving forces in such a way that it aids the recovery (or maintenance) of dynamic systems so that, although they are unlikely to be identical to their natural counterparts, they will be comparable in critical ways so as to function similarly (Jordan et al. 1987).

Rehabilitation should be based on an understanding of both the ecological starting point and on a defined goal endpoint, and should accept that it is not possible to predict exactly how the wetland is likely to respond to the rehabilitation interventions.

The most typical rehabilitation interventions designed to assist in the recovery of degraded wetland ecosystems are 'plugs' constructed within artificial drainage channels. The 'plugs' are placed with the intention of reinstating a more natural hydrology. Typical interventions for maintaining the health of wetland ecosystems that are in the process of degrading are the placement of erosion control structures which assist in halting the advancement through a wetland of an erosion headcut.

However, rehabilitation is not confined to physical structures, and rehabilitation may include interventions such as removal of alien vegetation or reducing the frequency of burning.

It is the contractor's responsibility to appoint a suitably experienced specialist who has sound knowledge of the receiving environment, to implement an approved Rehabilitation Plan. The plan shall include, but not be limited to:

- Detailed rehabilitation methodology;
- Details for potential structures proposed within existing systems to assist with the prevention of further erosion and improve flooding of wetland systems;
- Methods for the removal and control of alien invasive plant species within the wetland and riparian areas;
- Assessment of current vegetation species within the study site;
- Proposed plant species to be utilised for rehabilitating in the wetland and/or riparian areas; and,
- Monitoring requirements to assess how successful the rehabilitation techniques are within the systems.

10.3 CONCLUSIONS

The freshwater habitat assessment determined that the proposed development may have the potential to impact on the identified Depression and Channelled Valley-bottom systems. It is therefore the specialist's opinion that the proposed development is required to undergo a water use licence application in terms of Section 21(c) and (i) of the NWA due to the potential impacts posed. It must be noted that the proposed development activities are not anticipated to contribute to the direct loss of wetland habitat or biota, relating to the construction and operational phases. This is, however, dependant on the final construction plans and protocols. Additionally any rehabilitation of wetlands falls within the ambit of General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009 and not GN509.

The potential impacts to the identified systems would be from incorrect construction methods, prohibited intrusion into a system and stormwater management during both construction and operational phases. If the stipulated mitigation measures are correctly implemented, including adhering to the DWS Environmental Best Practice Guidelines, developing and implementing a site-specific EMPr, development of a rehabilitation plan and compiling a Work Method Statement, then all of the impacts are deemed to be of low significance.

The DWS will have to be engaged to get official comment on the proposed development in terms of the need for a General Authorisation in terms of Section 21 of NWA.

BIBLIOGRAPHY

- Bromilow, C. 2001. Problem Plants of South Africa: A Guide to the Identification and Control of more than 300 invasive plants and other weeds. Briza Publications, Pretoria.
- CSIR (Council for Scientific and Industrial Research). 2010. National Freshwater Ecosystem Priority Areas (NFEPA). Council for Scientific and Industrial Research, Pretoria, South Africa.
- Department of Water Affairs and Forestry. 2005a. A practical field procedure for identification and delineation of wetland and riparian areas. Edition 1, September 2005. DWAF, Pretoria.
- Department of Water Affairs and Forestry. 2005b. Environmental Best Practice Specifications: Construction. Integrated Environmental Management: Sub-Series No. IEMS 1.6. Third Edition. Pretoria.
- Department of Water Affairs and Forestry. 2005c. Environmental Best Practice Specifications: Operation. Integrated Environmental Management: Sub-Series No. IEMS 1.6. Third Edition. Pretoria.
- Department of Water Affairs and Forestry. 2009. DWAF Training Manual: National Water Act Section 21(c) and (i) Water Uses. Version: November 2009.
- Driver, A., Sink, K.J., Nel, J.L., Holness, S., Van Niekerk, L., Daniels, F., Jonaz, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. A synthesis Report. South African National Biodiversity institute (SANBI) and Department of Environmental Affairs, Pretoria, DWAF (Department of Water affairs and Forestry). 2009. DWAF Training Manual: National Water Act Section 21(c) and (i) Water Uses. Version: November 2009.
- Ekurhuleni Metropolitan Municipality. 2008. LAB Biodiversity Report: Ekurhuleni Metropolitan Municipality.
- Kotze, D., Marneweck, G., Batchelor, A., Lindley, D. and Collins, N. 2009. WET-EcoServices: A technique for rapidly assessing ecosystem services provided by wetlands. Wetland Management Series. Water Research Commission Report TT 339/09.
- Macfarlane, D., Kotze, D., Ellery, W., Walters, D., Koopman, V., Goodman, P. and Goge, M. 2009. WET-Health: A technique for rapidly assessing wetland health. Wetland Management Series. Water Research Commission Report TT 340/09.
- Mucina, L. and Rutherford, M. C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- Ollis, D., Snaddon, K., Job. N. and Mbona. N. 2013. Classification system for wetland and other aquatic ecosystems in South Africa. User manual: inland systems. SANBI biodiversity series 22. SANBI Pretoria.
- Van Ginkel, C.E., Glen, R.P., Gordan-Gray, K.D., Cilliers, C.J., Muasya and Van Deventer, P.P., 2011. Easy identification of some South African Wetland Plants (Grasses, Resticios, Sedges, Rushes, Bulrushes, Eriocaulons and Yellow-eyed grasses). WRC Report No. TT 459/10.
- WRC. 2015. Water Resources of South Africa 2012 Study (WR2012). Retrieved from http://waterresourceswr2012.co.za/resource-centre.

APPENDIX

G-3 WETLAND ASSESSMENT AND REHABILITATION PLAN

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BOKAMOS
Landscape Architects & Environmental Consultants CC

Wetland Assessment and Rehabilitation Plan

Jet Park

Erf 487 on Jet Park Extension 21, Ekurhuleni Metropolitan Municipality

April 2020

Prepared by:

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Declaration of Independence

I, **Lizette Venter**, in my capacity as a specialist consultant, hereby declare that I -

- Act as an independent specialist and will perform the study in an objective manner free of influence and prejudice, even if the resultant findings are unfavourable to the applicant;
- Have the relevant expertise in conducting the report relevant to this application;
- Will comply with all regulations, Acts and other applicable guidelines that are applicable to the activity;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended;
- Do not have any conflicting interests in the preparation of this report;
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision taken with respect to the application by the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended;
- As a registered member of the South African Council for Natural Scientific Professions (SACNASP), will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member; and
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.

This report has been prepared according to the requirements of Appendix 6 of the Environmental Impact Assessments Regulations, 2014 as amended; and GN 267, 2017 of the National Water Act, 1998 (Act No. 36 of 1998, as amended).

Lizette Venter (*Cand.Sci.Nat.*)
Wetland specialist
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Indemnity

This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as information available at the time of study. Therefore, the author reserves the right to modify aspects of the report, including the recommendations, if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although the author exercised due care and diligence in rendering services and preparing documents, she accepts no liability, and the client, by receiving this document, indemnifies the author against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by the author and by the use of this document.

Disclaimer

This report is aimed at evaluating site specific conditions as determined in context of relevant legislation and guidelines and to ensure the conservation and management of the water resources found on the site. However, the intention of this study is not to function as one of several attempts made by the proponent in order to gain favourable outcomes for the application. Rather, this report functions as an independent study and not as a comparative study between wetland specialists.

This report may be submitted directly to the competent authority should a prolonged correspondence occur between specialists and the applicant due to delineation comparisons.

Specialists	
Field work, data analysis and report writing	Lizette Venter MSc (Aquatic Health) BSc Hons (Environmental Management) Environmental Scientist / Wetland Specialist SACNASP Reg. No. 100144/15

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1. INTRODUCTION

Bokamoso Landscape Architects and Environmental Consultants cc, Specialist Division was appointed by WSP to conduct a wetland assessment and rehabilitation plan for the proposed warehousing development to be situated on Erf 487, Jet Park Extension 21, Ekurhuleni.

A Wetland Assessment was conducted by WSP in January, 2019 and is referred to for background information regarding the study site.

The site visit was conducted on 4 March 2020.

1.1 Terms of Reference

The focus of the investigation is to:

- Delineate and classify watercourses within the study site according to standardised and accepted methods;
- Undertake the ecological functional assessment, including the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS), of wetland areas (if present) within the area assessed;
- Recommend suitable buffer zones;
- Conduct a comprehensive assessment of the area affected by the activities conducted within the regulated area of the watercourses.
- A description of the process (based on best practice methodology) recommended for the rehabilitation, including timelines and responsible persons. To this effect, comprehensive measures and recommendations for the rehabilitation of the affected area must be provided.

1.2 Assumptions and Limitations

- The assessment is confined to the proposed development and 500m outside the boundary of the study site.
- The GPS used for delineations is accurate to within five meters. Therefore, the delineation plotted digitally may be offset by at least five meters in any direction. It is therefore suggested to measure and peg boundary areas in the field for higher accuracy.
- The on-site assessment is based on environmental indicators such as vegetation that are subjected to seasonal variation as well as factors such as fire and drought. Wherever available,

background information was gathered to aid in analysis of the site characteristics. Information provided within this report is based on observations made during the site survey on the specified date.

- Wetlands form transitional areas where vegetation species change from terrestrial to wetland species. Within this transition zone, some variation of opinion on the wetland boundary may occur, although all assessors should obtain relatively similar results when using the DWS methodology.

1.3 Definitions and Legal Framework

The National Water Act, 1998 (Act No. 36 of 1998, as amended) [NWA] defines a wetland as "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*." In addition to water at or near the surface, other distinguishing indicators of wetlands include hydromorphic soils and vegetation adapted to or tolerant of saturated soils (DWS, 2005).

Riparian habitat is described as "*the physical structure and associated vegetation of the areas associated with a watercourse, which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas"*. Riparian habitats often perform important ecological and hydrological functions, some similar to those performed by wetlands (DWS, 2005). Riparian habitat is also the accepted indicator used to delineate the extent of a river's footprint (DWAF, 2005).

This document was prepared according to the Gauteng Department of Agriculture and Rural Development (GDARD) Requirements for Biodiversity Assessments Version 3, February 2014, as well as key legislative requirements and guiding principles of the wetland study and the Water Use Authorisation process. The proponent must also comply with the provisions of the following relevant national legislation, conventions and regulations applicable to wetlands and riparian zones:

- The National Water Act, 1998 (Act No. 36 of 1998, as amended) [NWA]
- Convention on Wetlands of International Importance - the Ramsar Convention and the South African Wetlands Conservation Programme (SAWCP)

- National Environmental Management Act, 1998 (Act No. 107 of 1998, as amended) [NEMA]
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
- National Environment Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
- Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983)
- Regulations and Guidelines on Water Use under the NWA
- South African Water Quality Guidelines under the NWA
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002, as amended).

Water uses for which authorisation must be obtained from DWS, are indicated in Section 21 of the NWA. Section 21 (c) and (i) is applicable to any activity related to a wetland:

Section 21(c): Impeding or diverting the flow of water in a watercourse; and

Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

Wetlands situated within 500 m of proposed activities should be regarded as sensitive features potentially affected by the proposed development (GN 509, 2016). Such an activity requires a Water Use Licence (WUL) from the relevant authority. The regulation of wetlands is normally based on a water use licence, although a general authorisation can be applied for under GN 509. General Authorisation does not apply:
(a) to the use of water in terms of section 21(c) or (i) of the Act for the rehabilitation of a wetland as contemplated in General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009,
(b) to the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High as determined by the Risk Matrix.

This Risk Matrix must be completed by a suitably qualified SACNASP professional member;
(c) in instances where an application must be made for a water use license for the authorisation of any other water use as defined in section 21 of the Act that may be associated with a new activity;
(d) where storage of water results from the impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse; and
(e) to any water use in terms of section 21(c) or (i) of the Act associated with construction, installation or maintenance of any sewerage pipelines, pipelines carrying hazardous materials and to raw water and wastewater treatment works.

2. METHODOLOGY

An initial desktop study was conducted in order to gather background information on the site. The use of maps, aerial photographs and digital satellite imagery were consulted in order to assess the site conditions. GIS data was used to create maps describing the receiving environment, such as locality, soils, vegetation, critical biodiversity areas and hydrology.

A hand held GPS was used to capture co-ordinates in the field and a hand held camera for photographs. 1:50 000 cadastral maps and available GIS data were used as reference material for the mapping of the preliminary watercourse boundaries. These were converted to digital images containing delineation lines and buffers according to the field data received.

The delineation method documented by the Department of Human Settlements, Water and Sanitation (DHSWS), in their document "Updated manual for the identification and delineation of wetlands and riparian areas" (DWAF, 2008), and the Minimum Requirements for Biodiversity Assessments (GDACE, 2009) as well as the Classification System for Wetlands and other Aquatic Ecosystems in South Africa User Manual: Inland Systems (SANBI 2013) was followed throughout the field survey. These guidelines describe the use of indicators to determine the outer edge of the wetland and riparian areas.

2.1 Wetland and Riparian Classification and Delineation

2.1.1 Wetland indicators

Wetlands are delineated by means of the DHSWS guideline named 'A practical field procedure for identification and delineation of wetlands and riparian areas' (DWAF, 2008).

Wetlands are identified based on one or more of the following characteristic indicators (Figures 1 and 2):

- ***The Terrain Unit Indicator*** helps to identify those parts of the landscape where wetlands are more likely to occur. These include valley bottoms as well as slopes where groundwater discharge may occur.
- ***The Vegetation Indicator*** for the presence of plants adapted to saturated soils (hydrophytes). Vegetation growth helps in identifying the outer boundaries of a wetland since species composition changes dramatically between zones. Emphasis is placed on the group of species that dominate the plant community, and not on individual indicator species.

- ***The Soil Form Indicator*** identifies hydromorphic soils that display characteristics resulting from prolonged and frequent saturation and which are indicative of permanent, seasonal and temporary wetland zones. Gleyed soil has a grey, green or blue colour due to iron being dissolved out of the soil during anaerobic conditions. Seasonal or temporary wetlands generally have a fluctuating water table which creates alternating aerobic and anaerobic conditions in the soil. This causes iron to deposit over decades as yellow or orange patches, called mottles.
- ***The Soil Wetness Indicator*** to identify morphological changes due to anaerobic conditions developing in the first 50cm of the soil surface as a result of saturation. Specific soil colours and the presence of mottles are indicative of permanent or temporary saturation. The higher the frequency and duration, the greyer the soil matrix becomes. Hydromorphic soils that are permanently saturated generally do not show mottles.

According to the NWA, vegetation is the primary indicator, which must be present under normal circumstances. However, in practice the soil wetness indicator is used as the primary indicator since it shows long term morphological changes from saturation, whereas vegetation is seasonal and responds quickly to changes in soil moisture, human activities and climate. All other indicators are used to confirm the presence of a wetland.

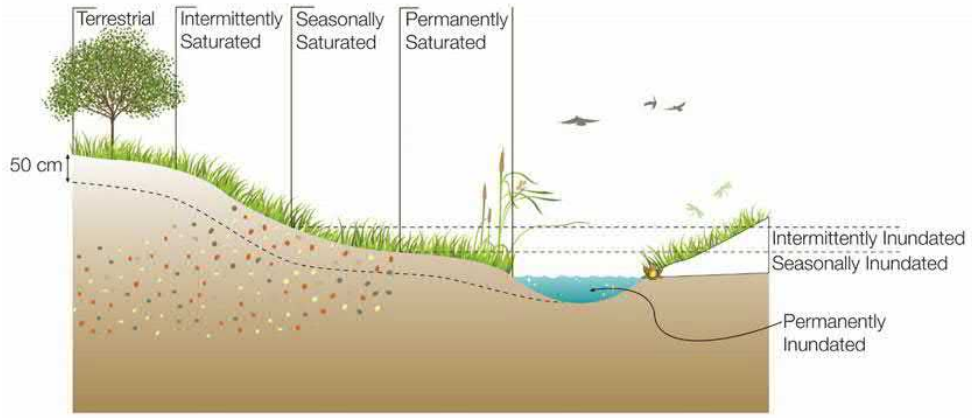

Figure 1: Typical cross-section of a wetland (Ollis, 2013)

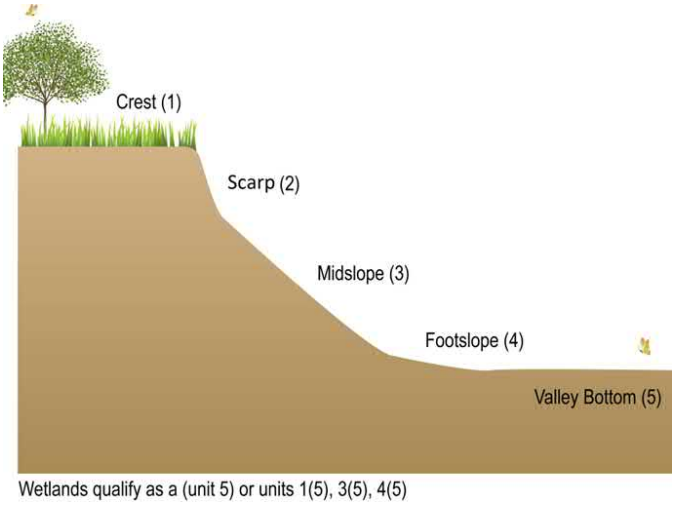

Figure 2. Terrain units (DWAF, 2005).

The boundary of the wetland is defined as the outer edge of the temporary zone of wetness, which is characterised by:

- A minimal grey matrix (<10%)
- Few mottles
- Short periods of saturation of less than 3 months per annum.

2.1.2 Riparian Area

Riparian areas have specific characteristics, namely:

- Are associated with a watercourse
- Contain distinctively different plant species than adjacent areas, exhibiting more vigorous or robust growth
- May have alluvial soils.

River channels flow within a confined valley or within an incised macro-channel. The "river" includes both the active channel (the portion which carries the water) as well as the riparian zone (Kotze, 1999). Riparian habitat is classified primarily by identifying riparian vegetation along the edge of the macro stream channel. Rich alluvial soils deposit nutrients making the riparian area a highly productive zone. This causes a very distinct change in vegetation structure and composition along the edges of the riparian area (DWAF, 2008). Riparian vegetation is supported by perennial and non-perennial streams.

Riparian areas perform valuable functions including:

- store water and help reduce floods
- stabilize stream banks
- improve water quality by trapping sediment and nutrients
- maintain natural water temperature for aquatic species
- provide shelter and food for birds and animals
- provide corridors for movement and migration of species
- act as a buffer between aquatic ecosystems and adjacent land uses
- can be used as recreational sites
- provide material for human use.

It is possible to delineate riparian areas by checking for the presence of specific indicators. Some areas may display both wetland and riparian indicators, and can accordingly be classified as both. The riparian delineation process requires that the following be taken into account:

- Topography associated with the watercourse
- Vegetation
- Alluvial soils and deposited material.

The most important indicator is vegetation, where the outer edge is adjacent to the watercourse where a distinct change in vegetation occurs. Topography and the presence of alluvial soils are the next indicators used to confirm the riparian area.

Riparian areas can be grouped into different categories based on their inundation period per year. Perennial rivers are rivers with continuous surface water flow, intermittent rivers are rivers where surface flow disappears but some surface flow remains, and temporary rivers are rivers where surface flow disappears for most of the channel. Two types of temporary rivers are recognized, namely “ephemeral” rivers that flow for less time than they are dry and support a series of pools in parts of the channel, and “episodic” rivers that only flow in response to extreme rainfall events, usually occurring high in their catchments (Seaman *et al,* 2010).

2.1.3 Wetland Classification

The classification system developed for the National Wetlands Inventory is based on the principles of the hydro-geomorphic (HGM) approach to wetland classification as described by SANBI, 2009 (Figure 3). In general, HGM units encompass three key elements (Semeniuk & Semeniuk 1995; Finlayson *et al*., 2002; Ellery *et al*., 2008; Kotze *et al*., 2008, Kotze *et al*., 2005), namely:

- Geomorphic setting - This refers to the landform characteristics and processes
- Water source - Precipitation, groundwater flow, stream flow, etc.
- Hydrodynamics – the presence and movement of water through the wetland.

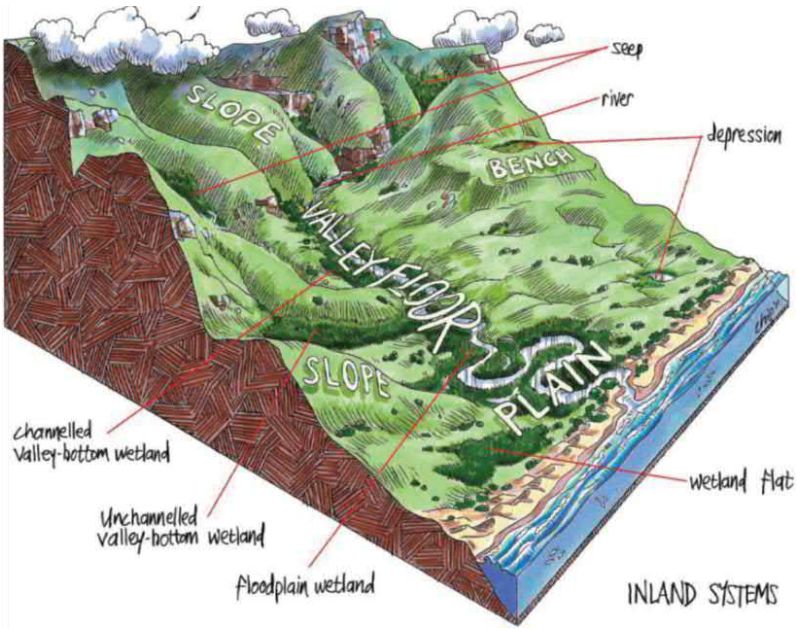

Figure 3: Wetland Units based on hydrogeomorphic types (Ollis et al. 2013)

2.2 Buffer Zones

A buffer zone is defined as *"a strip of land surrounding a wetland or riparian area in which activities are controlled or restricted"* (DWAF, 2005). A development has several impacts on the surrounding environment and on a wetland. The development changes habitats, the ecological environment, infiltration rate, amount of runoff and runoff intensity of the site, and therefore the water regime of the entire site. An increased volume of stormwater runoff, peak discharges, and frequency and severity of flooding is therefore often characteristic of transformed catchments. The buffer zone serves to highlight an ecologically sensitive area in which activities should be conducted with this sensitivity in mind.

Despite limitations, buffer zones are well suited to perform functions such as sediment trapping, erosion control and nutrient retention which can significantly reduce the impact of activities taking place adjacent to water resources. Buffer zones are therefore proposed as a standard mitigation measure to reduce impacts of land uses / activities planned adjacent to water resources. These must however be considered in conjunction with other mitigation measures.

Local government policies require that protective buffer zones be calculated from the outer edge of the temporary zone of a wetland (KZN DAEA, 2002; CoCT, 2008; GDARD, 2012).
Wetland buffer requirements:

- 30 meters from the temporary zone for wetlands occurring inside the urban edge;
- 50 meters from the temporary zone for wetlands occurring outside the urban edge; or
- Larger buffer areas for wetlands supporting sensitive faunal or floral species.

Rivers (non-perennial/perennial) buffer requirements:

- A 100-meter buffer zone from the edge of the temporary zone outside the urban edge;
- A 32-meter buffer zone from the edge of the temporary zone inside the urban edge; or
- Larger buffer areas for aquatic ecosystems supporting sensitive species.

The DHSWS Buffer Guideline (McFarlane *et al*., 2013) is used to determine the scientific buffer requirements which may be more or less than the generic values.

2.3 Functionality, Status and Sensitivity

Wetland functionality is defined as "a measure of the deviation of wetland structure and function from its natural reference condition." The natural reference condition is based on a theoretical undisturbed state extrapolated from an understanding of undisturbed regional vegetation and hydrological conditions. The hydrological, geomorphological and vegetation integrity are assessed for the wetland units associated with the study site, to provide a Present Ecological Status (PES) score (Macfarlane *et al*., 2007) and an Environmental Importance and Sensitivity category (EIS) (DWAF, 1999).

2.3.1 Present Ecological Status (PES) – WET-Health

A summary of the three components of the WET-Health method namely Hydrological, Geomorphological and Vegetation Health assessment for the wetlands found on site is described in Table 1.

Table 1: Health categories used by WET-Health for describing the integrity of wetlands (Macfarlane *et al.*, 2007)

Description	Impact Score Range	PES Score	Summary
Unmodified, natural.	>0.9	**A**	**Very High**
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1 - 1.9	**B**	**High**
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2 - 3.9	**C**	**Moderate**
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4 - 5.9	**D**	**Moderate**
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6 - 7.9	**E**	**Low**
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	**F**	**Very Low**

2.3.2 Ecological Importance and Sensitivity (EIS)

Ecological importance is an expression of a wetland's importance to the maintenance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (DWAF, 1999). The EIS methodology can also be applied to other water resources such as rivers and lakes.

This classification of water resources allows for an appropriate management class to be allocated to the water resource and includes the following:

- Ecological Importance in terms of ecosystems and biodiversity
- Ecological functions including groundwater recharge, provision of specialised habitat and dispersal corridors
- Basic human needs including subsistence farming and water use.

Explanations of the scores are given in Table 2.

Table 2: Environmental Importance and Sensitivity rating scale used for the estimation of EIS scores (DWAF, 1999)

Ecological Importance and Sensitivity Categories	Rating	Recommended Ecological Management Class
Very High Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water in major rivers	>3 and <=4	**A**
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers	>2 and <=3	**B**
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers	>1 and <=2	**C**
Low/Marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water in major rivers	>0 and <=1	**D**

3. RESULTS

3.1 Locality of the study site

The proposed warehousing development is situated in Jet Park, Ekurhuleni Metropolitan Municipality. The site boundaries are the R21 to the east, Marlin Avenue to the north and south, and Kelly Road to the west. The OR Tambo International Airport is situated across the R21 in the east. The development includes culverts and water pipelines.

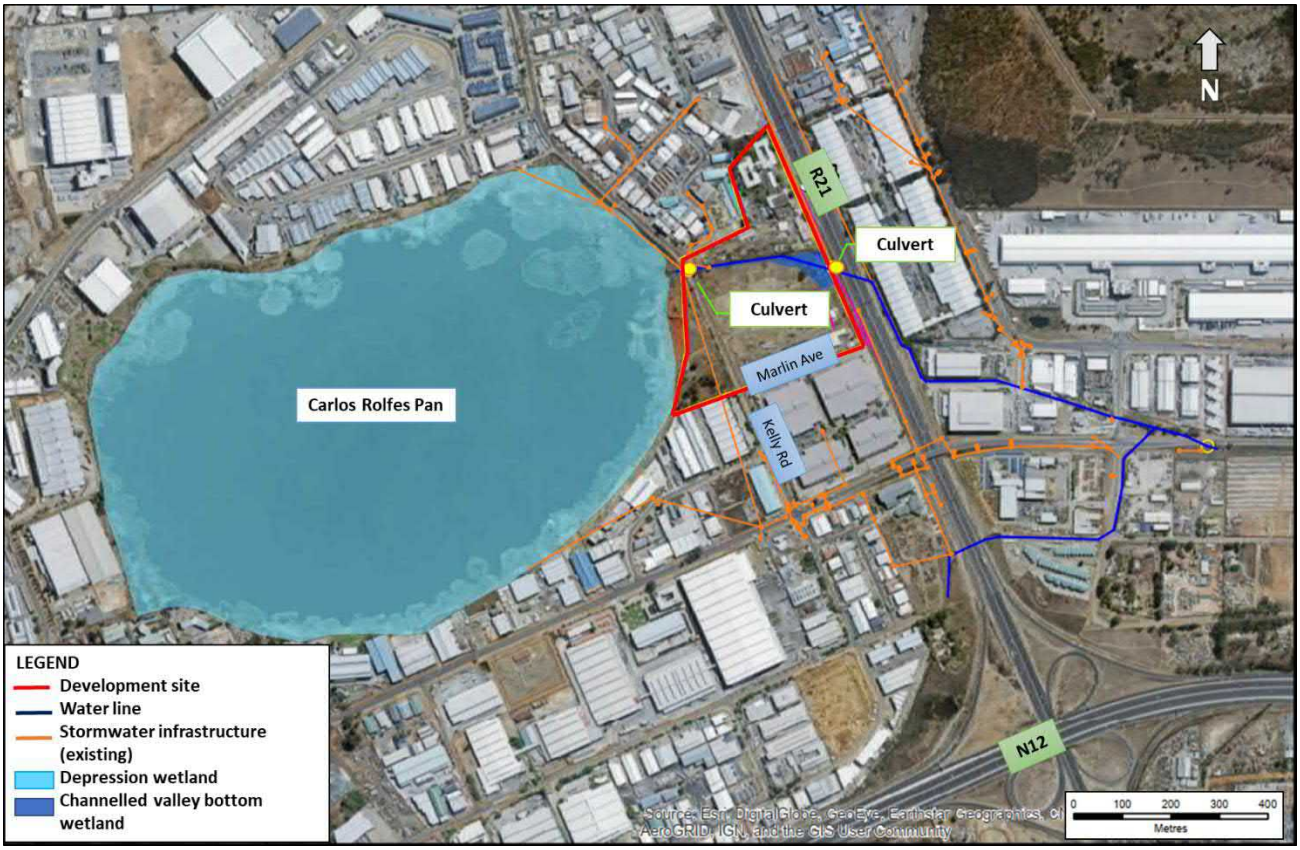

Figure 4: Locality Map indicating infrastructure and wetlands

3.2 Description of the Receiving Environment

3.2.1 Land Use

The surrounding areas are light industrial and business developments.

3.2.2 Hydrology

The site is situated in quaternary catchment C21D of the Vaal water management area. The Carlos Rolfes Pan is situated to the west.

3.2.3 Regional vegetation

The site is situated in the Soweto Highveld Grassland vegetation unit of the Mesic Highveld Grassland Bioregion in the Grassland Biome (Mucina & Rutherford, 2010).

Soweto Highveld Grassland vegetation is characterised by

3.2.4 Geology and Soils

According to available geological maps, the study site is underlain by Quartzite geology.

3.2.5 Gauteng Conservation Plan (C-Plan)

The proposed warehousing development is situated within an urban area and the Carlos Rolfes pan is classified as Ecological Support Area.

3.3 Watercourse Classification and Delineation

Two wetland HGM units occur within 500m of the study site. A Channelled Valley Bottom wetland borders the north of the site and is connected to a Pan / Depression to the west (Carlos Rolfes Pan), which covers approximately 85 hectares in extent. It was confirmed during the site survey that the wetlands have not changed since the WSP study was conducted in 2019. However, the impacts on the channelled valley bottom have increased due to the new development.

Augering of the wetland areas showed gley soils with mottling and increasing clay content at depth.

Refer to Figure 5 for the WSP wetland delineation map.

Figure 5: Wetlands of the study site (WSP 2019)

3.4 Wetland Impacts

The channelled valley bottom wetland initially extended further to the south and north, however, due to development over time, the wetland has become channelled and narrowed. Invasive and alien vegetation growth is high surrounding both wetlands, although the pan is impacted to a lesser degree. Due to development, parts of the wetland have been scraped clean for vehicle access and the vegetation removed. An earthen berm has been placed along the buffer line for the channelled valley bottom. A vehicle crossing was created previously between the sites north and south of the stream channel which has led to erosion and sedimentation.

The pan is in generally good condition, except for sections west of the development site boundary. These areas have been cleared for access roads to the pan. Dumping of builder's rubble and growth of the invasive blue gum trees and weeds are additional impacts to the area.

Refer to Figure 6-7 for historic and current site condition aerial imagery and Figure 8-10 for photos of site characteristics and impacts.

Figure 6: current site conditions (2020)

Figure 7: Site conditions in January 2019

Figure 8: Wetland characteristics for the channelled valley bottom

a – b) Wetland vegetation showing high growth of alien and invasiev species (trees and weeds). c) Stream channel. d) Wetland edge with *Typha capensis* stands within the stream channel. e-f) Soils showing clay content / gleying and mottles

Figure 9: Wetland characteristicsand impacts for the depression / pan

a – b) Pan characteristics. c – e) Site impacts

Figure 10: Wetland impacts for the channelled valley bottom

a-b) Clearing for access roads and stream crossing, showing sedimentation in the stream channel. c) Energy dissipating structure with retaining walls for stormwater. d – e) Clearing of the construction site with earth berm visible.

3.5 Present Ecological Status (PES) and Ecological Importance and Sensitivity (EIS)

The PES and EIS scores were calculated for the wetlands that occur within 500m of the proposed development. Refer to Table 3 to 5 below.

The combined **PES** score for the Channelled Valley Bottom wetland area is **5.5** and **D - Largely modified**. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural features are evident. Wetland conditions are not expected to deteriorate as limited space for additional development is available.

The combined **PES** score for the Hillslope Seep wetland area is **7.0** and **E - Seriously modified**. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable. The developer plans to rehabilitate the site and should the rehabilitation be conducted correctly, then the overall condition of the wetland will not deteriorate. Maintenance of the site is also required long term.

Table 3: The estimated Present Ecological State (PES) of the wetland

	Hydrology		Geomorphology		Vegetation	
	Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
Depression / Pan						
Area weighted impact scores	6.0	→	4.0	→	6.6	→
PES Category	**D**		**D**		**E**	
Channelled Valley Bottom						
Area weighted impact scores	7.0	→	6.4	→	7.6	→
PES Category	**E**		**E**		**E**	

Table 4: The Ecological Importance and Sensitivity (EIS) of the Channelled Valley Bottom

RIVER IMPORTANCE AND SENSITIVITY		
	Importance	***Confidence***
ECOLOGICAL IMPORTANCE & SENSITIVITY	1.3	*4.6*
HYDROLOGICAL/FUNCTIONAL IMPORTANCE	0.9	*4.5*
DIRECT HUMAN BENEFITS	0.2	*4.5*

The **EIS** scores indicate that the Channelled Valley Bottom is classed as **Low**. The wetland is ecologically important and sensitive on a local scale for stormwater management.

Table 5: The Ecological Importance and Sensitivity (EIS) of the Depression / Pan

RIVER IMPORTANCE AND SENSITIVITY		
	Importance	***Confidence***
ECOLOGICAL IMPORTANCE & SENSITIVITY	2.0	*4.6*
HYDROLOGICAL/FUNCTIONAL IMPORTANCE	1.9	*4.5*
DIRECT HUMAN BENEFITS	1.2	*4.6*

The **EIS** scores indicate that the Depression / Pan is classed as **Moderate / High**. The wetland is ecologically important and sensitive on a local scale. The biodiversity of the wetland is moderate and slightly sensitive to flow and habitat modifications. The wetland provides habitat for birds, fish, reptiles and small mammals.

3.6 Buffer recommendation

A **30m buffer** is required for both the wetlands adjacent to the study site, although this buffer has been reduced to **15m** around the depression / pan. Considreding the risks of flooding in the area (the channel is very shallow and could overflow easily), it is recommended to retain the 30m buffer around the valley bottom wetland. However, the northern sid eof the wetland has been cleared many years ago and does not have sufficient space to apply the 30m buffer, therefore the 15m buffer is accepted for the northern side.

Application of buffers around the depression / pan is limited as the majority of the surronding areas have already been developed.

4. REHABILITATION PLAN

The developer wishes to rehabilitate the wetland areas and to create open spaces where people can rest and enjoy the wetlands. Rehabilitation measures will be aimed at improving the vegetation species composition and ground cover, removal of dumping and resloping of disturbed areas.

For the valley bottom wetland, some natural and indigenous landscaping will be applied between the buffer and buildings. The developer wishes to construct a bird hide at the edge of the depression / pan for people to enjoy the significant bird life.

Figure 10 shows the areas to be rehabilitated. Table 6 and 7 describes the rehabilitation measures to be applied for the site before any landscaping activities can occur.

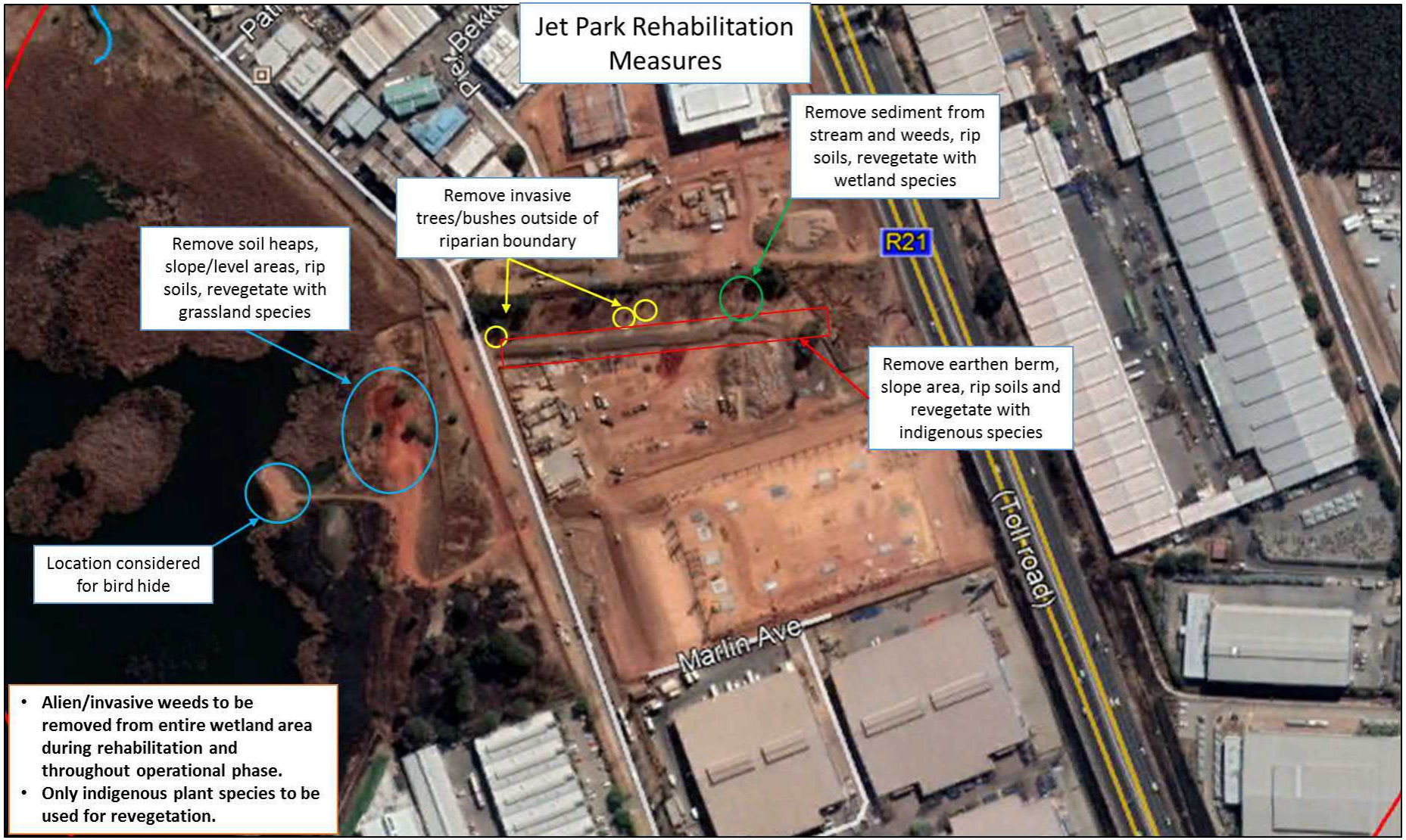

Figure 11: Rehabilitation sites and measures for the wetland areas

Table 6: Table of rehabilitation activities for the Jet Park development

REHABILITATION ACTIVITIES			
Activity	**Applicable areas**	**Method**	**Timeframe (approximate)**
Planning	• All areas planned for rehabilitation	• Plan the access and construction areas for the site. • The rehabilitation plan must be made available to all parties involved. • Plan the areas to be rehabilitated in stages so as to work on one area at a time.	• Prior to rehabilitation commencing
Access control	• Stream channel / pan edges	• Access must be restricted to as few people as possible. • Only vehicles required for the work may access the wetland channel during resloping and infilling activities. • All works should be supervised.	• Duration of rehabilitation activities
Storm water management	• Stream channel / pan edges	• Erosion and siltation prevention must be applied throughout the rehabilitation process. • Sand bags, hay bales and silt nets can be used.	• Duration of rehabilitation activities
Waste removal	• All areas for rehabilitation	• Designate an area for the temporary storage of waste and stockpiling. • The area must be located outside of sensitive areas. • Waste and rubble removal to occur daily. • Waste must be disposed of to a suitable landfill site.	• Daily during rehabilitation activities
Site clearing	• Dump areas	• All dumped soils and materials to be removed and cleared. • All materials to be removed to an approved dumping site.	• Prior to sloping activities
Site preparation	• Areas to be rehabilitated	• Areas for revegetation must be cleared of alien and invasive plants. • Indigenous vegetation must be cut to just above ground level and stockpiled for use in brush packing and seeding. • Activities must commence in areas that are small enough to be revegetated and stabilised before working on another area. • Areas where indigenous grass clump growth are unaffected by resloping activities should be preserved in order to stabilise the banks.	• Day 1-7 • Commence in early rain season (September to October)

		• The use of fertiliser should be avoided. Organic fertiliser to only be used if needed. • Soils must be moist for revegetation activities. • If needed, topsoil must be placed at a depth of 100mm in open areas to be vegetated.	
Resloping	• All cleared areas	• In order to promote vegetation growth and establishment, the slope angle must be a maximum of 1(V):3(H). The site is generally flat; however, the original topography of the area must be restored. • Slope reshaping must follow the natural slope and topography of the surrounding undisturbed areas. • Areas for resloping must be ripped or loosened to a depth of 150mm to prepare soils for revegetation and allow water penetration into the soils. • Ripping must be done manually with hand tools wherever possible. • No vehicles are permitted in the area once ripping is completed in order to prevent further disturbance to the wetland.	• Day 8-14
Revegetation	• All disturbed areas	• A suitable grass mixture must be spread by hand along the extent of the ripped areas. The species to be used must only be indigenous and endemic to the area. • The seed mixture may be purchased in the required amounts from co-ops. • Seeds must be thorough mixed before applying. • The seeds must be applied according to the required rates. • Application rates can be increased in areas that are unfavourable or steep, but no more than double the recommendations. • Seeds can be mixed with a spreading agent such as river sand, bran or finely sifted kraal to ensure even distribution. • Once complete, the seeded area must be watered and patted down gently. • Indigenous vegetation removed from the area must be applied over the seeded area as mulch.	• Day 15-16 • Directly after resloping.

		• Areas to be watered daily until vegetation has established (about 2 weeks).	

Table 7: Long Term maintenance

LONG TERM REHABILITATION ACTIVITIES			
Activity	**Applicable area**	**Method**	**Timeframe (approximate)**
Vegetation growth maintenance	• Revegetated areas	• Cordon off areas for new plant growth with danger tape and droppers. • No access must be permitted for vehicles, pedestrians or animals. • Monitoring for the establishment of alien plants must be done regularly, and these should be removed by hand.	• 3 months
Alien invasive control	• All wetland areas / open spaces	• Alien and invasive vegetation to be removed regularly.	• Throughout the operational phased of the development

5. ROLES AND RESPONSIBILITIES

5.1 Site Supervisor

- Planning of rehabilitation activities and timeframes.
- Appointment of contract team/ staff to perform the rehabilitation measures.
- Assign roles and responsibilities for contract team.
- Ensure rehabilitation activities are done in accordance to this document.
- Record keeping of dates when measures are applied, take photos and notes of the progress of the rehabilitation works.

5.2 Environmental Control Officer (ECO)

An independent environmental control officer shall be appointed for the duration of the rehabilitation works.

The ECO will:

- Ensure compliance of rehabilitation works to the approved Rehabilitation Plan.
- Ensure the owner is aware of all specifications relating to the Rehabilitation Plan.
- Ensure that all staff are aware of and adhering to the stipulations in the Rehabilitation Plan.
- Monitor the rehabilitation throughout its implementation.

6. INCIDENT MANAGEMENT

6.1 Failure of erosion control

- Contain eroded material by means of silt traps, hay bales, logs etc.
- Notify the ECO.
- Repair and replace damaged materials.
- Replace eroded material, being careful not to damage vegetation.
- Remove material from site.

6.2 Slope failure

- Stabilise the toe of the slope with bags, silt fences, hay bales etc.
- Prevent water from flowing towards silt fence.
- Protect the area from further collapse.
- Notify the ECO.

- Discuss options for restoration with the ECO and follow the restoration methods as discussed.
- Monitor the restoration until the area has stabilised.

7. REFERENCES

Department of Water Affairs (2008): Updated Manual for the Identification and Delineation of Wetlands and Riparian areas.

Department of Water Affairs (2010). National Water Act, 1998 (Act No 36 of 1998) S21(c) & (i) Water Uses. Version: February 2010. Training Manual.

Ewart-Smith J., Ollis D., Day J. and Malan H. (2013). National Wetland Inventory: Development of a Wetland Classification System for South Africa. Water Research Council project number K8/652

Gauteng Department of Agriculture, Conservation & Environment (2014) GDARD Minimum Requirements for Biodiversity Assessments Version 3. Directorate Nature Conservation, Johannesburg.

Gauteng Department of Agriculture and Rural Development, (2011): Gauteng Conservation Plan Version 3 ArcGIS Spatial data

Kleynhans CJ, Mackenzie J, Louw MD. 2007. Module F: Riparian Vegetation Response Assessment Index in River EcoClassification: Manual for EcoStatus Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry report.

Kleynhans CJ, Louw MD. 2007. Module A: EcoClassification and EcoStatus determination in River EcoClassification: Manual for EcoStatus Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry report.

Kotze D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.S. and Collins, N.B. (2005). WET-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands

Macfarlane D.M., Kotze D.C., Ellery W.N., Walters D, Koopman V, Goodman P and Goge C. (2008). WET-Health: A technique for rapidly assessing wetland health. Water Research Commission, Pretoria. WRC Rport TT340/08 February 2008

Macfarlane D.M., Teixeira-Leite A., Goodman P., Bate G and Colvin C. (2010) Draft Report on the Development of a Method and Model for Buffer Zone Determination. Water Research Commission project K5/1789. The Institute of Natural Resources and its Associates

Macfarlane D.M., Bredin I.P., Adams J.B., Zungu M.M., Bate G.C., and Dickens C.W.S. (2014) Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries. Water Research Commission report TT610/14.

Mucina L., & Rutherford M. C. (2006). Vegetation Map of South Africa, Lesotho and Swaziland, 1:1 000 000 scale sheet maps. South African National Biodiversity Institute., Pretoria.

APPENDIX A: GLOSSARY OF TERMS

Activity	a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation
Buffer	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Duration	the length of time over which the stressor will cause a change in the resource or receptor.
EIS	ecological importance and sensitivity. Key indicators in the ecological classification of water resources. Ecological importance relates to the presence, representativeness and diversity of species of biota and habitat. Ecological sensitivity relates to the vulnerability of the habitat and biota to modifications that may occur in flows, water levels and physico-chemical conditions.
Impacts/ Risks	the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
MC	management class representative of those attributes that the DWA (as the custodian) and society require of different water resources (consultative process). The process requires a wide range of trade-offs to assessed and evaluated at a number of scales. Final outcome of the process is a set of desired characteristics for use and ecological condition each of the water resources in a

	given catchment. The WRCS defines three management classes, Class I, II, and III based on extent of use and alteration of ecological condition from the predevelopment condition.
PES	present ecological state. The current state or condition of a water resource in terms of its biophysical components (drivers) such as hydrology, geomorphology and water quality and biological responses viz. fish, invertebrates, riparian vegetation). The degree to which ecological conditions of an area have been modified from natural (reference) conditions.
Seepage	A type of wetland occurring on slopes, usually characterised by diffuse (i.e. unchannelled, and often subsurface) flows.
Sedges	Grass-like plants belonging to the family Cyperaceae, sometimes referred to as nutgrasses. Papyrus is a member of this family.
Wetland	"land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil." (National Water Act; Act 36 of 1998).
Wetland delineation	the determination and marking of the boundary of a wetland on a map using the DWAF (2005) methodology. This assessment includes identification of suggested buffer zones and is usually done in conjunction with a wetland functional assessment. The impact of the proposed development, together with appropriate mitigation measures are included in impact assessment tables
WMA	water management area

APPENDIX B: CV OF SPECIALIST

Lizette Venter

South African Wetland Society
SACNASP (Reg. No. 100144/15)

Work History

DELTERRA CONSULTING – Environmental Consultant

Wetland delineation
Ecological/ risk and impact assessments
Desktop analysis
Environmental Compliance

WETREST – Research as part of MSc in Aquatic Health

- "A Holocene Wetland: Hydrological Response to Rehabilitation at Colbyn Valley Wetland, Pretoria, Gauteng"
- Weekly groundwater level and pressure monitoring
- Isotope analysis
- Water quality monitoring
- Vegetation growth mapping

Education

MSC IN AQUATIC HEALTH – University of Johannesburg
BSC HONS IN ENVIRONMENTAL MANAGEMENT (CUM LAUDE) – UNISA
BSC AGRICULTURE – University of the Free State

Short Courses

FEB 2017	Taxonomy of wetland Plants (SANBI)
FEB 2016	Grass identification and veld management
NOV 2015	WRC/ ECO-PULSE Workshop in determination of buffers for rivers, wetlands and estuaries
APR 2015	Workshop on environmental compliance, enforcement and risk management

Projects

Wetland delineation, PES/EIS, functional assessment, Impacts and Mitigation, VEGRAI, QHI, Risk Assessments

Riverwalk Electrical

Lanseria x66 Mixed-use Development, Johannesburg

Lanseria x65 Filling Station, Johannesburg

TUT Ga-Rankuwa Expansion, Ga-Rankuwa, Gauteng. (in progress)

Waterfall Ridge Mixed-use Development, Johannesburg. (in progress)

Glen Vista Residential Development, Gauteng

Nkosi City Mixed-Use Development, Mpumalanga

Slovo Park/ Nancefield Residential Development, Gauteng

Kudube Unit 9 Sewer Outfall, Gauteng

Mooibosch Resort Development, Gauteng

Hartebeeshoek Mixed-use Development, Gauteng

Wheatlands Solar Farm, Gauteng

Thula Mall, Bushbuckridge, Mpumalanga

Mthatha – Bedford City Mixed-use Development, Mthatha, Eastern Cape

Expansion of Transnet Railway Loops at Thabazimbi, Ferrogate and Northam, Limpopo

Riverwalk Electrical Line, Pretoria

Ormonde Residential Development, Johannesburg

Coal mining rights application for Berenice, Limpopo Province.

Ekhuthuleni Roads and Stormwater Upgrades

Proposed Housing Development on the Farm Middbuilt Position 11 and 81 and Eloff Er 675, Delmas.

Kagisa and Environs Integrated Development and Housing Project, West Rand, Gauteng.

Witpoortjie Residential Development, Krugersdorp, Gauteng

Moretele Distribution Powerlines and Substations, Pretoria, Gauteng

Panfontein Access Road for Rand Water in Midvaal Local Municipality, Gauteng

Hawerklip Coal Siding at Brazen Algar, Delmas, Mpumalanga

Eskom Westgate - Ntshona Powerline, Gauteng Province

Ecological Importance and Sensitivity, and Present Ecological Status assessment for water use application for Soweto, Gauteng Province

Diepsloot East Powerline and Substation, Gauteng Province

Gem Valley Residential Development, Pretoria North

Amberfield Residential Development, Centurion

Wetland Rehabilitation Plans

Kameeldrift Feedlot, Cullinan

Thula Mall, Bushbuckridge, Mpumalanga

Waterfall 5IR Wetland Rehabilitation and Action Plan, Gauteng (in progress)

Eagle's Creek Flight Academy, Centurion

Risk Assessments

Hazeldean Bouleavrd Rd amended WUL, Pretoria

Kudube Unit 9 Sewer Pump Station, Shoshanguve

Thema Babelegi Sewer Pump Station and Pipeline, Shoshanguve

Kikuyu/Waterfall Fields Electrical Lines, Johannesburg

Kikuyu/ Waterfall Fields Water Pipelines, Johannesburg

Parkdene x7 Mixed-use Development services and road upgrades, Johannesburg

Reiger Park x19 Mixed-use Development services and road upgrades, Johannesburg

Slovo Park/ Nancefield Informal Settlement, Johannesburg

Waterfall Fields Electrical Line, Johannesburg

Winterveld x5 Residential Development Sewer, Soshanguwe

Winterveld North Sewer Outfall, Soshanguve

Winterveld South Sewer Outfall, Soshanguve

Riverwalk Electrical Line, Pretoria

Thula Mall, Bushbuckridge, Mpumalanga

Leeuwpoort South Mixed-use Development, Johannesburg

Kudube Sewer Outfall and Pump Stations, Shoshanguve

Environmental Authorisations - Approved

DK Pharmaceutical Building, Lesotho - Scoping and EMPr

Peach Tree x21&22 Industrial Township, Centurion – BAR, Pt1 amendment

Peach Tree x23 Industrial Township, Centurion – Pt1 amendment

Peach Tree x24 Industrial Township, Centurion– Pt1 amendment

Peach Tree x25 Industrial Township, Centurion - BAR

Varsity College Expansion, Pretoria – Ecological Opinion

Fairlands Interchange, Johannesburg – EIA

PWV17 Freeway, Pretoria – EIA

Environmental Authorisations in Progress

Glencoe Abattoir – Integrated EIA, AEL and WL for coagulation pond and deboning plant.

Hazeldean Boulevard Road – EIA

Lanseria x 66 Mixed-use Development – BAR

Knopjeslaagte Filling Station and Shopping Centre, Centurion – BAR

La Montagne Reservoirs, Pretoria – BAR

PWV18 Route Determination – Environmental Scan

Welgedacht Filling Station – BAR

Thula Mall – S24G and Wetland Rehabilitation Plan

APPENDIX

G-4 CONCEPTUAL STORM WATER MANAGEMENT PLAN

ABBEYDALE BUILDING AND CIVILS (PTY) LTD

ABBEYDALE JET PARK WULA ADDITIONAL SPECIALIST STUDIES

CONCEPTUAL STORM WATER MANAGEMENT PLAN

23 APRIL 2021

ABBEYDALE JET PARK WULA ADDITIONAL SPECIALIST STUDIES

CONCEPTUAL STORM WATER MANAGEMENT PLAN

ABBEYDALE BUILDING AND CIVILS (PTY) LTD

FINAL

PROJECT NO.: 41102515
DATE: APRIL 2021

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QUALITY MANAGEMENT

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FIGURES

1 INTRODUCTION

Abbeydale Building and Civils (Pty) Ltd (Abbeydale) proposes to construct industrial warehousing and commercial offices ('proposed development') on Jet Park Extension 64 in Boksburg. The majority of the site is currently highly disturbed from previous development and commercial activities. Abbeydale propose to re-develop the property. WSP Environmental (Pty) Ltd (WSP) was appointed by Abbeydale to undertake a Conceptual Stormwater Management Plan (SWMP), which forms part of the specialist studies in support of a Water Use License Application (WULA) process for a development at Jet Park Extension 64 in Boksburg. This report outlines both the methodology adopted to develop the conceptual SWMP, as well as the associated infrastructure requirements.

2 APPROACH

The objective of the SWMP is to prevent contamination of receiving watercourses through 'dirty' surface water runoff generated at the proposed development, through the appropriate separation and/or containment of 'clean' and 'dirty' storm water. The following scope of work was conducted as part of the assessment:

- Desktop Review;
- Conceptual Storm Water Management; and
- Numerical Modelling.

These aspects are elaborated on further in the sections that follow.

2.1 DESKTOP REVIEW

A conceptual understanding of the sites was developed which involved the identification of potential clean areas and their isolation from likely dirty areas. An overview of the site's geo-environmental characteristics (climate, vegetation cover, geology etc.), and a comprehensive understanding of expected surface water flow dynamics and site catchment boundaries was compiled from the following sources:

- Water Research Commission (WRC), 1994. The Surface Water Resources of South Africa, 1990, Volume VI, Eastern Escarpment (WRC Report No 298/6.1/94 and 298/6.2/94).
- Kunz, RP, 2004. Daily Rainfall Extraction Utility Version 1.4 (software). Institute for Commercial Forestry Research, Pietermaritzburg.

The development of the SWMP for the site took into account the following guidelines:

- Department of Water and Sanitation (DWS) Government Notice No.704 (GN704) (June 1999);
- DWAF Best Practice Guidelines (BPGs):
  - BPG G1 – Storm Water Management (August 2006); and
  - BPG A4 – Pollution Control Dams (August 2007).

These documents support Section 26 of the National Water Act (Act No. 36 of 1998) which regulates any activity that may have an impact on a water resource, and the conservation and protection of this water resource. The main principles adopted in these documents include:

- Confine or divert any unpolluted water to a 'clean' water system, and polluted water to a 'dirty' water system;
- 'Clean' and 'dirty' water systems should be designed and constructed to prevent cross-contamination between the 'clean' and 'dirty' water systems;
- 'Clean' and 'dirty' water systems should contain the 1:50-year storm event, and should not lie within the 1:100-year flood line or within a horizontal distance of 100m from any watercourse; and
- Appropriate maintenance and management of storm water related infrastructure should be undertaken.

2.2 CONCEPTUAL STORM WATER MANAGEMENT PLAN

Based on the information gathered during the desktop review, a conceptual SWMP was developed for the proposed development. The discretisation of the catchments factored in existing storm water infrastructure, overall functionality and the most practical and feasible implementation of the final SWMP.

Based on the discretised catchments, the required storm water management drainage and storage elements (including channels, pipes and Storm Water Attenuation Ponds (SWAPs)) were defined to ensure appropriate storm water management according to the management principles outlined in the GN704 and the relevant BPGs.

2.3 NUMERICAL MODELLING

The PCSWMM storm water drainage model was used to size the proposed storm water management infrastructure. PCSWMM is a hydrological rainfall-runoff numerical simulation model suitable for application to both rural and urban environments. PCSWMM can be used to determine the design requirements for various drainage elements as well as analyse the performance of existing drainage systems. PCSWMM requires a number of input parameters for each of the elements, including:

- Design and daily rainfall;
- Catchment characteristics including catchment area, overland flow length, slope, impervious areas, surface cover and soil characteristics.
- Proposed design characteristics of the drainage infrastructure, including the channels, pipes and PCDs.

The conceptual SWMP was assessed in terms of the 1:50-year recurrence interval storm event (as per the GN704 requirements) to define the required capacity of the storm water infrastructure (i.e. channels, pipes and SWAPs).

3 BASELINE RECEIVING ENVIRONMENT

3.1 SITE LOCALITY

The proposed development site is located within the Jet Park Extension 64 in Boksburg, within the Ekurhuleni Metropolitan Municipality of the Gauteng Province. The site (**Figure 1**), which consists of Extensions 64 and 70, is located approximately 14 km northwest of the Boksburg CBD and 21 km east of the city of Johannesburg (Latitude: -26.1650; Longitude: 28.2265). The study site is located within the Vaal Water Management Area (WMA), specifically the C21D quaternary catchment. Immediately upstream of the development site (to the west) is the Carlos Rolfes Pan, which is a formally protect area (Ekurhuleni Metropolitan Municipality, 2008). The pan drains in an easterly direction through an existing canal, which passes through the proposed development site.

3.2 ENVIRONMENTAL SETTING

3.2.1 CLIMATE

The area is characterised as a summer rainfall region, as 80% of the rainfall occurs between October to March. The Mean Annual Precipitation (MAP) is 698 mm and the Mean Annual Evaporation (MAE) is 1625 mm. The Summer months are characterised with mild temperatures of around 30°C with temperatures of above 30°C seldom recorded. Winter months experience temperatures of below 0°C, with severe frost occurring.

3.2.2 LAND COVER

The study area falls within the Soweto Highveld Grassland (Gm8) vegetation type (Mucina & Rutherford 2006). The area is highly developed and characterised by various economic land uses, including residential and urban industrial.

3.2.3 TOPOGRAPHY

The study site area lies on fairly flat terrain with a slight slope toward the east. The elevation of the site ranges from 1665 to 1680 masl.

3.2.4 GEOLOGY AND SOILS

The underlain geology of the study site is dominated by Quartzite. Soils within the study area consist of soils from the Avalon (Av 26), Ruston (Av16) and Soetmelk (Av36) soil series. These soils are characterised by their red/yellow colour with a sandy clay loam texture. The soils are macrostructureless, with a plinthic horizon. The soils have favourable water-holding properties, with drainage being unfavourable in areas of high rainfall.

3.2.5 HYDROGEOLOGY

The study area is dominated by dolomite of the Chuniespoort Group (part of the Transvaal Sytem) and tillites of the Dwyka Group (part of the Karoo System), both of which carry water. The presence of various geological structures, such as faults, fissures, and fracture zones, as well as contact zones of intrusions such as dykes and sills, dictate the occurrence of groundwater (Ekurhuleni Metropolitan Municipality, 2008). Karst, Intergranular and Fractured Aquifers are the dominant aquifer types in the EMM. The Karst Aquifers occur in the dolomites of the Chuniespoort Group.

3.3 HYDROLOGICAL SETTING

The site is bounded by the following:

— Industrial activities to the South;

— R21 Regional Route Freeway to the East;

— Prepared area (recently demolished commercial buildings) to the North; and,

— Carlos Rolfes Pan to the West.

The R21 Freeway serves as a cut-off drain to the natural flow path of stormwater within the catchment. The commercial building areas to the North of the earth-lined channel currently drain into existing storm water networks. The site is very flat with a slight fall in the south easterly direction. The run-off through the properties considered originate from two sources; the overflow of Carlos Rolfes Pan as well as a 900mm diameter concrete storm water pipe alongside Kelly Road discharge into the natural earth canal drain running through the properties.

Figure 1: Locality Map

3.4 RAINFALL

The Daily Rainfall Extraction Utility, developed by the Institute for Commercial Forestry Research (ICFR) in conjunction with the School of Bio-resources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal, Pietermaritzburg, was used to obtain summary data for all rainfall stations within the vicinity of the site. This data was assessed in terms of length of record, completeness of the data set, MAP and location of the rainfall station with respect to the site and the catchment

Table 1: Rainfall Gauging Station Summary (Kunz, 2003)

Rainfall Station	Station Number	Latitude	Longitude	Distance from site (km)	Record (years)	Reliable data (%)	MAP (mm)
JAN SMUTS WK 30 L	0476399W	26.151	28.234	1.846	9	99.3	729
JAN SMUTS AIRPORT	0476398W	26.134	28.234	3.693	109	19.7	619
JAN SMUTS (WK)	0476398AW	26.134	28.234	3.963	97	5.7	719
RIETFONTEIN (GM)	0476309 W	26.151	28.201	3.810	97	35.3	697

Daily rainfall data for the station Rietfontein was acquired from the Daily Rainfall Utility and presented in **Figure 2** for the period 1903 to 2000.

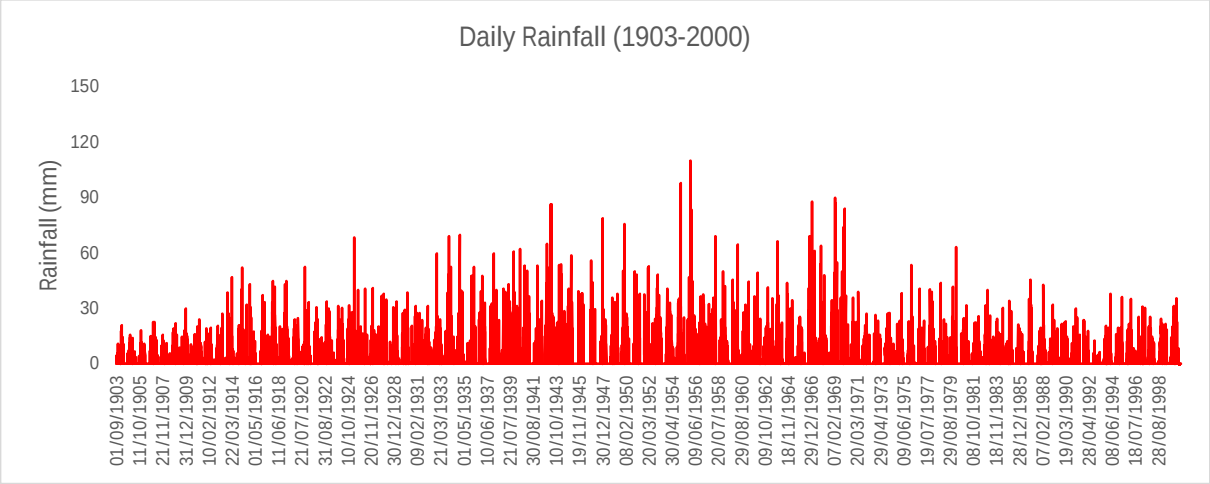


Figure 2: Daily rainfall around the Jet Park Development

3.5 DESIGN RAINFALL DEPTHS

The design rainfall depths for the centroid of the site were extracted using the Design Rainfall Estimation software for South Africa (Smithers and Schulze, 2003). The design rainfall depths (mm) for the 1:2-year, 1:5-year, 1:10-year, 1:20-year, 1:50-year, 1:100-year and 1:200-year return periods were extracted (**Table 2**).

Table 2: Design rainfall depths

	Return Period in Years						
Duration	**2**	**5**	**10**	**20**	**50**	**100**	**200**
24-hour	62.9	86.9	105.1	124.4	152.5	176.1	202.1

4 CONCEPTUAL STORM WATER MANAGEMENT PLAN

4.1 TOPOGRAPHICAL AND SITE LAYOUT

The site layout used in the numerical modelling was obtained from the client (Abbeydale). Five meter, readily available contour data was used to define the current topographical surface of the site.

4.2 CLEAN AND DIRTY CATCHMENTS

The site will be used for industrial warehousing and commercial offices, therefore, the runoff generated on the site will be clean, however measures must be put in place, such as oil traps in the parking areas, to ensure that the water being discharged from the site is not “dirty”.

Table 3: PCSWMM catchment details

Name	Area (ha)	Width (m)	Flow Length (m)	Imperv. (%)
S1	0.2413	25	96.52	100
S2	0.3055	40	76.375	100
S3	0.0595	18	33.056	100
S4	0.5139	51	100.765	85
S5	0.057	10	57	100
S6	0.0536	10	53.6	100
S7	0.0198	7.5	26.4	95
S8	0.7793	63	123.698	70
S9	0.7784	48.5	160.495	100
S10	0.786	48.5	162.062	100
S11	0.0546	14	39	95
S12	0.219	13.5	162.222	90
S13	0.3564	34.5	103.304	95
S14	0.2076	43	48.279	85
S15	0.4374	30	145.8	100
S16	0.4055	30	135.167	100
S17	0.0644	17	37.882	100
S18	0.0699	100	6.99	25
S19	0.0703	25	28.12	100

S20	0.2551	49	52.061	95
S21	0.1148	20	57.4	100
S22	0.1373	20	68.65	100
S25	0.4188	29	144.414	100
S26	0.3998	29	137.862	100
S28	0.1112	17	65.412	100
S29	0.1049	17	61.706	100
S30	0.0097	8.5	11.412	25
S31	0.2329	31	75.129	65
S32	0.0854	15.5	55.097	80
S33	0.0765	12	63.75	50
S34	0.0668	9	74.222	90
S35	0.0682	7	97.429	90
S36	0.2645	45	58.778	90
S37	0.153	25	61.2	90
S38	0.0662	20	33.1	95
S39	0.2597	35	74.2	95
S40	0.1554	35	44.4	90
S41	0.1543	17	90.765	25
S42	0.0852	13.5	63.111	60
S43	0.1169	19	61.526	95
S44	0.1883	13	144.846	90
S45	0.0431	11.5	37.478	20
S46	0.0608	12.5	48.64	85

The proposed site contains seven SWAPs (**Figure 3**), which serve as flood protection and flood alleviation mechanisms by slowing down the high flow rate during a flood. Of the seven SWAPs, SWAP 1, 2, 4 and 5 are proposed, whilst SWAP 3, 6 and 7 are existing.

In order to ensure that the water generated from the proposed development is adequately contained and routed to the SWAPs, a storm water management plan was developed for the site **Figure 4**. The proposed plan includes the use of channels, to manage the runoff from the various contributing catchment areas.

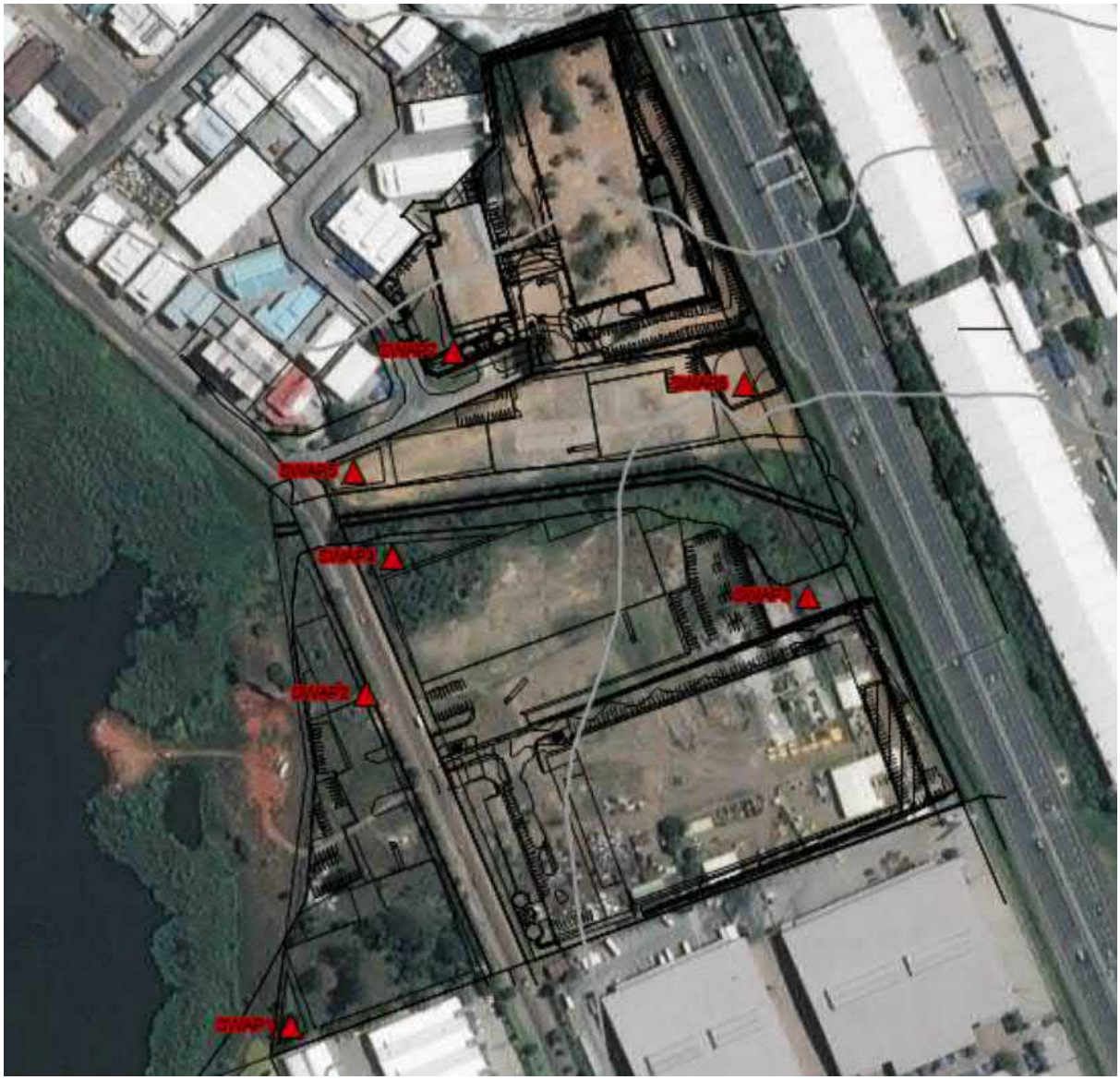


Figure 3: SWAPs within the proposed Jet Park Development

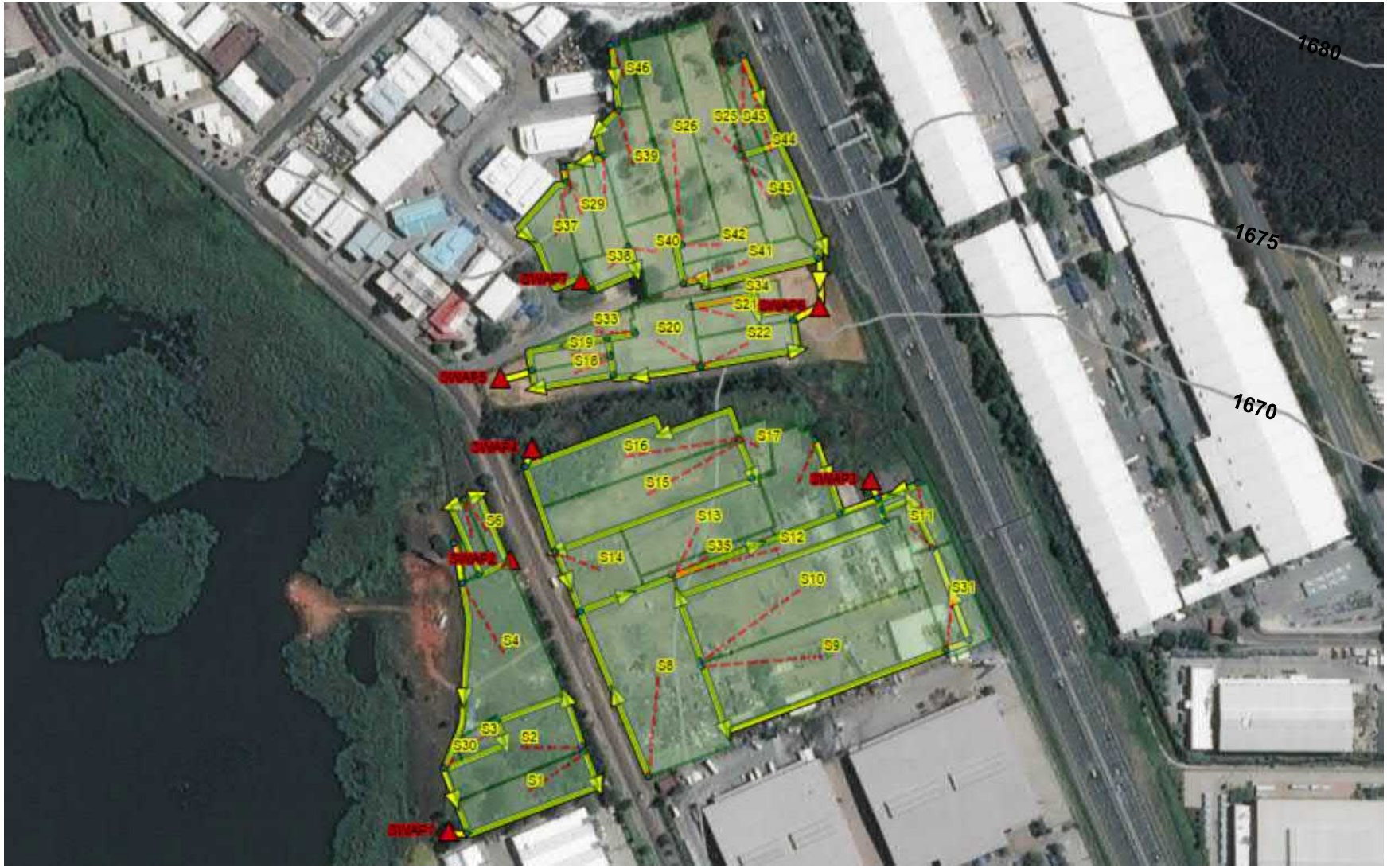


Figure 4: Discretised catchment and proposed storm water management plan

5 NUMERICAL MODELLING

In order to determine the required sizing of the storm water management infrastructure, storm event modelling using the PCSWMM model was undertaken. The numerical modelling was based on the proposed infrastructure and layout of the operations. The results for each infrastructure component is elaborated on in the sections that follow.

5.1 DESIGN RAINFALL

The 1:50-year design rainfall was fitted to the SCS-SA type 3 rainfall distribution and applied to the proposed development to determine the peak flow and volume reporting to the various infrastructure. The rainfall distribution graph is shown below:

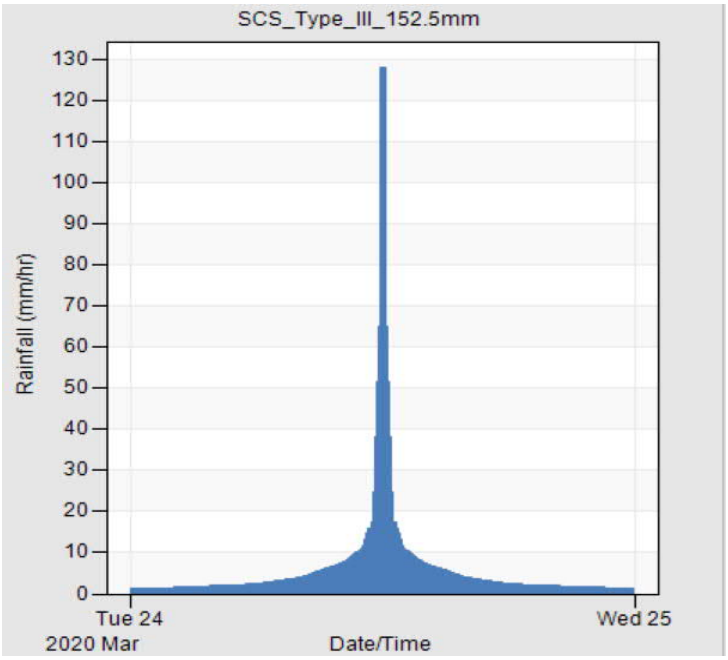


Figure 5: 1:50-year rainfall distribution for the Jet Park Development

5.2 MODELLING OUTPUTS

The sub-catchment characteristics and the flow rates and volumes are shown in **Table 4** and the flow rates and volumes reporting to the channels is shown in **Table 5**.

Table 4: Catchment details

Name	Outlet	Precipitation (mm)	Infiltration (mm)	Runoff Depth (mm)	Runoff Volume (ML)	Peak Runoff (m^3/s)
S1	J6	152.5	0	152.29	0.37	0.09
S2	J26	152.5	0	152.32	0.47	0.11
S3	J5	152.5	0	152.36	0.09	0.02
S4	J32	152.5	10.12	142.24	0.73	0.18
S5	J11	152.5	0	152.34	0.09	0.02
S6	J12	152.5	0	152.35	0.08	0.02

S7	J27	152.5	3.37	149.01	0.03	0.01
S8	J37	152.5	20.31	132.11	1.03	0.27
S9	J8	152.5	0	152.18	1.18	0.28
S10	J7	152.5	0	152.17	1.2	0.28
S11	J10	152.5	3.37	149.02	0.08	0.02
S12	J33	152.5	6.75	145.51	0.32	0.08
S13	J33	152.5	3.37	148.94	0.53	0.13
S14	J36	152.5	10.11	142.31	0.3	0.07
S15	J3	152.5	0	152.21	0.67	0.16
S16	J1	152.5	0	152.23	0.62	0.14
S17	J1	152.5	0	152.55	0.1	0.02
S18	J16	152.5	50.52	102.07	0.07	0.02
S19	J15	152.5	0	152.38	0.11	0.03
S20	J42	152.5	3.37	149.01	0.38	0.09
S21	J18	152.5	0	152.36	0.17	0.04
S22	J19	152.5	0	152.34	0.21	0.05
S25	J49	152.5	0	152.2	0.64	0.15
S26	J47	152.5	0	152.21	0.61	0.14
S28	J53	152.5	0	152.35	0.17	0.04
S29	J54	152.5	0	152.35	0.16	0.04
S30	J28	152.5	50.55	102.07	0.01	0
S31	J9	152.5	23.66	128.82	0.3	0.08
S32	J31	152.5	13.49	138.95	0.12	0.03
S33	J44	152.5	33.82	118.71	0.09	0.03
S34	J18	152.5	6.74	145.64	0.1	0.02
S35	j33	152.5	6.74	145.61	0.1	0.02
S36	J38	152.5	6.74	145.65	0.39	0.09
S37	J55	152.5	6.74	145.65	0.22	0.05
S38	J50	152.5	3.37	149.02	0.1	0.02
S39	J52	152.5	3.37	148.99	0.39	0.09
S40	J50	152.5	6.74	145.66	0.23	0.06
S41	J22	152.5	50.97	101.6	0.16	0.05
S42	J47	152.5	27.03	125.58	0.11	0.03
S43	J49	152.5	3.37	149	0.17	0.04
S44	J46	152.5	6.75	145.54	0.27	0.07
S45	J46	152.5	54.1	98.53	0.04	0.01
S46	J51	152.5	10.11	142.31	0.09	0.02

Table 5: Flow rate and volumes reporting to the channels

Name	Length (m)	Roughness	Max. |Flow| (m^3/s)	Max. |Velocity| (m/s)	Contributing Area (ha)
C1	178.545	0.015	0.166	0.92	0.47
C2	26.732	0.015	0.19	1.27	0.536
C3	13.169	0.015	0.318	2.35	0.907
C4	86.453	0.015	0.105	0.24	0.306
C5	120.142	0.015	0.082	0.28	0.241
C6	13.483	0.015	0.377	1.67	1.15
C7	208.634	0.015	0.284	1.24	0.778
C8	17.069	0.015	0.594	1.17	1.011
C9	20.89	0.015	0.02	0.48	0.057
C10	2.903	0.015	0.039	0.81	0.111
C11	61.732	0.015	0.02	0.3	0.057
C12	61.244	0.015	0.019	0.44	0.054
C13	21.759	0.015	0.166	1.58	0.472
C14	19.939	0.015	0.026	0.38	0.076
C15	62.209	0.015	0.091	0.8	0.255
C16	88.653	0.015	0.065	0.46	0.182
C17	87.438	0.015	0.049	0.36	0.137
C18	21.643	0.015	0.112	0.44	0.319
C19	99.478	0.015	0.221	1.33	0.639
C20	32.207	0.015	0.492	2.59	1.406
C21	118.508	0.015	0.245	1.46	0.69
C22	12.126	0.015	0.079	0.36	0.222
C23	4.076	0.015	0.323	1.82	0.911
C24	57.165	0.015	0.386	0.57	1.066
C25	67.988	0.015	0.343	1.27	0.987
C26	52.875	0.015	0.094	0.58	0.264
C27	13.411	0.015	1.306	2.59	3.832
C28	29.283	0.015	0.032	0.1	0.085
C29	44.138	0.015	0.073	0.33	0.208
C30	122.149	0.015	0.271	0.95	0.779
C31	68.447	0.015	0.479	0.61	1.011
C32	29.604	0.015	0.172	1.16	0.485
C33	88.716	0.015	0.271	2.17	0.767

C34	49.132	0.015	0.079	0.61	0.222
C35	44.445	0.015	0.022	0.45	0.061
C36	38.649	0.015	0.114	1.31	0.32
C37	28.408	0.015	0.153	1.67	0.432
C38	10.039	0.015	0.191	1.83	0.537
C39	11.749	0.015	0.025	0.22	0.07
C40	67.599	0.015	0.051	0.66	0.147
C41	12.062	0.015	0.024	0.3	0.07
C42	67.546	0.015	0.115	0.85	0.325
C43	29.434	0.015	0.155	0.6	0.437
C44	205.216	0.015	0.154	0.83	0.437
C45	64.388	0.015	0.081	0.96	0.231
C46	0.839	0.015	0.604	2.53	1.725
C47	63.753	0.015	0.119	0.25	0.365
C48	47.464	0.015	0.299	0.79	0.908
C49	27.646	0.015	0.009	0.03	0.02
C50	130.367	0.015	0.183	0.47	0.534
C51	8.177	0.015	0.293	0.44	0.786
C52	8.229	0.015	0.626	0.98	1.852
C53	123.451	0.015	0.569	1.74	1.63
C54	27.127	0.015	0.662	1.41	1.895
C55	198.742	0.015	0.278	0.82	0.786

The 1:50-year flood event was routed through the proposed development area to determine the SWAP volume requirements to contain the 1:50-year flood event. The cumulative flood volumes can be seen in the table below:

Table 6: Flow volumes reporting to the SWAPs

Name	Contributing Area (ha)	Max. Flow (m^3/s)	Total Flow (ML)	Total Flow (m^3)
SWAP 1	1.15	0.377	1.677	1677
SWAP 2	0.111	0.039	0.168	168
SWAP 3	3.832	1.306	5.512	5512
SWAP 4	0.907	0.318	1.376	1376
SWAP 5	0.472	0.166	0.647	647
SWAP 6	1.725	0.604	2.476	2476
SWAP 7	0.911	0.323	1.347	1347

It is important to note that GN704 is very conservative, as it relates to mining activities. There are currently no surface water legislation pertaining to the industrial sector.

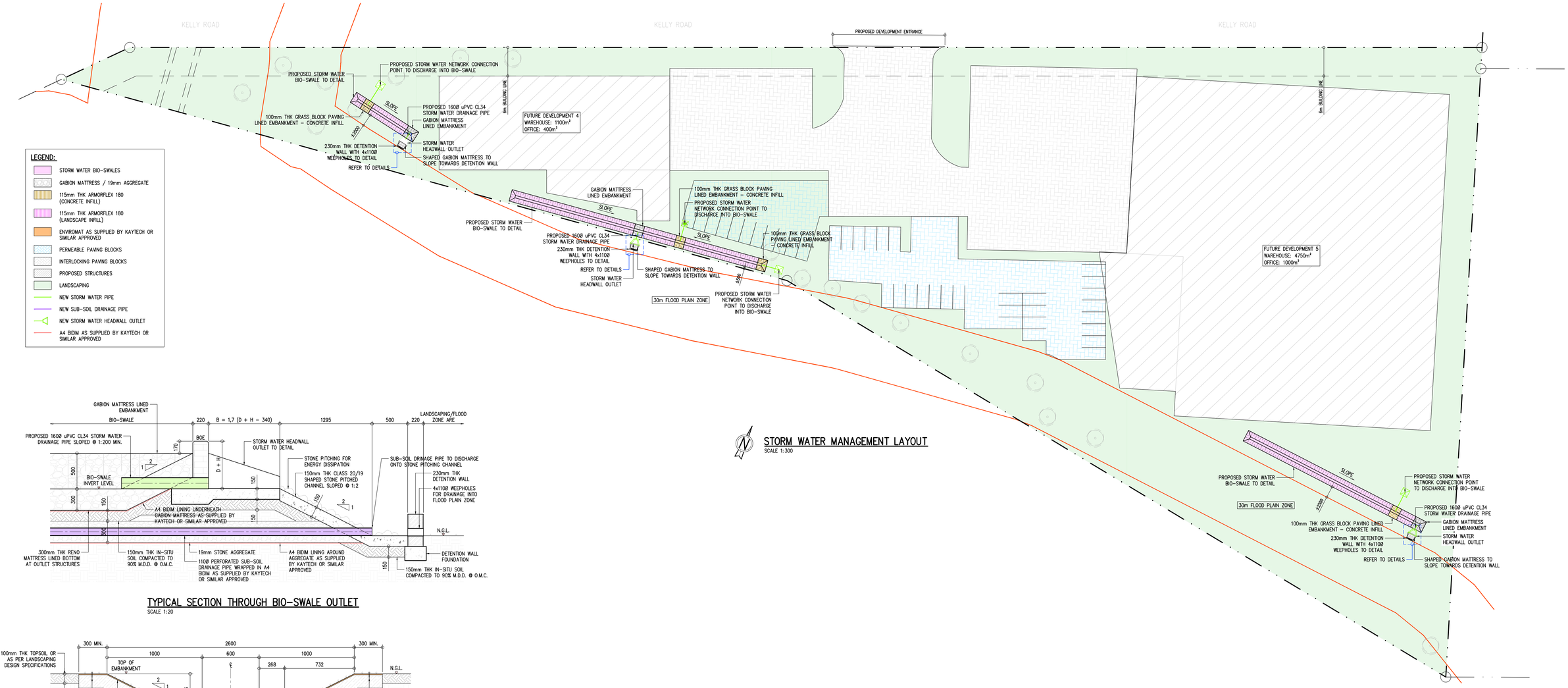
6 RECOMMENDATIONS

Based on observations made during the desktop study and development of the SWMP for the Jet Park Development, the following recommendations are proposed:

- The SWMP should be revisited after any major changes to the current operations.
- The pipes and channels need to be constructed to facilitate routine maintenance (i.e. simple, effectual housekeeping).
- It is recommended that stone pitching channels and concrete pipes are used to transfer runoff. Stone pitching is recommended to reduce high runoff velocities in channels and sulphate-resistant concrete to reduce sulphate content generated in 'dirty' areas with sulphate contaminants.
- To prevent clogging of the grated channel covers and maintain channel capacity, best practice and proper housekeeping practices must be ensured.
- All pipes and channels must be checked after any major rainfall events to ensure that there are no blockages and that the water flow will not be restricted in any way.
- Sediment that accumulates within pipes, channels and retention facilities needs to be removed directly after the storm events and appropriately disposed of to ensure design capacity is maintained.
- It is recommended that the SWAPs be operated empty or at a storage level low enough to accommodate storm water inflows, whilst meeting the required spillage frequency and freeboard requirements.

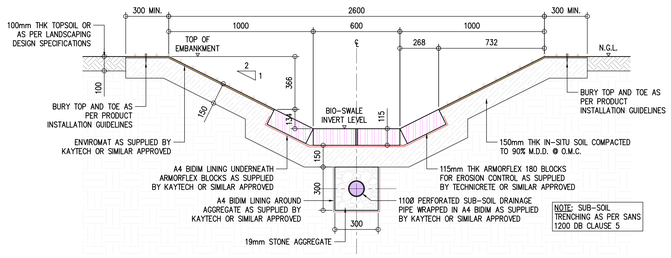
7 REFERENCES

– Mucina, L. and Rutherford, M. C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

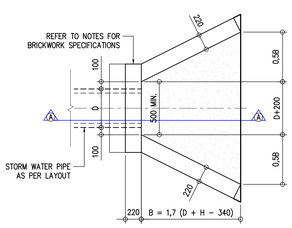


STORM WATER MANAGEMENT LAYOUT
SCALE 1:300

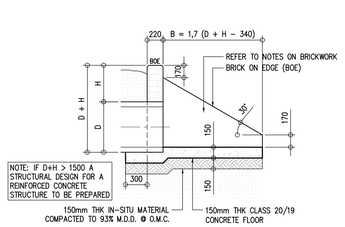
TYPICAL SECTION THROUGH BIO-SWALE OUTLET
SCALE 1:20



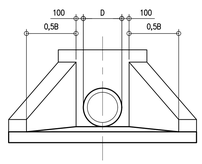
TYPICAL BIO-SWALE CROSS SECTION
SCALE 1:15



PLAN OF TYPICAL STORM WATER OUTLET STRUCTURE



SECTION A–A THROUGH TYPICAL OUTLET STRUCTURE



ELEVATION OF TYPICAL STORM WATER OUTLET STRUCTURE

TYPICAL STORM WATER HEADWALL OUTLET STRUCTURE
SCALE 1:30

OUTLET STRUCTURE NOTES:

APPLICATION:

1. THE TYPICAL STORM WATER OUTLET STRUCTURE MAY ONLY BE USED WHERE;
   - SPECIFIED BY THE ENGINEER
   - THE FLOW VELOCITY AT THE OUTLET PERMITS THE USE
   - D + H < 1500
2. FOR HIGHER FLOW VELOCITIES THE STRUCTURE MUST BE MODIFIED OR ANOTHER TYPE MUST BE USED IN ACCORDANCE WITH THE SPECIFICATIONS OF THE ENGINEER
3. NO SCOURING OR EROSION MAY OCCUR DOWNSTREAM OF THE OUTLET STRUCTURE
4. FOR LARGER STRUCTURES A STRUCTURAL REINFORCED CONCRETE DESIGN IS REQUIRED

MASONRY:

1. MASONRY WALLING SHALL CONFORM IN ALL RESPECTS TO THE REQUIREMENTS OF SANS 10164-1
2. MORTAR SHALL BE CLASS II (COMPRESSIVE STRENGTH OF 7MPa AT 28 DAYS)
3. THE REQUIREMENTS SET OUT IN APPENDIX B OF SANS 10164-1: SHALL BE ADHERED TO UNLESS OTHERWISE APPROVED OR DIRECTED BY THE ENGINEER
4. ALL BRICKS SHALL COMPLY WITH SANS 227 AND SHALL BE ENGINEERING UNITS OF CLASS FBS (FACE BRICK STANDARD) WITH A NOMINAL COMPRESSIVE STRENGTH OF 12MPa

CONCRETE:

1. ALL CONCRETE TO BE CURED FOR A MINIMUM PERIOD OF 7 DAYS

NOTES AND SPECIFICATIONS:

1. CONSTRUCTION:

1.1. ALL CONSTRUCTION, TESTING AND MATERIALS TO COMPLY WITH ALL RELEVANT SANS 1200 SERIES OF SPECIFICATIONS.
1.2. ALL TRENCHING AND BACKFILLING TO COMPLY WITH SANS 1200 DB
1.3. PIPE BEDDING TO BE CLASS B AS PER SANS 1200 LB WITH BEDDING CRADLE OF SELECTED FILL QUALITY

2. MATERIALS:

2.1. ALL CONCRETE STORM WATER PIPES TO BE OGEE CLASS 75D UNLESS OTHERWISE SHOWN
2.2. ALL GRID INLETS IN ROADS AND PARKING AREAS TO BE 450 x 600 H/D WITH HINGED GRATINGS UNLESS OTHERWISE SHOWN
2.3. ALL GABION BASKETS AND RENO MATTRESSES TO BE HEXAGONAL WOVEN MESH. CLASS A GALVANISED OR WITH ADDITIONAL 0.5mm THK GREY PVC COATING, MESH APERTURE OF 80x100mm AND MESH WIRE DIAMTER OF 2.7mm, SALVAGE WIRE DIAMETER OF 3.4mm
2.4. BIDIM LINING UNDERNEATH GABION MATTRESS AND AROUND STONE AGGREGATES TO BE A4 BIDIM AS SUPPLIED BY KAYTECH OR SIMILAR APPROVED

NO	DATE	REVISION	DRAWN	CHECKED
A	10/12/2021	ISSUED FOR INFORMATION	S.V.	R.T.

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SIGNATURE	DATE	12022-008-540.dwg
DESIGNED: S. VENTER	12/2021	SCALE: AS SHOWN
DRAWN: S. VENTER	12/2021	SHEET SIZE: A0
		D&G DRAWING NUMBER: 12022-008-540

CLIENT
CLIENT

ARCHITECT/MAIN AGENT
ICM ARCHITECTURAL STUDIOS

PROJECT
FRASER ALEXANDER
JET PARK X64

DRAWING TITLE
STORM WATER MANAGEMENT LAYOUT AND DETAILS

Stefan Venter

APPENDIX

H EMPR

SABLE PLACE PROPERTIES 131 (PTY) LTD

JET PARK WAREHOUSE DEVELOPMENT: PHASE 3

FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME

GAUT 002/21-22/E3022

2022-01

JET PARK WAREHOUSE DEVELOPMENT: PHASE 3

FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME

SABLE PLACE PROPERTIES 131 (PTY) LTD

TYPE OF DOCUMENT (VERSION)

PROJECT NO.: 41101076
DATE: 2022-01

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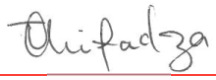
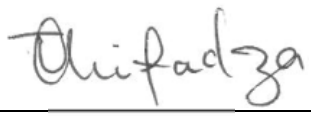
QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Final EMPr			
Date	January 2022			
Prepared by	Tutayi Chifadza			
Signature				
Checked by	Anri Scheepers			
Signature				
Authorised by	Anri Scheepers			
Signature				
Project number	41101076			
Report number	01			
File reference	W:\000 NEW Projects\41101076 - Jet Park Development\42 ES\2-REPORTS\01-Final\EMPr			

SIGNATURES

PREPARED BY



Tutayi Chifadza
Consultant

REVIEWED BY

Anri Scheepers
Principal Consultant

This Final Environmental Management Programme (Report) has been prepared by WSP Environmental Proprietary Limited (WSP) on behalf and at the request of Sable Place Properties 131 (Pty) Ltd (Client), to provide the Client and all interested and affected parties with an understanding of the impacts associated with the proposed project.

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.

PRODUCTION TEAM

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Bokamoso Landscape Architect and Environmental Consultants CC	Lizette Venter

GLOSSARY

ABBREVIATION	MEANING
BA	Basic Assessment
BAR	Basic Assessment Report
CA	Competent Authority
CBA	Critical Biodiversity Area
CR	Critically Endangered
CRR	Comment and Response Report
CVB	Channelled Valley-bottom
DAFF	Department of Agricultural, Forestry and Fisheries
DEFF	Department of Environment, Forestry and Fisheries
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMM	Ekurhuleni Metropolitan Municipality
EMPr	Environmental Management Programme
EN	Endangered
GA	General Authorisation
GDARD	Gauteng Department of Agriculture and Rural Development
HGM	Hydrogeomorphic
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
MAE	Mean Annual Evaporation

ABBREVIATION	MEANING
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
NEMA	National Environmental Management Act
NEM:WA	National Environmental Management: Waste Act
NEMBA	National Environmental Management: Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resource Act
NPAES	National Protected Areas Expansion Strategy
NWA	National Water Act
PPE	Personal Protective Equipment
RISFSA	Road Infrastructure Strategic Framework for South Africa
RQO	Resource Quality Objectives
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SAWS	South African Weather Service
SCC	Species of Conservation Concern
WMA	Water Management Area
WSP	WSP Environmental (Pty) Ltd
WUL	Water Use License

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B EAP DECLARATION OF INTEREST AND UNDERTAKING

C LAYOUT MAP

D REHABILITATION PLAN

E CONCEPTUAL STORMWATER MANAGEMENT PLAN

Kindly note that changes from the Draft to the Final reports are indicated in underlined text

1 INTRODUCTION

1.1 BACKGROUND

Sable Place Properties 131 (Pty) Ltd (Sable) proposes the construction of light industrial warehousing and commercial activities on a site within 32 metres of the edge of a watercourse situated in a critical biodiversity area (CBA) on the remaining extent of Portion 12 (91) of Witkoppie, 64 IR, Boksburg, Johannesburg, City of Ekurhuleni Metropolitan Municipality (EMM), Gauteng Province.

The proposed warehouse requires an environmental authorisation (EA) in terms of the National Environmental Management Act (Act 107 of 1998), as amended (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations, 2014 as amended. WSP Group Africa (Pty) Ltd (WSP) was appointed by Sable as the independent Environmental Assessment Practitioner (EAP) to facilitate the Basic Assessment (BA) process in accordance with the EIA Regulations, 2014, as amended.

The proposed light industrial warehouse is required in order to provide additional storage and operational capacity for national and international companies, due to the site's close proximity to the O.R Tambo International Airport.

Figure 1-1 provides a locality map of the proposed Sable warehousing and commercial activity development where the project will occur.

Figure 1-1: Sable Warehouse Development Locality Map

1.2 TERMS OF REFERENCE AND DETAILS OF THE EAP

WSP was appointed in the role of Independent EAP to undertake the BA processes for the proposed construction and operation of the warehousing and commercial activities. This Environmental Management Programme Report (EMPr) was drafted 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**. The EAP declaration of interest and undertaking is included in **Appendix B**. **Table 1-1** 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 1-1** provides the relevant details of the project proponent.

Table 1-1: Details of the EAP

EAP	**WSP ENVIRONMENTAL (PTY) LTD**
Company Registration:	1995/08790/07
Contact Person:	Anri Scheepers
Postal Address:	P.O. Box 98867, Sloane Park 2151, Johannesburg
Telephone:	011 300 6089
Fax:	011 361 1301
Email:	Anri.Scheepers@wsp.com
EAP Expertise	Anri graduated from the University of Johannesburg with a BA honours in Geography in 2007, and has thirteen years work experience. Anri is an environmental consultant and team coordinator for the Environmental Planning and Advisory Services unit. Anri has been involved in numerous mining and industrial projects in South Africa. Anri has experience with diamond, gold, platinum, chrome, coal and manganese mining and processing operations. The projects include Environmental and Social Impact Assessments, Amendment processes and Environmental Management Programme consolidation and alignment processes. She has project managed numerous multi disciplinary projects in various sectors in South Africa and has experience with the International Finance Corporation Performance Standards and African Development Bank Guidelines. Anri's roles and responsibilities include the management of Environmental Authorisation and Waste Management Licence Processes (Basic Assessments and Scoping and Environmental Impact Assessment Reporting), Water Use Licence Application Processes and Auditing.

1.3 ENVIRONMENTAL MANAGEMENT PROGRAMME STRUCTURE

Table 1-2 cross-references the sections within the EMPr with the legislated requirements as per Appendix 4 of GNR 326.

Table 1-2: Legislation Requirements as Detailed in Appendix 4 of GNR 326

APPENDIX 4	**LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 326**	**RELEVANT REPORT SECTION**
(a)	Details of	

APPENDIX 4	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 326	RELEVANT REPORT SECTION
	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
(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 C**
(d)	A description of the impact management outcomes, 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 4 Section 5 Section 7 Section 8
	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.	
(f)	A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) 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
	ii) Comply with any prescribed environmental management standards or practices;	
	iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	
(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 6.4
(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 6.4
(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
(l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	Section 6

APPENDIX 4	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 326	RELEVANT REPORT SECTION
(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 *"A site specific Environmental Management Programme (EMPr) is included in the DEIR. The EMPr must however comply with the content requirements as stipulated in Appendix 4 of the Environmental Impacts Assessment (EIA) regulations, 2014. The EMPr will need to address behaviour to preserve the untransformed areas of the site and other sensitivities and thus contribute to the principles of sustainable development. The state of the primary vegetation needs to be assessed, hence aspects such as the habitats should also be considered. The measures to safeguard this habitat as well as general conservation principles must be incorporated into the revised EMPr."*	Section 7 Section 6.3.5

1.4 AIMS AND OBJECTIVES

This EMPr is the primary document for managing potential environmental risks and opportunities during the project. It provides the framework for identifying environmental aspects and impacts, and environmental controls and processes to be implemented by the project proponent and contractors in carrying out their respective responsibilities. The EMPr serves as a live document and should be revised and updated to reflect any new information that should arise. The objectives of the EMPr are to:

- Provide effective, site-specific and implementable procedures and mitigation measures to control and monitor environmental impacts of the construction, operation and decommissioning phases, such that the related activities do not adversely impact the environment in the surrounding area.
- Comply with all applicable national laws, regulations, standards and guidelines for the protection of the environment.
- Train employees and contractors with regard to environmental obligations.
- Ensure that during the life of the project, Sable ensures mitigation for negative impacts associated with the pump house upgrade work. An important component of this is the monitoring, evaluation, and communication of findings and adherence to the principle of continuous improvement.

1.5 APPLICABLE DOCUMENTATION

The following document is to be read in conjunction with the EMPr:

- Final BAR for the proposed construction and operation of the warehouse;
- Biodiversity Assessment by The Biodiversity Company;
- Wetland Assessment by WSP;
- Heritage Exemption Letter by Archaetnos ; and
- Wetland Assessment and Rehabilitation Plan by Bokamoso.

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. Environmental protection functions are carried out by different authorities at both national and regional levels. The applicable legislation and policies are shown in **Table 2-1** below.

Table 2-1: Applicable Legislation and Policies

APPLICABLE LEGISLATION AND POLICY	APPLICABILITY 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 responsible for Environmental Affairs (DEFF) may identify activities that may not commence without prior authorisation and make regulations in accordance with the procedures required for such authorisations. Activities identified were published in GNR 983 of 4 December 2014 and amended by GN 327 of 7 April 2017 (Listing Notice 1); GNR 984 of 4 December 2014 and amended by GN 325 of 7 April 2017 (Listing Notice 2); and GNR 985 of 4 December 2014 and amended by GN 324 of 7 April 2017 (Listing Notice 3). The regulations outlining the procedures required for authorisation are published in GNR 982 [Environmental Impact Assessment Regulations (EIA)] (2014). 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, 19 and 27 of GNR 983** and **Listed Activities 12 c (ii) and 14 (ii) c c (iv) of GNR 985** are considered applicable and therefore a BA process must be followed. An EA is required and is being applied for.
Listing Notice 1: GNR 983	*Activity 12 - The development of—* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* **Description:** The proposed warehouse development and commercial facilities, are proposed within 32 metres of a watercourse as measured from the edge of the watercourse.
	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 **Description:**

APPLICABLE LEGISLATION AND POLICY	APPLICABILITY OF LEGISLATION
	The proposed warehouse development and commercial facilities are within the riparian zone of a watercourse. This will entail excavation, removal of soil of more than 10 cubic metres from the watercourse.
	Activity 27 - The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.* **Description:** The proposed warehouse development and commercial facilities will require the clearance of approximately 15 600 m^2 (1.56 hectare) of indigenous vegetation within a CBA area as identified in the Gauteng Conservation Plan.
Listing Notice 3: GNR 985	***Activity 12 –*** *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan—* *c. Gauteng* *(ii) Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans; or* **Description:** The proposed warehouse development and commercial facilities will require the clearance of approximately 15 600 m^2 (1.56 hectare) of indigenous vegetation within a CBA area as identified in the Gauteng Conservation Plan
	Activity 14 – *The development of–* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *Where such development occurs–* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *c. Gauteng* *iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* **Description:** The proposed warehouse development and commercial facilities are proposed within 32 metres of a watercourse as measured from the edge of the watercourse.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) is subsidiary and supporting legislation to the NEMA. The Act is a framework legislation that provides the basis for the regulation of waste management. The Act also contains policy elements and gives a mandate for further regulations to be promulgated. On 29 November 2013 GNR 921 was promulgated (repealing GN R718) which contains a list of waste management activities that, if triggered, require a Waste Management License (WML) and in turn a Basic Assessment (Category A activities) or Scoping and EIA (Category B activities) process to be undertaken in terms of the NEMA EIA Regulations. Category C

APPLICABLE LEGISLATION AND POLICY	APPLICABILITY OF LEGISLATION
	activities are required to comply with the Norms and Standards for Storage of Waste 2013 (GN. 926) and do not require authorisation. It is anticipated that activities on the site will not trigger the NEM:WA. However, waste handling, storage and disposal during the construction and operational phase of the project must be undertaken in accordance with the requirements of this Act and the Best Practicable Environmental Option which will be incorporated into the site specific Environmental Management Programme (EMPr).
National Environmental Management Biodiversity Act (No. 10 of 2004)	The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) was promulgated in June 2004 within the framework of NEMA to provide for the management and conservation of national biodiversity. The NEMBA's primary aims are for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. In addition, the NEMBA provides for the establishment and functions of a South African National Biodiversity Institute (SANBI). SANBI was established in terms of the NEMBA with the primary purpose to report on the status of the country's biodiversity and conservation status of all listed threatened or protected species and ecosystems. The construction of the proposed warehouse is located within a CBA. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. As such, a Biodiversity Assessment was undertaken as part of the BA process with mitigation measures proposed.
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. Section 21 of the Act outlines a number of categories which require a water user to apply for a Water Use License (WUL) and Section 22 requires water users to apply for a General Authorisation (GA) with the Department of Water and Sanitation (DWS) if they are under certain thresholds or meet certain criteria. The list of water uses applicable that require a WUL under Section 21 are presented below: (c) impeding or diverting the flow of water in a watercourse; (i) altering the bed, banks, course or characteristics of a watercourse; It is anticipated that a WUL will be required for the proposed development within 32 metres of a watercourse under Section 21 (c) and (i) of the NWA.
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 300 m in length or a development that exceeds 5 000 m^2 must notify the heritage resources authority and undertake the necessary assessment requested by that authority.

APPLICABLE LEGISLATION AND POLICY	APPLICABILITY OF LEGISLATION
	The construction area will be 15 900 m^2 and as such a heritage assessment has been conducted as part of the proposed development. Construction activities should be conducted carefully and all activities ceased if any archaeological, cultural and heritage resources are discovered. The SAHRA should be notified and investigation conducted before any activities can commence.

3 PROJECT DESCRIPTION

3.1 LOCATION OF THE PROPOSED PROJECT

The proposed development site is located within the Jet Park Extension 64 in Boksburg, within the City of Ekurhuleni Metropolitan Municipality of the Gauteng Province. The site is located approximately 14 km northwest of the Boksburg CBD and 21 km east of the city of Johannesburg.

The majority of the property is already developed and is currently being upgraded/enhanced. However a small portion of the property to the west of Kelly Road is situated in a CBA and within 32 metres of a watercourse.

The majority of the site is currently disturbed from previous activities. The project area has been severely altered from its natural state and only a small section of natural vegetation or habitat remains. The land uses surrounding the project area consist mainly of built up urban and industrial areas. Other impacts within the vicinity of the project area include access roads, dumping, litter, human encroachment, erosion and the presence of alien or invasive plant species.

This application only relates to the development of the portion to the west of Kelly Road, the remainder of the property does not require environmental authorisation as the site was previously developed and/or transformed and is not situated in a CBA.

The proposed development will be situated on the remaining extent of Portion 12 (91) of Witkoppie, 64 IR, Boksburg, Johannesburg and City of Ekurhuleni Metropolitan Municipality, Gauteng Province. The proposed development footprint is shown in **Figure 3-1** below. The site is situated within an urban node and falls within the existing developed area of the EMM Aerotropolis. Access to the site is gained from major routes, most notable the R21, from where it is connected to internal roads. There is an existing access from Kelly Road, which will be formalised. No additional access or access roads are planned.

Figure 3-1: Proposed Development Footprint

The proposed warehouse development will be located on the land parcel outlined in **Table 3-1** within the confines of the site boundary.

Table 3-1: Cadastral Information of the site

DETAILS REQUIRED AS PER GN.R 326 ANNEX 1 (3)	DETAIL
21 Digit Surveyor General Code of each Cadastral Land Parcel	T0IR000000000006400091
Physical Address and Farm Name	26 Kelly Road, Jet Park, Boksburg Remaining extent of Portion 12 (91) of Witkoppie, 64 IR
Landuse Zoning	"Special" for a warehouse, wholesale trading, a workshop and light industrial purposes

The coordinates of the preferred proposed project footprint are shown in **Table** 3-2.

Table 3-2: Coordinates of the Proposed Project Footprint

POINTS	LATITUDE	LONGITUDE
A	26°09'52.85"S	28°13'28.25"E
B	26°09'52.76"S	28°13'29.02"E

POINTS	LATITUDE	LONGITUDE
C	26°10'00.15"S	28°13'32.42"E
D	26°10'01.49"S	28°13'28.21"E
E	26°09'56.45"S	28°13'28.91"E

3.2 LAYOUT AND DESCRIPTION

The proposed light industrial warehouse development will be used as a storage area and for commercial activities. The site will have a warehouse space (5 500 m^2) that will be used for storage (which is the core function). An office space adjoining the warehouse (900 m^2) will also be constructed as part of the project. There will also be another office on the property (1 100 m^2) that will serve the site personnel. The rest of the site will be hardstanding (parking areas) and landscaped with grass and trees / plants following completion of construction activities.

The proposed layout is indicated in **Figure 3-2** and the environmental site sensitivities are indicated in **Figure 3-3**.

Figure 3-2: Proposed Development Layout

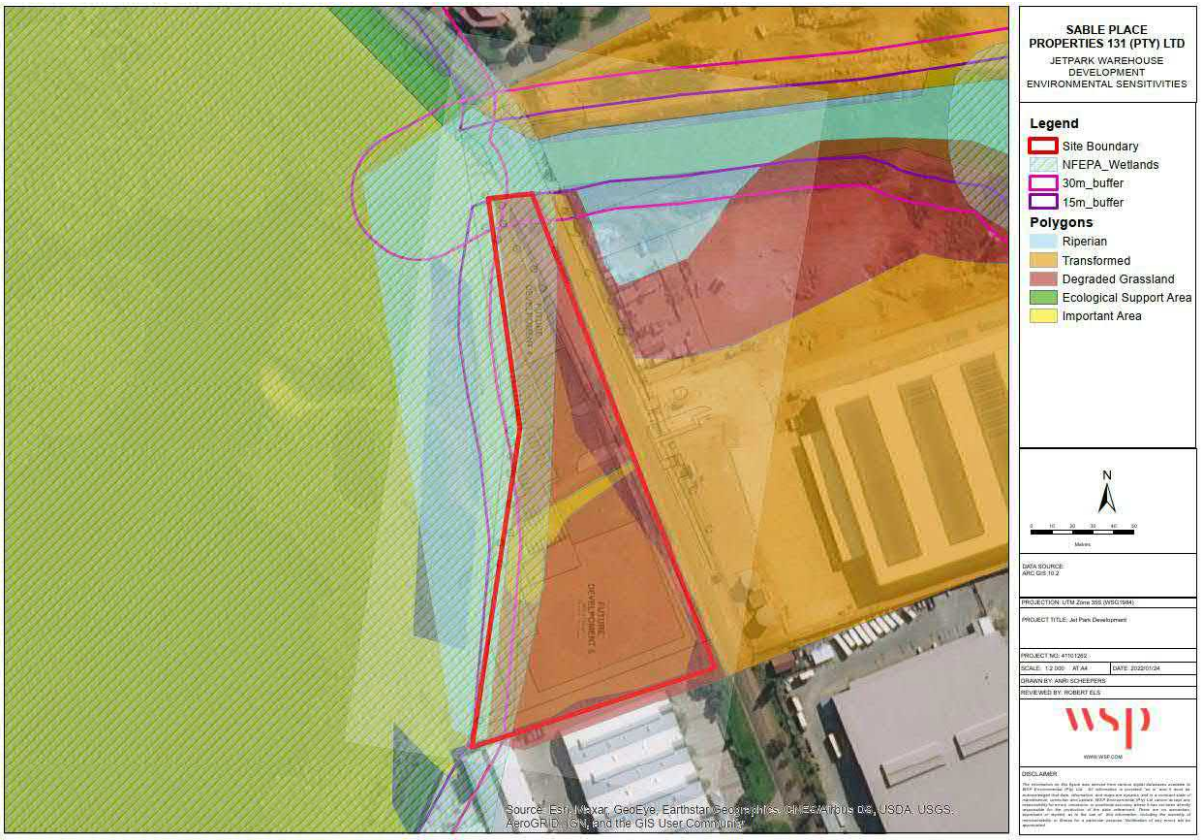


Figure 3-3: Site Environmental Sensitivities

3.2.1 CONSTRUCTION ACTIVITIES

The proposed construction will involve the clearance of vegetation around the project footprint. This involves the clearance of approximately 15 600 m^2 of vegetation within a CBA area and within 32 metres from the edge of a watercourse. The majority of the site is currently disturbed from previous activities. The project area has been severely altered from its natural state and only a small section of natural vegetation or habitat remains. The land uses surrounding the project area consist mainly of built up urban and industrial areas. Other impacts within the vicinity of the project area include access roads, dumping, litter, human encroachment, erosion and the presence of alien or invasive plant species.

Excavations will be done on the site in order to lay foundations for the proposed warehouse. Any topsoil and subsoil removed will be stockpiled and be used for backfilling and rehabilitation of the site once construction activities are complete.

The construction process will follow industry standard methods and techniques. Key activities associated with the construction process are described in **Table 3-3**.

Table 3-3: Construction Activities

ACTIVITY / ASPECT	DESCRIPTION
Site clearance	Site clearance of the small shrubs and grass onsite will be done in order to expose the surface where the warehouse will be constructed. The topsoil will be stripped and stored at a demarcated area on the project footprint.

ACTIVITY / ASPECT	DESCRIPTION
Contractor's facilities and materials lay-down areas	These will be strictly located within already cleared areas at the existing warehouse. Activities within these areas are likely to include: — Temporary offices and administration facilities (e.g. containers, portable cabins). — General materials storage and laydown areas. — Construction of chemicals storage facilities (oil, grease, solvents etc.) and associated infrastructure (bunds, secured / roofed areas etc.). — Chemical toilets and showering facilities (linked to conservancy tanks – removal of contents by exhauster vehicle and disposal at permitted facility). Temporary waste storage areas; these shall be established and managed in accordance with EMPr requirements.
Site access	The proposed development is located within the Jet Park development and is accessed via Kelly Road. The site is to the West of the R21 Road. No new access roads will be required for the project as the proposed development is within an already developed area.
Sourcing of construction materials and equipment	Bulk materials (aggregate, cement, steel etc.) will be sourced from existing lawful commercial sources; there will be no direct mining, harvesting or extraction of natural resources.
Excavation and earthworks	Subject to the determination of founding specifications for the warehouse to be constructed, it is envisaged that earthworks will be required. This is likely to entail: — Levelling and compaction using heavy machinery / earthmoving equipment. — Potential for excavations and trenching in order to prepare foundations. — Piling / drilling depending on the identified construction / founding technique.
Use of general mechanical equipment	This will be undertaken within construction areas and includes the use of generators, cutting and welding equipment, compressors etc.
Working Hours	The construction activities will follow the working hours as will be stipulated by the construction permit when it is issued.
Water demand, supply and storage	During construction, the site personnel will have a contractor laydown area at the proposed development site. Water for use for the project (contractor's use) will be supplied from the surrounding properties who are also owned by Sable and a water reticulation system will be installed for use for warehouse operations. Rainwater harvesting will be investigated for use at the ablution facilities, and in addition grey water will be used for irrigation
Electricity demand and Supply	The site camp will mainly be constituted of storage containers for materials, ablution facilities and the site office. Power to the main contractor's camp and site office will be supplied via use of a diesel powered generator for construction activities while the warehouse will be connected to the Eskom grid during operation. The warehouse facility will ensure that energy efficient lighting is installed throughout, in addition the use of glass will be reduced in order reduce energy losses from the building. The developer will investigate the use of solar energy to enhance energy usage

3.2.2 OPERATIONAL ACTIVITIES

The proposed development will operate as a storage facility and will have receiving and loading bays. Operational activities will mainly involve managing logistics involving movement, unloading and loading of trucks in and around the warehouse facility. There will be intermittent traffic for as and when deliveries are made.

3.2.3 DECOMMISSIONING ACTIVITIES

Decommissioning will be subject to a separate authorisation and impact assessment process as according Activity 31 of Listing Notice 1 of GNR 983, as amended. It is not foreseen that decommissioning will be undertaken in the next 10 years.

3.2.4 WASTE MANAGEMENT

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 by the project. **Table 3-4** describes the different waste products that the proposed project will produce, as well as the various options to dispose of them. Waste will be generated during all project phases. The facility will separate waste, it is anticipated that paper and plastic waste will be sent for recycling where as domestic waste will be collected by the municipality for disposal.

Table 3-4: Waste Management Options

WASTE	TYPE OF WASTE	MANAGEMENT OPTIONS
Hydrocarbons (Contaminated soil)	Hazardous	Fuel and oil spillages can be a source of contamination of water sources and the soil. Management options include: — Using spill kits to clean any spillages; — Ensure storage facilities are maintained and meet industry regulations; — Transportation and storage of fuel must be regulated and correctly managed according to the EMPr; and — All hazardous waste is to be disposed of at a registered hazardous landfill (safe disposal certificates must be obtained).
Contaminated Personal Protective Equipment (PPE)	Hazardous	PPE can be contaminated during handling of hydrocarbons. Management options include: — Store contaminated PPE in hazardous waste skips; and — Ensure contaminated PPE is disposed of at a registered hazardous landfill (safe disposal certificates must be obtained).
Office waste	General	Office waste (inorganic matter) can be disposed of as per normal and form part of the municipal waste management system. — Ensure waste is stored securely in refuse bins or selected areas; and — Co-ordinate waste removal to the local general waste landfill site.
Food waste	General	Food waste is generated as site personnel take their meals on the construction site. Management options include: — Store any waste and packaging into a labelled food waste bin; and — Co-ordinate waste removal to the local general waste site.

3.3 NEEDS AND DESIRABILITY OF THE PROJECT

The Needs and Desirability Guidelines highlights the need to consider how the geographical, physical, biological, social, economic and cultural species of the environment that may be affected by the proposed activity.

There is a high demand of industrial offices and warehouses in close proximity to the O.R Tambo International Airport in order to provide additional storage and operational capacity for national and international companies. The site is situated approximately 6 km from the O.R Tambo International Airport. The site is currently impacted on and the formalisation will assist with improved management of the site and activities taking place. The facility will provide additional storage capacity for other business within the area and companies requiring storage in close proximity to the O.R Tambo. The facility will also generate local employment opportunities.

4 IMPACT ASSESSMENT

A summary of the identified impacts and corresponding (initial and residual) significance ratings for the proposed development is provided in **Table 4-1** below.

Table 4-1: Impact Summary

NO.	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
C1	Generation of Dust and PM	Construction	**Medium**	(-)	**Low**	(-)
C2	Noise	Construction	**Low**	(-)	**Low**	(-)
C3	Soil Erosion	Construction	**Medium**	(-)	**Low**	(-)
C4	Soil Contamination	Construction	**Medium**	(-)	**Low**	(-)
C5	Increased Runoff Sediment Input into Systems	Construction	**Medium**	(-)	**Low**	(-)
C6	Alteration of Flow Patterns	Construction	**Medium**	(-)	**Low**	(-)
C7	Change of Flow Volumes and Drainage Patterns (Groundwater)	Construction	**Medium**	(-)	**Low**	(-)
C8	Deterioration in Water Quality (Groundwater)	Construction	**Medium**	(-)	**Low**	(-)
C9	Loss and fragmentation of flora	Construction	**Medium**	(-)	**Low**	(-)
C10	Increased alien vegetation species	Construction	**Medium**	(-)	**Low**	(-)
C11	Displacement and Fragmentation of Fauna	Construction	**Medium**	(-)	**Low**	(-)
C12	Increase in Local Traffic	Construction	**Low**	(-)	**Low**	(-)
C13	Employee Health and Safety	Construction	**Medium**	(-)	**Low**	(-)
C14	Damage on Palaeontological and Heritage Resources	Construction	**Low**	(-)	**Low**	(-)
C15	Employment Opportunities	Construction	**Low**	(+)	**Medium**	(+)

NO.	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
O1	Scouring or Erosion	Operation	**Medium**	(-)	**Low**	(-)
O2	Alteration of Flow Patterns and Scouring or Erosion	Operation	**Medium**	(-)	**Low**	(-)
O3	Contamination of Artificial System	Operation	**Medium**	(-)	**Low**	(-)
O4	Continued Displacement and Fragmentation of Fauna	Operation	**Medium**	(-)	**Low**	(-)
O5	Traffic	Operation	**Low**	(-)	**Low**	(-)
O6	Health and Safety	Operation	**Medium**	(-)	**Low**	(-)
O7	Employment Opportunities	Operation	**Low**	(+)	**Medium**	(+)

5 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.

5.1 ENVIRONMENTAL OBJECTIVES AND TARGETS

To facilitate compliance to the EMPr, Sable 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 Sable 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 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.

6 MANAGEMENT PROCEDURES AND ADMINISTRATIVE REQUIREMENTS

6.1 ORGANISATIONAL STRUCTURE 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 6-1** below.

Table 6-1: Roles and Responsibilities

RESPONSIBLE PERSON	RESPONSIBILITIES
Project Manager	— Ensure that the Site Manager and the contractor are aware of all specifications, legal constraints and Sable'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 should 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 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 Designated Environmental Officer (DEO) and ECO; — Be fully conversant with all relevant environmental legislation and Sable'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 DEO, 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.
Contractor Designated Environmental Officer (DEO)	— A suitably qualified DEO who would, on a daily basis (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 DEO can either be provided by the contractor or Sable (proof of appointment must be maintained onsite). Responsibilities of the DEO 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 weekly 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 onsite to the Project Manager.
Environmental Control Officer (ECO)	— A suitably qualified ECO who would, on a monthly basis (or as necessary depending on the construction activities), monitor the project compliance with the conditions of the EA and the EMPr; and

RESPONSIBLE PERSON	RESPONSIBILITIES
	— The costs of the ECO shall be borne by Sable (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; — Approve method statements; — Remain employed until the completion of the construction activities; — Hand over responsibilities to the operational team, if necessary; and — 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.
Internal Environmental Manager - Operation	— Monitor environmental performance of the facility and its operations; — Ensure all staff remain aware of their responsibilities in terms of reducing environmental impacts.
Contractors, Staff and Service Providers	— Complying with Sable'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.

6.2 ENVIRONMENTAL METHOD STATEMENTS

Method Statements are written suggestions by the contractor to the ECO in response to the requirements of this EMPr, or as requested by the ECO. The contractor shall be required to prepare Method Statements for several specific construction activities and/or environmental management aspects.

The contractor shall not commence the activity for which a Method Statement is required until the ECO has approved the relevant Method Statement. Method Statements must be submitted and accepted or rejected timeously. Failure to submit a Method Statement may result in suspension of the activity concerned until such time as a Method Statement have been submitted and approved.

The Method Statements shall cover relevant details with regard to:

- Proposed construction works;
- Establishment and management of construction camps including location and extent (this would be indicated on a site plan);
- Delineation of laydown areas / active work areas;
- Sensitive area demarcation (this would be indicated on the site plan in agreement with the wetland rehabilitation specialist);

- Materials and equipment to be utilised;
- Procedures for transporting materials to/from site (entry/exit points and turning areas would be indicated on the site plan);
- Method and location of storage of material (this would be required to be indicated on a site plan);
- Procedures for containment of leaks/spills as well as associated Emergency Response;
- Plan/Spill Contingency Plan;
- Management of construction materials (movement, storage, preparation/handling);
- Management of stormwater;
- Waste management;
- Erosion control/s;
- Equipment maintenance;
- Covid-19; and
- Roles and responsibilities of the Contractor's key personnel concerning environmental management.

This Method Statement will be used in conjunction with the EMPr during project.

6.3 ENVIRONMENTAL AWARENESS PLAN

Legislation (NEMA) requires that Sable 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 should not only be a legal obligation but also as a 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.

Sable will provide appropriate resources to facilitate social and environmental awareness training during the construction and operational phases of the project. Sable 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 should be used to implement and ensure environmental and social awareness and competence.

6.3.1 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;
- Daily operational bulletins;
- Newsletter;
- E-mail;
- Telephone; and
- Induction training.

6.3.2 STANDARD MEETINGS

The Safety, Health and Environmental (SHE) Meetings will be held on a monthly basis, and chaired by Senior Management. During these meetings discussions will be held regarding raising environmental awareness; identifying potential problems, and discussions regarding any complaints received and corrective actions taken.

All employees can also communicate to Senior Management through their reporting lines or by using complaint forms and incident forms to improve communication.

6.3.3 ENVIRONMENTAL AND SOCIAL TALK TOPICS

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

- Protection of untransformed area;
- Water Quality;
- Water Use and Consumption;
- Air Quality i.e. dust;
- Power Consumption and Energy Efficiency;
- Waste Management;
- Fauna and Flora;
- Emergency Procedures;
- Incidents Reporting;
- Systems;
- Noise;
- Heritage Impacts;
- Landowner Etiquette; Speed Limits;
- Health Risks (such as HIV/ Aids); and
- General Awareness (e.g. World Environment Day, National Arbour Day).

6.3.4 GENERAL COMMUNICATIONS

Communication to the community, government, landowners, neighbouring farmers, environmental groups, non-government organisations and other stakeholders should be communicated to ensure environmental and social awareness by means of the existing Environmental Monitoring Committee (EMC). If deemed appropriate, the following means may also be used, where necessary:

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

6.3.5 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 be trained on the requirements of the protection of the untransformed area and the implementation of the Rehabilitation Plan outlined in **Section 8.4**.
- 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 should include the environment, health and safety as well as basic HIV/AIDS education.

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 briefing on the protection of the untransformed areas of the site and other sensitivities;
  - Employees and visitor must be informed about the 30m buffer zone and be advised that no activities are allowed to be undertaken within this area.
  - 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**: The DEO will be responsible for the environmental and social competency and awareness training of Middle Management and supervisors. 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.

6.3.6 COMPLAINTS PROCEDURE

A signboard should be erected at the entrance to the project site, informing the public of the construction activities taking place. Enquiries or complaints should be able to be received from adjacent land-users and / or the community (i.e. stakeholders) through the following channels:

- Contact: Mike Macfarlane
- Telephone number: **011 323 2700**
- Email: **mikem@abbeydale.co.za**

Community enquiries or complaints must be brought to the attention of the Site Manager and ECO who should ensure corrective action and close-out. As a minimum the following information should 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 a response (even if pending further investigation) to be given to the complainant within 7 days.

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

6.4 MONITORING

The following monitoring will be required on site:

- **Construction Phase:** The ECO will undertake monthly audits to ensure compliance with the EMPr and conditions of the EA during the construction activities, and will report to the Site Manager should any non-compliance be identified or corrective action deemed necessary.
- **Operational Phase:** The internal environmental manager will monitor the day-to-day site activities on an ongoing basis and will produce monitoring reports.
- **External Monitoring:** External environmental audits of the EMPr must be undertaken by an independent environmental consultant / ECO upon commencement and completion of the construction activities. The EA will determine the frequency of external audits during the operational phase, however annual external audits are recommended.
- **Functionality of the Wetland.** An external assessment must be undertaken once construction is completed to evaluate the implementation of the Rehabilitation Plan. Once operation commence an assessment needs to be undertaken six monthly for the first three years to determine success of the rehabilitation plan. There after a biennial assessment must be undertaken. The following aspects must be included in the monitoring:
  - alien plant invasion,
  - erosion
  - altered hydrology or geomorphology.

6.5 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.

6.5.1 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 activities the applicable conditions may be included in a management system;

- All persons employed by a contractor or their sub-contractors will 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 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.

6.5.2 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.

6.6 DOCUMENTATION AND REPORTING

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

- A copy of the EA;
- A copy of the EMPr;
- Record of complaints;
- Record of emergencies and incidents;
- Training records; and
- Monitoring reports.

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.

7 ENVIRONMENTAL MANGEMENT 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 7-1** below shows the structure of the EMPr.

Table 7-1: 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, Sable 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 7-2 outlines the EMPr for the proposed project.

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

Table 7-2: 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. — To implement measures to minimise impacts on the environment from the initiation of construction activities through the identification and demarcation of no-go areas, working areas and site camp facilities. 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 internal DEO and an ECO to manage and verify compliance with the EA and EMPr.	Contractor (Site Manager)	Once-Off
	Ensure construction activities remain within the demarcated project footprint.	ECO DEO Site Manager	Construction
	A training plan/programme developed to focus on Environmental, Health and Safety Aspects.	Contractor (DEO)	Construction Operation
	Site clearing must be limited to the footprint of the infrastructure requirements.	ECO Contractor (DEO)	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
		Site Manager	
	Any no go areas identified should be demarcated before the construction or decommissioning commences.	ECO Contractor (DEO) Site Manager	Pre-Construction Pre-Decommissioning
	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 Contractor (DEO)	Construction
	A site layout plan must be compiled indicating the limits of disturbance associated with the proposed development in relation to the identified sensitive areas (i.e. wetland and floodlines). No-Go areas and any stormwater infrastructure must be indicated on this plan along with environmental management plans, particularly erosion and sediment, controls and measures.	ECO Contractor (DEO)	Construction
	Ensure deliveries are done as and when required.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	The road network which surrounds the proposed development will have to be correctly maintained in order to support additional movement of vehicles.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	Since the access road is narrow, ensure that all vehicles do not park along the road but within the site boundary.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	All site vehicles must limit the idle time on the access road.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	Locate firefighting measures onsite, such as fire extinguishers, and make personnel aware of fire prevention and firefighting measures. Firefighting equipment must be securely placed and inspected monthly.	ECO Contractor (DEO)	Construction Operation Decommissioning
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. — 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 maintenance activities must occur on site.	ECO Contractor (DEO)	Construction
	Ensure that the equipment, machinery and vehicles are adequately maintained so as to:	ECO	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
Operation of Equipment, Machinery and Vehicles	— Reduce the potential for spillages of oil, diesel, fuel or hydraulic fluid. — Ensure road-worthiness. — Reduce emissions.	Contractor (DEO) Operator	Operation
	Vehicles bearing open loads of potentially wind-borne materials must be covered or wet down in order to minimise dust entrainment.	Contractor (DEO) Operator	Construction
Traffic Congestion	The movement of 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.	Contractor (DEO) Operator	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). — Health, safety, environmental and community incident and complaints management system register. — Chemicals Management Procedure. — Monitoring and audit reports. — Training records.			
Fuel and Chemical Management	Develop an Incident Classification and Reporting Procedure for fuel and chemical management including storage, handling and spillages.	ECO Contractor (DEO)	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Indicate the location of the fuel and chemical storage area on the layout plans.	Contractor (DEO)	Construction
	In cases where a surface leak occurs during loading and off-loading activities, the spill material will be cleaned using a spill kit.	Contractor (DEO) Operator	Construction
	Securely fence and lock the storage areas to accommodate all hazardous substances such as fuel, oils and chemicals. The storage area floor must be an impermeable surface and suitably bunded as per the requirements outlined in SANS 10089-1 (2008). If storage capacity is triggers licencing, those should be acquired.	ECO Contractor (DEO)	Construction
	Label all liquids (chemicals and hydrocarbons) stored onsite for easy identification. MSDSs for onsite chemicals, hydrocarbon materials and hazardous substances must be readily available. MSDSs must include mitigation measures to ameliorate potential environmental impacts which may result from a spill, incorporating health and safety mitigation measures.	Contractor (DEO)	Construction
	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 Contractor (DEO)	Construction
Health and Safety	Display “no smoking” and “no naked flame” signs in and around the project area, as well as near the hazardous material store.	ECO Contractor (DEO) Operator	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.			

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
— Waste Management Plan (WMP). — Relevant SANS Codes of Practice. — 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 WMP (Section 8.1 of this EMPr). The procedure must be reviewed to ensure compliance with legislative amendments.	Contractor (DEO) Operator	Construction Operation
	All types of waste generated during operation of the proposed use must be disposed of in accordance with the municipal waste disposal requirements.	Contractor (DEO) Operator	Construction Operation
	Train and inform all onsite personnel regarding general waste minimisation, management and disposal as per the WMP.	Contractor (DEO)	Construction Operation
	Prohibit littering and burning of waste onsite.	Contractor (DEO) Operator	Construction Operation
	Place an adequate number of 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.	Contractor (DEO)	Construction
	Retain records of appropriate safety disposal associated with waste removal, transportation and disposal.	Contractor (DEO)	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	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.	Contractor (DEO)	Construction
	Recover, recycle and reuse waste where possible.	Contractor (DEO)	Construction
Hazardous Waste Management	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.	Contractor (DEO)	Construction
	Train and inform all onsite personnel regarding hazardous waste minimisation, management and disposal as per the WMP in Section 8.1 of this EMPr.	Contractor (DEO)	Construction
	Clean areas where hazardous waste spills have occurred and dispose of the hazardous material appropriately. Spill kits must be maintained onsite. Key personnel must be trained on handling spillages.	Contractor (DEO)	Construction
	Retain records of appropriate safety disposal certificates associated with hazardous waste removal, transportation and disposal.	Contractor (DEO)	Construction
	The emergency preparedness and response plan (Section 8.6 of this EMPr) must be implemented. The plan must be placed in key locations around the site, visible to all employees.	Contractor (DEO) Operator	Construction Operation
	Ensure that waste manifest documentation (as per the Waste Classification and Management Regulations – GNR 634) is prepared and maintained for the generation, transportation and disposal of waste.	Contractor (DEO)	Construction
	Report any major spill incidents to the Department within 24 hours of occurrence.	Contractor (DEO)	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
UNTRANSFORMED AREA 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 the untransformed area. — To prevent any disturbance, erosion or contamination of soil resources. — To implement measures to prevent the contamination on surface and groundwater resources. Indicator and Compliance Mechanisms: — Induction training and records. — Monitoring and audit reports.			
Vegetation Management	Implementation of the recommended 30m buffer zone for the systems.	Site Manager Contractor (DEO)	Construction Decommissioning
	No vehicles or equipment are allowed to enter within the untransformed 30m buffer area.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	It is recommended that areas to be developed be specifically demarcated so that during the construction / decommissioning phase, only the demarcated areas be impacted upon and prevent movement of workers into sensitive surrounding environments.	Site Manager Contractor (DEO)	Construction Decommissioning
	No development related activities should take place within the identified wetland and wet grasslands boundaries or associated buffer zones around delineated sensitive areas.	Contractor (DEO) Operator	Construction Operation Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Operational Limit disturbance to identified systems and surrounding environment (buffers). Implementation of an operational management plan	Site Manager Contractor (DEO)	Operation
	It is recommended that an alien invasive plant management programme be implemented in compliance of section 75 of the NEMBA.	Contractor (DEO) Operator	Construction Operation Decommissioning
	Areas that are cleared during construction / decommissioning or where alien plant species are removed, should be revegetated with appropriate, indigenous plant species. Species which are endemic to this specific region would be the most preferable.	Contractor (DEO)	Construction Decommissioning
	Removal should be done in an appropriate manner and no excessive damage to surrounding plant species should be allowed.	DEO Contractor	Post Construction Decommissioning
	Plant trees or shrubs as a screen, or even the construction of a wildlife-friendly wall (ideally with small openings near the ground so that small animals can move through)	DEO Contractor	Post Construction
	The use of herbicides should be minimised as far as possible or ideally, not used at all, especially in wetland areas.	Site Manager DEO	Pre-Construction Decommissioning
Fauna Management	No trapping, killing or poisoning of any wildlife is to be allowed, including snakes, birds, lizards, frogs, insects or mammals, and all workers (including contractors) need to be informed of this.	Contractor (DEO) Operator	Construction Operation Decommissioning
	Once construction is complete, measures must be put in place to reduce the presence of people into wetland area.	Operator	Operation
	The use of artificial lighting in these wetland and pan areas is not recommended.	Contractor (DEO)	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
		Operator	Operation
Soil and Land Management	Landscape the area so that there is a free flow of water, without being erosive, thus increasing the catchment area.	Site Manager Contractor (DEO)	Construction Decommissioning
Water Management	The CVB system should undergo rehabilitation to improve the functionality and current state of the system. This will also provide an opportunity for aesthetic and recreational improvements for the occupancies of the proposed development.	Site Manager Contractor (DEO)	Construction
	An operational monitoring programme should be put in place to monitor any long-term changes in integrity and functionality of the identified systems. Any changes to their state should be reported and mitigated. The major aspects requiring monitoring include: alien plant invasion, erosion and altered hydrology or geomorphology.	Site Manager Contractor (DEO)	Construction Operation
	Implement the wetland rehabilitation and management plan as outlined in **Section 8.4**.	Site Manager Contractor (DEO)	Construction Operation
Waste Management	Prohibit littering and burning of waste within the untransformed buffer area.	Contractor (DEO) Operator	Construction Operation
	Place an adequate number of general waste bins around the buffer area in order to minimise littering. None of the bins must be placed within the buffer area. The bins must be removed from the site on a regular basis for disposal at a registered or licensed disposal facility.	Operator	Operation
	The buffer area must be inspected and cleaned on a monthly basis.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
General Management	Employees must be trained on the requirements of the protection of the untransformed area and the implementation of the Rehabilitation Plan outlined in **Section 8.4**.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	Employees and visitor must be informed about the 30m buffer zone and be advised that no activities are allowed to be undertaken within this area, refer to **Appendix C** for the buffer area.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	The protection of the untransformed area must be included in the monthly environmental and social topics. This topic must be discussed at least twice a year.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	The buffer zone must be indicated on facility layout and must be displayed at the reception area. Refer to **Appendix C** for the demarcated area.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	The buffer zone must be clearly demarcated using weatherproof signage.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	The monitoring requirements outlined in **Section 6.4** must be implemented.	Site Manager	Construction Operation Decommissioning

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: — Induction training and records. — Monitoring and audit reports.			
Vegetation Management	It is recommended that areas to be developed be specifically demarcated so that during the construction / decommissioning phase, only the demarcated areas be impacted upon and prevent movement of workers into sensitive surrounding environments.	Site Manager Contractor (DEO)	Construction Decommissioning
	No development related activities should take place within the identified wetland and wet grasslands boundaries or associated buffer zones around delineated sensitive areas.	Contractor (DEO) Operator	Construction Operation Decommissioning
	The existing access routes (maintenance roads) and walking paths must be made use of, and no creation of any new routes, except for within the project site.	ECO Contractor (DEO)	Construction Decommissioning
	All building materials should be mixed off site and storage of all building materials limited to the clarifier area and transported along the existing roads, to limit the development footprint to transformed areas.	Site Manager Contractor (DEO)	Construction Decommissioning
	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.	Contractor (DEO)	Construction Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	It is recommended that all NEMBA Category 1b alien plant species found during construction, be removed according to best practice guidelines and all efforts should be made to prevent further growth of other alien or invasive plant species.	Contractor (DEO)	Construction Decommissioning
	It is recommended that an alien invasive plant management programme be implemented in compliance of section 75 of the NEMBA.	Contractor (DEO) Operator	Construction Operation Decommissioning
	Removal should be done in an appropriate manner and no excessive damage to surrounding plant species should be allowed.	DEO Contractor	Post Construction Decommissioning
	The use of herbicides should be minimised as far as possible or ideally, not used at all, especially in wetland areas.	Site Manager DEO	Pre-Construction Decommissioning
	Limit the construction area to the defined project areas and only impacting those areas where it is unavoidable to do so otherwise.	Contractor (DEO) Operator	Construction Decommissioning
	It should be made an offence for any staff to bring any plant species into any portion of the project site, including offices. No plant species whether indigenous or exotic should be brought into the project area, to prevent the spread of exotic or invasive species.	Contractor (DEO)	Construction Decommissioning
	Compile and implement an alien vegetation management plan for the entire site, including the surrounding project area.	Contractor (DEO)	Construction Decommissioning
	Areas that are cleared during construction / decommissioning or where alien plant species are removed, should be revegetated with appropriate, indigenous plant species. Species which are endemic to this specific region would be the most preferable.	Contractor (DEO)	Construction Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Plant trees or shrubs as a screen, or even the construction of a wildlife-friendly wall (ideally with small openings near the ground so that small animals can move through)	DEO Contractor	Post Construction
	Rehabilitate and de-weed areas that have been disturbed by construction activities, to avoid occupation by alien species.	Contractor (DEO)	Post Construction
Fauna Management	If any faunal species are recorded during construction / decommissioning, activities should temporarily cease, to allow fauna to move away. Faunal species that have not moved away should be carefully and safely removed, if permitted, to a suitable location beyond the extent of the development footprint.	Contractor (DEO)	Construction Decommissioning
	No trapping, killing or poisoning of any wildlife is to be allowed, including snakes, birds, lizards, frogs, insects or mammals, and all workers (including contractors) need to be informed of this.	Contractor (DEO) Operator	Construction Operation Decommissioning
	If permissible, construction / decommissioning shouldn't take place within the period from dusk to dawn, as much as possible	Contractor (DEO)	Construction Decommissioning
	Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the surrounding environment	Contractor (DEO) Operator	Construction Operation Decommissioning
	Once construction is complete, measures must be put in place to reduce the presence of people into wetland area.	Operator	Operation
	The use of artificial lighting in these wetland and pan areas is not recommended.	Contractor (DEO) Operator	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Screening of the drainage line and wetland will provide a safer and quieter zone for wildlife to move through.	Contractor (DEO) Operator	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 (DEO)	Construction
	Where possible, consider conducting construction activities during winter where rainfall is minimal.	Site Manager Contractor (DEO)	Construction Decommissioning
	Only the identified areas should be cleared of vegetation. This should be done in stages as construction works progress, if possible.	Site Manager Contractor (DEO)	Construction Decommissioning
	Implement stormwater management measures that will help to reduce the speed of the water. These measures must also assist with the prevention of water pollution, erosion and siltation.	Site Manager Contractor (DEO)	Construction Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	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.	Contractor (DEO) ECO	Construction Decommissioning
	Any exposed earth should be rehabilitated promptly, and this could include planting suitable vegetation (vigorous indigenous grasses) that mimics the surrounding environment to protect the exposed soil.	Site Manager Contractor (DEO)	Construction Decommissioning
	If excavations or foundations fill up with stormwater, these areas should immediately be drained and measures to prevent access to these areas should be implemented.	Site Manager Contractor (DEO)	Construction Decommissioning
	Erosion control measures should be implemented during the construction phase on large exposed areas and where stormwater is temporarily channelled.	Site Manager Contractor (DEO)	Construction Decommissioning
	Landscape the area so that there is a free flow of water, without being erosive, thus increasing the catchment area.	Site Manager Contractor (DEO)	Construction Decommissioning
	All construction vehicles, plant, machinery and equipment must be properly maintained to prevent leaks.	Site Manager Contractor (DEO)	Construction Decommissioning
	Plant and vehicles are to be repaired immediately upon developing leaks.	Site Manager Contractor (DEO)	Construction Operation Decommissioning
	Drip trays shall be supplied for all idle vehicles and machinery.	Site Manager Contractor (DEO)	Construction Operation Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	No repair work may be undertaken on machinery onsite or campsite area.	Site Manager Contractor (DEO)	Construction Decommissioning
	Drip trays are to be utilised during daily greasing and re-fuelling of machinery and to catch incidental spills and pollutants.	Site Manager Contractor (DEO)	Construction Decommissioning
	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 Contractor (DEO)	Construction Decommissioning
	Ensure appropriate handling of hazardous substances.	Site Manager Contractor (DEO)	Construction Operation Decommissioning
	Keep spill kits onsite and train personnel to use them appropriately.	Site Manager Contractor (DEO)	Construction Operation Decommissioning
	Fuels and chemicals must be stored in adequate storage facilities that are secure, enclosed and bunded.	Site Manager Contractor (DEO)	Construction Operation Decommissioning
	Implement stormwater management measures that will help to reduce the speed of the water flows. These measures must also assist with the prevention of wider range of the site.	Site Manager Contractor (DEO)	Construction Operation Decommissioning

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.			
Surface Water Management – Stormwater Management	Implementation of the recommended buffer zone for the systems.	Site Manager Contractor (DEO)	Construction Decommissioning
	The site should contoured to allow for surface water to readily drain away and to prevent ponding of water.	Site Manager Contractor (DEO)	Construction
	The stormwater management should be revisited after any major changes to the current operations.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	The stormwater management system for the proposed development must be designed to ensure that runoff regimes post-construction activities matches that regimes pre-construction (i.e. without resulting in increased peak discharge to water resources, soil saturation in non-wetland areas and erosion/ sedimentation).	Site Manager Contractor (DEO) Operator	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Use of sediment curtains to curtail the sedimentation of the surrounding watercourses must be investigated.	Site Manager Contractor (DEO) Operator	Construction Operation
	Intrusion into the buffer must be limited and minimised to ensure the construction footprint and time is minimised as far as possible.	Site Manager Contractor (DEO)	Construction
	All outlets must be designed to dissipate the energy of outgoing flows to levels that present a low erosion risk.	Site Manager Contractor (DEO)	Construction
	The CVB system should undergo rehabilitation to improve the functionality and current state of the system. This will also provide an opportunity for aesthetic and recreational improvements for the occupancies of the proposed development.	Site Manager Contractor (DEO)	Construction
	An operational monitoring programme should be put in place to monitor any long-term changes in integrity and functionality of the identified systems. Any changes to their state should be reported and mitigated. The major aspects requiring monitoring include: alien plant invasion, erosion and altered hydrology or geomorphology.	Site Manager Contractor (DEO)	Construction Operation
	Implement the wetland rehabilitation and management plan as outlined in **Section 8.4**.	Site Manager Contractor (DEO)	Construction Operation
	Maintain a 30m buffer around the pan and wetland.	Site Manager Contractor (DEO)	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	The use of open, grass-lined channels/swales and stone-filled infiltration ditches is recommended for consideration rather than closed culvert type piped systems or impermeable concrete V-drains within the development footprint	Site Manager Contractor (DEO)	Construction
	The use of multiple smaller outlets must be considered over one/few larger stormwater outlets. This will result in diffuse surface flow and minimise flow concentration and erosion. As far as possible, all stormwater detention and attenuation and outlet structures must be located outside of systems and their respective buffer/exclusion zones with some allowance for outlet protection e.g. reno-mattresses or rock packs)	Site Manager Contractor (DEO)	Construction
	All outlets must be designed to dissipate the energy of outgoing flows to levels that present a low erosion risk	Site Manager Contractor (DEO)	Construction
	Operational Limit disturbance to identified systems and surrounding environment (buffers). Implementation of an operational management plan.	Site Manager Contractor (DEO)	Operation
	The pipes and channels need to be constructed to facilitate routine maintenance (i.e. simple, effectual housekeeping).	Site Manager Contractor (DEO)	Operation
	It is recommended that stone pitching channels and concrete pipes are used to transfer runoff. Stone pitching is recommended to reduce high runoff velocities in channels and sulphate-resistant concrete to reduce sulphate content generated in 'dirty' areas with sulphate contaminants.	Site Manager Contractor (DEO)	Operation
	To prevent clogging of the grated channel covers and maintain channel capacity, best practice and proper housekeeping practices must be ensured.	Site Manager Contractor (DEO)	Operation
	All pipes and channels must be checked after any major rainfall events to ensure that there are no blockages and that the water flow will not be restricted in any way.	Site Manager Contractor (DEO)	Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Sediment that accumulates within pipes, channels and retention facilities needs to be removed directly after the storm events and appropriately disposed of to ensure design capacity is maintained.	Site Manager Contractor (DEO)	Operation
	It is recommended that the storm water attenuation facilities be operated empty or at a storage level low enough to accommodate storm water inflows, whilst meeting the required spillage frequency and freeboard requirements.	Site Manager Contractor (DEO)	Operation
Groundwater Management	Construction areas should be demarcated in order to prevent creation of pathways to contaminating groundwater through these systems.	Site Manager Contractor (DEO)	Construction
	During construction contractors used for the project must have spill kits available to ensure that any fuel or oil spills are cleaned-up and discarded correctly.	Site Manager Contractor (DEO)	Construction
	As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site.	Site Manager Contractor (DEO)	Construction
	All chemicals and toxicants during construction and operation must be stored in bunded areas.	Site Manager Contractor (DEO)	Construction
	All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site.	Site Manager Contractor (DEO)	Construction
	All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”.	Site Manager Contractor (DEO)	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation).	Site Manager Contractor (DEO)	Construction Operation
	Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems.	Site Manager Contractor (DEO)	Construction
Fire	Follow the fire management plan (Section 8.5 of this EMPr) for fire management. Contractors must prove compliance with the emergency response plan.	Site Manager Contractor (DEO) Operator	Construction Operation
	No open fires to be permitted on construction sites. Fires must only be made within the construction camp and only in areas and for purposes approved by the ECO.	Site Manager Contractor (DEO)	Construction
	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.	Site Manager Contractor (DEO)	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 to be a fire hazard.	Site Manager Contractor (DEO)	Construction
	Provide suitable fire control measures. No smoking shall be allowed in areas of natural habitat where accidental fires could occur. Follow the fire management plan (Section 8.5 of this EMPr) to curb any accidental fires.	Site Manager Contractor (DEO)	Construction
	All activities where a threat of potential fire is identified shall comply with minimum fire control regulations.	Site Manager Contractor Operator	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
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. — Health, safety, environmental and community incident and complaints management system register. — Monitoring and audit reports. — Records of PPE. — Incident Classification and Reporting Management Procedure.			
Noise	Fit equipment, machinery and vehicles generating excessive noise with appropriate noise abatement measures, if deemed necessary, and undergo regular maintenance to ensure optimum efficiency during operation.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	Provide a complaints register to report any excessive noise incidents.	Site Manager Contractor (DEO)	Construction Decommissioning
	Onsite employees must be provided relevant PPE. Onsite personnel are responsible for maintaining their PPE and implementing it during construction activities.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	Ensure regular maintenance of equipment to reduce the generation of additional unwanted noise.	Site Manager	Construction

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
		Contractor (DEO)	Decommissioning
	Provincial noise regulations as outlined in Provincial Notice No. 5479 of 1999: Gauteng Noise Control Regulations must be complied with at all times.	Site Manager Contractor (DEO) Operator	Construction Operation Decommissioning
	During construction phase, construction equipment may only operate between the hours of 08h00 and 17h00 on weekdays, 08h00 and 13h00 on Saturdays, with operation being prohibited on Sundays and Public Holidays.	Site Manager Contractor (DEO)	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	In the event that an artefact or heritage site be uncovered, work in the vicinity must cease, representatives of the SAHRA must be contacted and an archaeological consultant must be appointed to assess the site. Work must only resume, once clearance is given in writing by the archaeological consultant. The chance find procedure must be followed.	Site Manager Contractor (DEO)	Construction
	Construction activities should be conducted carefully and all activities ceased if any archaeological, cultural and heritage resources are discovered. The SAHRA should be notified and investigation conducted before any activities can commence.	Site Manager Contractor (DEO)	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. — Incident Classification and Reporting Management Procedure. — 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	An HSE officer is to be appointed who will monitor safety conditions during construction / decommissioning activities.	Site Manager Contractor (DEO)	Construction Decommissioning
	Ensure employees are properly trained to use specific equipment or machinery.	Contractor (DEO)	Construction Decommissioning
	Train personnel on how to deal with snake encounters, as well as encounters with other dangerous animals known to occur in the area.	Contractor (DEO) Operator	Construction Operation Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Provide suitable personal protective equipment (PPE).	Contractor (DEO) Operator	Construction Operation Decommissioning
	Conduct site and safety induction to raise awareness of the risks associated with the site.	Contractor (DEO) Operator	Construction Operation Decommissioning
	Conduct regular toolbox talks as refreshers to improve health and safety.	Contractor (DEO) Operator	Construction Operation Decommissioning
	Develop safe work instruction method statements that should be used by employees in completing their tasks.	Contractor (DEO) Operator	Construction Operation Decommissioning
	Train all relevant personnel on handling, use and storage of hazardous substances.	Contractor (DEO) Operator	Construction Operation Decommissioning
	Provide MSDS for all hazardous substances kept onsite.	Contractor (DEO) Operator	Construction Operation Decommissioning
	All visitors should undergo site induction and be made aware of the risks associated with the site.	Contractor (DEO) Operator	Construction Operation

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
			Decommissioning
	Develop an emergency preparedness plan and incident procedure. Train site personnel on understanding the procedure and its implementation via toolbox talks and induction.	Contractor (DEO) Operator	Construction Operation Decommissioning
	Task based risk assessments must be in place for specific tasks (loading, stacking, working at heights).	Contractor (DEO) Operator	Construction Operation Decommissioning
	Train all relevant personnel on handling, use and storage of hazardous substances	Contractor (DEO) Operator	Construction Operation Decommissioning
	Store hazardous substances in a bunded, locked, roofed and ventilated storage area	Contractor (DEO) Operator	Construction Operation Decommissioning
	Provide MSDS for all hazardous substances kept onsite	Contractor (DEO) Operator	Construction Operation Decommissioning
	All spillages must be cleaned up to prevent personnel from slipping	Contractor (DEO) Operator	Construction Operation Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
	Ensure that the fire fighting equipment is well maintained and that “No Smoking” or “No Flame” signs are put up around the warehouse. A trained firefighter must be appointed	Contractor (DEO) Operator	Construction Operation Decommissioning
	First aid kits must be available onsite along with trained appointed first aiders	Contractor (DEO) Operator	Construction Operation Decommissioning
	Provide onsite personnel with sufficient potable water for drinking.	Site Manager Contractor	Construction Decommissioning
	Implement Covid-19 Measures.	Site Manager Contractor Operator	Construction Operation Decommissioning
Public Safety	Restrict public access.	Site Manager Contractor Operator	Construction Operation Decommissioning
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.			

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
Local Awareness Training	As far as possible, contractors and labour must be sourced locally from within the local communities.	Project Manager Contractor Operator	Construction Operation
	Train employees to gain skills they can use in the future.	Project Manager Contractor Operator	Construction Operation
	Consult with local communities to boost local business.	Project Manager Contractor Operator	Construction Operation
AIR QUALITY			
Objectives: — To ensure that air quality impacts to the surrounding area is kept to a minimum or mitigated as far as possible. — To ensure that odour impacts to the surrounding environment are minimal or mitigated Indicator and Compliance Mechanisms: — Maintenance records. — Incident reporting system. — Induction training and records. — Health, safety, environmental and community incident and complaints management system register. — Monitoring and audit reports. — Air Quality Impact Assessment. — Records of PPE.			

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
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 (DEO)	Construction Decommissioning
	All stockpiles must be restricted to designated areas and must not exceed a height of two (2) metres.	Site Manager Contractor (DEO)	Construction Decommissioning
	All materials transported to or from 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 (DEO)	Construction Decommissioning
	Ensure that all vehicles and machines are adequately maintained to minimise emissions.	Site Manager Contractor (DEO)	Construction Decommissioning
	No burning of waste, such as plastic bags, cement bags and litter is permitted.	Site Manager Contractor (DEO)	Construction Decommissioning
	It is recommended that the clearing of vegetation from the site must be selective and done just before construction / decommissioning 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 or stabilised.	Site Manager Contractor (DEO)	Construction Decommissioning
	All issues/complaints must be recorded in the complaints register.	Site Manager Contractor (DEO)	Construction Decommissioning

ACTIVITY/ASPECT	ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURE	RESPONSIBLE PERSON	PRIORITY TIMEFRAME
REHABILITATION			
Objectives: — To return disturbed sites to a natural state characteristic to the area.			
Rehabilitation and Landscaping	Re-vegetate areas disturbed by excavations and site laydown using indigenous species for rehabilitation.	Site Manager Contractor (DEO)	Post Construction
	All areas disturbed by construction activities must be inspected for contamination, remediated if necessary and then maintained/landscaped to ensure efficient stormwater drainage.	Site Manager Contractor (DEO)	Post Construction

8 MANAGEMENT PLANS

A number of generic management plans have been included in the EMPr. The plans included below provide an indication of the requirements that must be followed on the proposed construction of the storage warehouse. It must be noted that many of these plans can be updated at any stage depending on any changes that may occur on the site.

The following specific plans have been compiled:

- Waste Management Plan;
- Alien / invasive Plant Management Plan;
- Plant Rescue and Protection Plan;
- Re-vegetation and Habitat Rehabilitation Plan;
- Fire Management Plan;
- Emergency Response Plan;
- Stormwater Management Plan; and
- Erosion Management Plan.

8.1 WASTE MANAGEMENT PLAN

8.1.1 WASTE HIERARCHY

A waste is any solid, liquid or contained gaseous material that is being discarded by, disposal, recycling, burning or incineration. Waste management options for a particular waste need to be considered according to the Waste Management Hierarchy (**Figure 8-1**) which reflects the relative sustainability of each of the options. One of the key principles underlying the waste management hierarchy is to ensure that waste is dealt with as high up the waste hierarchy as possible. Since all waste disposal options have some impact on the environment, the only way to avoid impact is not to produce waste in the first place, and waste reduction is therefore at the top of the hierarchy. Re-use, followed by recovery techniques (recycling, composting and generating energy from waste) follow, while disposal to landfill or by incineration (the worst options) are at the bottom of the hierarchy.

In deciding on the most appropriate disposal route, both environmental and economic costs and benefits need to be considered. This decision should be reached taking into account all the costs and impacts associated with waste disposal, including those associated with the movement of waste.

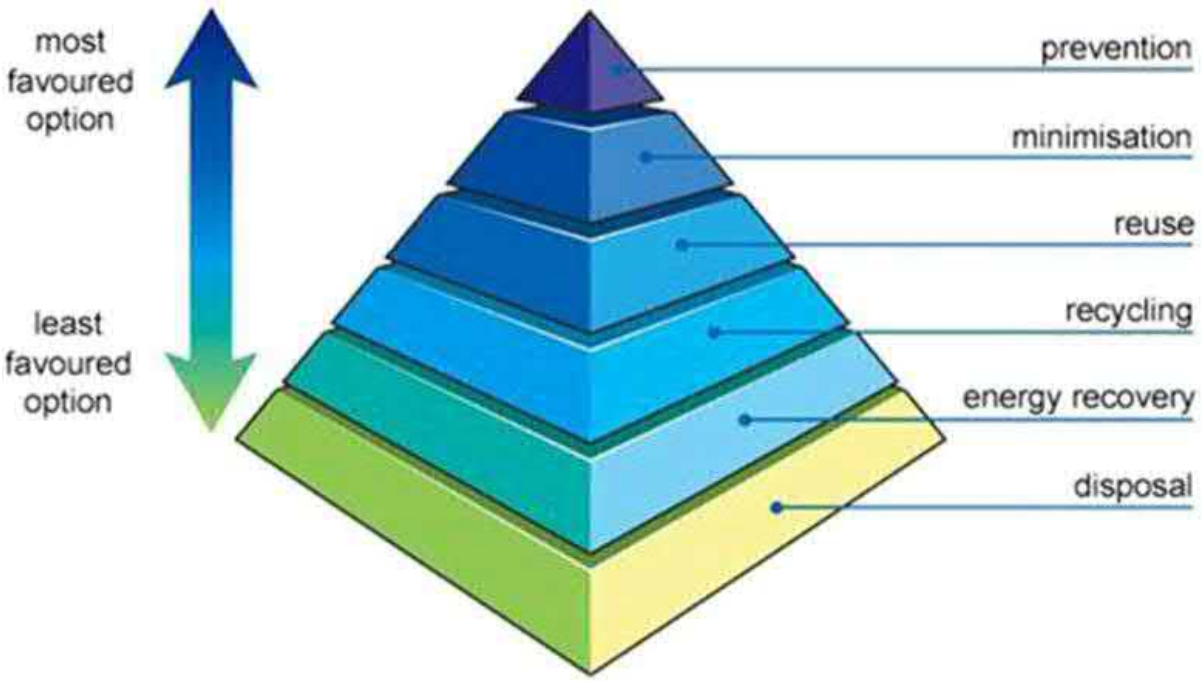


Figure 8-1: Waste Hierarchy

8.1.2 PROJECT STAGES

The purpose of this section is to assess the construction and operational processes of the facility in order to identify short comings, like raw materials procurement, infrastructure, employee training, health and safety, transportation, storage, compliance with legislative requirements, emergency preparedness and waste streams arising from an operation and its related activities, as well as the current waste management practices per waste stream. The assessment serves as the baseline against which any problem areas or gaps in waste management practises, process technology and environmental authorisations are identified and against which future performance objectives, activities and targets can be set.

The project stages are described below with the waste generation and management methods described in the corresponding tables below them including:

- Details on how waste will be managed during the construction, operational phases taking into consideration the waste management hierarchy;
- Details of the procedure for the separation of non-recyclable and recyclable waste;
- Details of the management of non-recyclable waste i.e. how waste will be stored on site during construction and operational phases, including the frequency for the removal of waste from the site and an indication of the landfill site where it will be disposed;
- Details for the management of recyclable waste e.g. the type of waste materials that will be recycled on site and the details pertaining to the offloading, sorting, handling, storage and collection procedures for the waste types (e.g. compaction and bailing, breaking of glass etc.); and
- The frequency for the removal of waste from the proposed development to where it will be finally managed must be included.

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 site. **Table 8-1** describes the different waste products that the proposed project will produce, as well as the various options to dispose of them. Waste will mainly be generated during both construction activities when contractors spend considerable amount of time on the site. During operation, contractors are only on the site for limited amount of time as and when maintenance is required.

Table 8-1: Waste Management Options

WASTE	TYPE OF WASTE	MANAGEMENT OPTIONS
Hydrocarbons (Contaminated soil)	Hazardous	Fuel and oil spillages can be a source of contamination of water sources and the soil. Management options include: — Using spill kits to clean any spillages; — Ensure storage facilities are maintained and meet industry regulations; — Transportation and storage of fuel must be regulated and correctly managed according to the EMPr; and — All hazardous waste is to be disposed of at a licenced hazardous landfill (safe disposal certificates must be obtained).
Contaminated Personal Protective Equipment (PPE)	Hazardous	PPE can be contaminated during handling of hydrocarbons. Management options include: — Store contaminated PPE in hazardous waste skips; — Ensure contaminated PPE is disposed of at a registered hazardous landfill (safe disposal certificates must be obtained).
Office waste	General	Office waste (inorganic matter) can be disposed of as per normal and form part of the municipal waste management system. — Ensure waste is stored securely in refuse bins or selected areas; and — Co-ordinate waste removal to the local general waste landfill site.
Food waste	General	Food waste is generated as site personnel take their meals on the construction site. Management options include: — Store any waste and packaging into a labelled food waste bin; and — Co-ordinate waste removal to the local general waste site.

8.1.3 WASTE MANAGEMENT ROLES AND RESPONSIBILITIES

In order to facilitate effective waste management, the relevant authorities, roles and responsibilities shall be defined, documented and communicated within, and through implementation of, the WMP. Management shall provide resources essential to the implementation and control of the WMP, including human resources, technology, and financial resources.

Sable will appoint specific management representative(s) who, irrespective of other responsibilities, shall have defined roles, responsibility, and authority for waste management of the facility.

The different role players in the waste management process include:

— Site manager;
— DEO during construction;
— Waste contractors; and
— Staff.

Table 8-2 provides an overview of the roles and responsibilities of individuals on site related to construction and operational activities.

Table 8-2: Roles and Responsibilities

ROLE PLAYER	RESPONSIBILITIES
Site Manager Project Manager	— Review and authorise updates to the WMP; — Ensure resource allocation for implementation of the WMP requirements; — Ensure that WMP requirements are integrated into project plans, work method statements, tender and contract documents; — Ensure necessary support to the DEO for implementation of the WMP; and — Participate in incident investigations (as required).
Designated Environmental Officer	— Update the WMP where necessary; — Ensure that WMP requirements are implemented on the site during construction; — Ensure communication of WMP requirements to relevant contractor and sub-contractor personnel; — Facilitate environmental induction of all project staff and either deliver or coordinate delivery of all such training that would be required for the effective implementation of the WMP. This includes identifying additional project training requirements and implementing the training programme; — Ensure maintenance of site document control requirements; — Ensure that contractors use the appropriate disposal methods and facilities; — Maintain training records for all project personnel including contractors; — Maintain environmental incidents and complaints register for construction; — Report significant incidents internally and externally as required by law and the conditions of EA upon receipt; — Investigate incidents and recommend corrective and preventative actions; — Undertake environmental system reviews, site inspections, audits and other verification activities to assure that the WMP implementation is at an optimal level; — Participate in environmental performance verification activities to verify the level of compliance with the WMP in delivering the legal and environmental obligations; — Provide support and advice to the contractor and all sub-contractors in the implementation of WMP procedures and corrective actions; and — Ensure that contractors use the appropriate disposal methods and facilities.
Waste contractors	— Adhere to WMP requirements; — Ensure all waste contractors are appropriately certified as waste transporters; — Use the appropriate disposal methods and licensed facilities; — Provide the required waste manifests and safe disposal certificates; and — Ensure that personnel are appropriately trained in waste handling and transporting.
Staff	— Attend WMP training; and — Follow WMP requirements including waste separation and recycling appropriately.

8.2 ALIEN / INVASIVE PLANT MANAGEMENT PLAN

The purpose of this Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the project, which in turn serves to manage open spaces, as required. The broad objectives of the plan include the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal and encroachment.
- Managing and maintaining the ecosystem in a near-natural state and restoring and/or rehabilitating the ecosystems to such a state.
- Develop and implement a monitoring and eradication programme for alien and invasive species.

- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

Mitigation and management measures include, but are not limited to the following:

- Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding.
- Alien vegetation and the spread of exotic species on the site will need to be controlled.
- The contractor must be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion.
- Herbicide use shall only be allowed according to contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used.
- The use of pesticides and herbicides on the site must be discouraged as these can impact on important pollinator species of indigenous vegetation.
- Six monthly checks of the area must take place for the emergence of invader species.
- Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that is undertaken during the operation phase.
- Correct rehabilitation with locally indigenous species.
- Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided.
- Constant maintenance of the area to ensure re-colonisation of floral species.
- Regular removal of alien species which may jeopardise the proliferation of indigenous species.

8.3 PLANT RESCUE AND PROTECTION PLAN

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures, in addition to the mitigation measures included in the EMPr to reduce the impact of the development of the project on listed and protected plant species and their habitats, and to provide guidance on search and rescue of species of conservation concern.

Mitigation and management measures include, but are not limited to the following:

- Vegetation clearing must only commence after a walk down has been conducted by a suitably qualified ecologist / botanist and the necessary permits obtained.
- Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
- Vegetation removal must be limited to the construction site and must be removed only as it becomes necessary rather than removing all the vegetation throughout the site at once
- Materials must not be delivered to the site prematurely which could result in additional areas being cleared or affected.
- No vegetation to be used for firewood.
- Gathering of firewood, fruit, medicinal plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO.
- Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas.
- All natural areas impacted during construction must be rehabilitated with locally indigenous plant species.
- A buffer zone must be established in areas where construction will not take place to ensure that construction activities do not extend into these areas.
- The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation.
- Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation in the soil. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.

8.4 RE-VEGETATION AND HABITAT REHABILITATION PLAN

The purpose of the rehabilitation plan is to ensure that areas cleared or impacted during construction activities are rehabilitated with a plant cover that reduces the risk or erosion from these areas as well as restores some ecosystem function. The purpose of the rehabilitation plan for the site can be summarised as follows:

- Achieve long-term stabilisation of all disturbed areas to minimise erosion potential.
- Re-vegetate all disturbed areas with suitable local plant species.
- Minimise visual impact of disturbed areas.
- Ensure that disturbed areas are safe for future uses.

Mitigation and management measures include, but are not limited to the following:

- Re-vegetation must aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.
- Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. This must be done through seeding with locally indigenous species typical of the representative botanical unit.
- Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction.
- Seeds from surrounding seed banks can be used for re-seeding.
- Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.
- Planting of indigenous tree species in areas not to be cultivated or built on must be encouraged.
- Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided.

The areas to be rehabilitated are illustrated in **Figure 8-2**, **Table 8-3** and **Table 8-4** describes the rehabilitation measures to be applied for the site before any landscaping activities can occur.

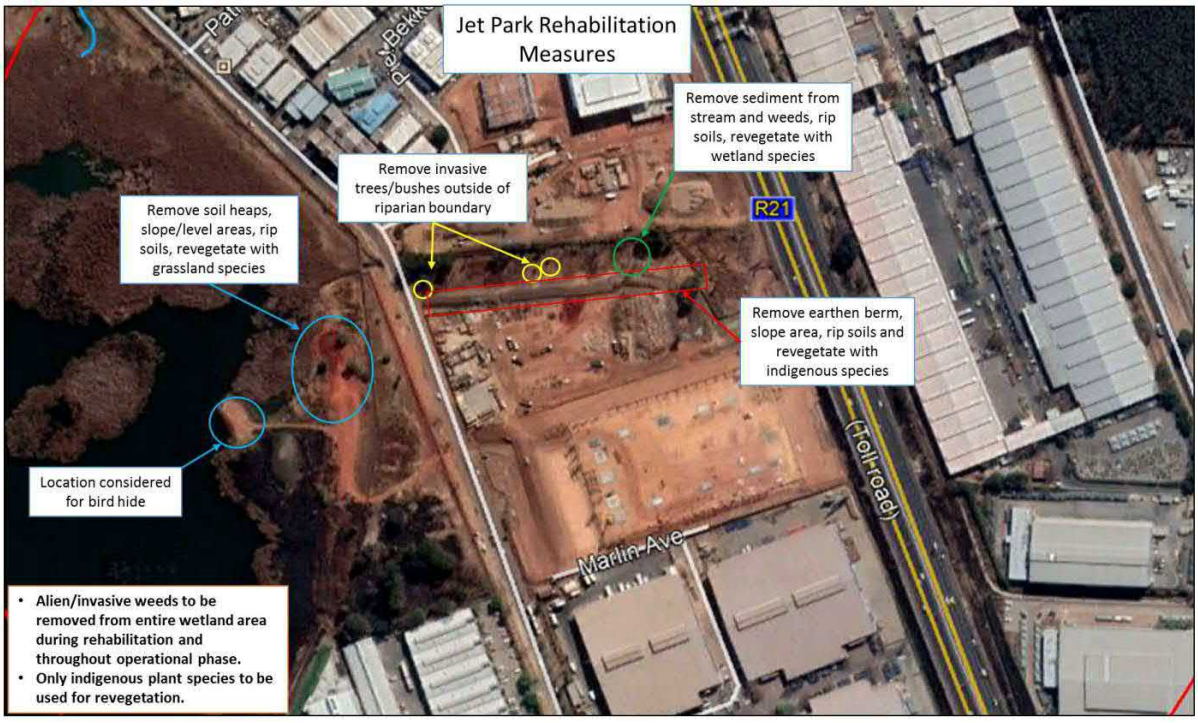


Figure 8-2: Rehabilitation Sites and Measures for the Wetland Areas

Table 8-3: Rehabilitation Activities

ACTIVITY	APPLICABLE AREA	METHOD	TIMEFRAME (APPROXIMATE)
Planning	– All areas planned for rehabilitation	– Plan the access and construction areas for the site. – The rehabilitation plan must be made available to all parties involved. – Plan the areas to be rehabilitated in stages so as to work on one area at a time.	– Prior to rehabilitation commencing
Access Control	– Stream channel / pan edges	– Access must be restricted to as few people as possible. – Only vehicles required for the work may access the wetland channel during resloping and infilling activities. – All works should be supervised.	– Duration of rehabilitation activities
Storm Water Management	– Stream channel / pan edges	– Erosion and siltation prevention must be applied throughout the rehabilitation process. – Sand bags, hay bales and silt nets can be used.	– Duration of rehabilitation activities
Waste Removal	– All areas for rehabilitation	– Designate an area for the temporary storage of waste and stockpiling. – The area must be located outside of sensitive areas. – Waste and rubble removal to occur daily. – Waste must be disposed of to a suitable landfill site.	– Daily during rehabilitation activities
Site Clearing	– Dump areas	– All dumped soils and materials to be removed and cleared. – All materials to be removed to an approved dumping site.	– Prior to sloping activities
Site Preparation	– Areas to be rehabilitated	– Areas for revegetation must be cleared of alien and invasive plants. – Indigenous vegetation must be cut to just above ground level and stockpiled for use in brush packing and seeding. – Activities must commence in areas that are small enough to be revegetated and stabilised before working on another area. – Areas where indigenous grass clump growth are unaffected by resloping activities should be preserved in order to stabilise the banks. – The use of fertiliser should be avoided. Organic fertiliser to only be used if needed. – Soils must be moist for revegetation activities. – If needed, topsoil must be placed at a depth of 100mm in open areas to be vegetated.	– Day 1-7 – Commence in early rain season (September to October)

ACTIVITY	APPLICABLE AREA	METHOD	TIMEFRAME (APPROXIMATE)
Resloping	— All cleared areas	— In order to promote vegetation growth and establishment, the slope angle must be a maximum of 1(V):3(H). The site is generally flat; however, the original topography of the area must be restored. — Slope reshaping must follow the natural slope and topography of the surrounding undisturbed areas. — Areas for resloping must be ripped or loosened to a depth of 150mm to prepare soils for revegetation and allow water penetration into the soils. — Ripping must be done manually with hand tools wherever possible. — No vehicles are permitted in the area once ripping is completed in order to prevent further disturbance to the wetland.	— Day 8-14
Revegetation	— All disturbed areas	— A suitable grass mixture must be spread by hand along the extent of the ripped areas. The species to be used must only be indigenous and endemic to the area. — The seed mixture may be purchased in the required amounts from co-ops. — Seeds must be thorough mixed before applying. — The seeds must be applied according to the required rates. — Application rates can be increased in areas that are unfavourable or steep, but no more than double the recommendations. — Seeds can be mixed with a spreading agent such as river sand, bran or finely sifted kraal to ensure even distribution. — Once complete, the seeded area must be watered and patted down gently. — Indigenous vegetation removed from the area must be applied over the seeded area as mulch. — Areas to be watered daily until vegetation has established (about 2 weeks).	— Day 15-16 — Directly after resloping.

Table 8-4: Long Term Maintenance

ACTIVITY	APPLICABLE AREA	METHOD	TIMEFRAME (APPROXIMATE)
Vegetation growth maintenance	— Revegetated areas	— Cordon off areas for new plant growth with danger tape and droppers. — No access must be permitted for vehicles, pedestrians or animals. — Monitoring for the establishment of alien plants must be done regularly, and these should be removed by hand.	— 3 months

ACTIVITY	APPLICABLE AREA	METHOD	TIMEFRAME (APPROXIMATE)
Alien invasive control	— All wetland areas / open spaces	— Alien and invasive vegetation to be removed regularly.	— Throughout the operational phased of the development

The detailed Wetland Assessment and Rehabilitation Plan is included in **Appendix D**.

8.5 FIRE MANAGEMENT PLAN

The purpose of this plan is to address firefighting requirements throughout the construction of the project and to preserve and protect human life as well as tangible goods and equipment in the event of a fire.

Mitigation and management measures include, but are not limited to the following:

- All construction camps shall be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible.
- The Contractor shall take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures must include appropriate instruction of employees about fire risks and designated smoking areas.
- Fire prevention facilities must be present at all storage facilities. No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires.
- The Contractor shall have operational fire-fighting equipment available on site at all times. The level of firefighting equipment must be assessed and evaluated through a typical risk assessment process.
- Emergency numbers for local police and fire department etc. must be placed in a prominent area.
- Firefighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank.
- All construction staff must be trained in fire hazard control and firefighting techniques. Translators are to be used where necessary.
- All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances.
- Smoking must only be conducted in demarcated areas.
- Firefighting equipment must be regularly maintained by an appropriate company.

8.6 EMERGENCY RESPONSE PLAN

Appropriate resources must be provided to respond to accidental and emergency situations for operations and activities during construction and operation phases. The procedures will include plans for addressing training, resources, responsibilities, communication and all other aspects required to effectively respond to emergencies associated with their respective hazards.

This Emergency Response Plan (ERP) is intended as a practical working document for the proposed construction of the storage warehouse. The purpose of this document is to provide the basic guidelines on how to respond to potential emergency situations that may arise as at the proposed storage warehouse location. These potential emergency situations include medical emergencies and fires.

All activities associated with the project will require site-specific emergency response plans to mitigate impacts, which meet or exceed all applicable regulations.

The objectives of this plan are as follows:

- Protect the communities and the environment through the development of emergency response strategies and capabilities;
- Set out the framework for hazard identification in order to define procedures for response to the situations including the development of contingency measures;

- Structure a process for rapid and efficient response to and manage emergency situations during the construction and operational phases of the project; and
- Assign responsibilities for responding to emergency situations.

The ERP must take the incident procedures referred to in Section 30 of the NEMA into account.

8.6.1 ROLES AND RESPONSIBILITIES

With respect to this plan, Sable has the responsibility to:

- Provide emergency response services and to structure and coordinate emergency response procedures for the project;
- Ensure that specific emergency responsibilities allocated to them are organised and undertaken; and
- Ensure that employees and contractor third parties are trained and aware of all required emergency procedures.

Roles, responsibility and authority shall be defined, documented and communicated in order to facilitate effective emergency response through implementation of the ERP. Management shall provide resources essential to the implementation and control of the ERP including: human resources, technology, and financial resources.

Sable shall appoint specific emergency response representative(s) who, irrespective of other responsibilities, shall have defined roles, responsibility, and authority for emergency response of the facility.

The sections below provide more specific responsibilities related to each position.

Emergency Response representative(s)
■ Actively participate in the facilities planning, implementation and reviewing of the sites Emergency response plan. ■ Ensure all staff members are aware of the procedures outlined in the ERP. ■ Setting up practical training schedules (drills) annually to ensure that all staff are prepared encase of an emergency. ■ Report any incidents that occur to senior management staff and/or the relevant authorities. ■ Appoint an Emergency Response (ER) team which includes an appropriate first aid representative and a fire warden. ■ Ensure that the appoint ER team undergo the correct training. ■ Appoint an appropriate Emergency coordinator.
First Aid representative(s)
■ Ensuring the first aid box is properly stocked to meet all foreseeable incidents which may occur. ■ Ensure that the boxes are properly safe guarded and that First Aiders name appears on the box. ■ Should any activity involve hazardous chemical substances, or any other specific first aid emergencies, this must be brought to the attention of the emergency coordinator. ■ Ensure the first aid certificate is current. ■ Ensure that there is always a first aider available at each shift.
Fire warden(s)
■ Ensure that the firefighting equipment is regularly serviced. ■ Attend the relevant firefighting training. ■ Report any unserviceable or damaged fire- fighting equipment to the ER.
Emergency Co-ordinator
■ Ensure that an update of the ERP is kept on file and is easily accessible in case of an emergency. ■ Ensure that all staff have been issued with the correct Personal Protective Equipment. ■ Ensure that a list of emergency telephone numbers, including those of the Emergency Response team, are visible to all staff at a number of locations around the facility. ■ In the case of an emergency, the emergency coordinator is responsible for undertaking roll call at the designated Assembly points.

8.6.2 EMERGENCY COMMUNICATIONS AND COORDINATION PLAN

In an emergency situation where there is an immediate threat to communities, personnel or the environment, the Project Manager will be notified immediately. The Project Manager will dispatch the Emergency Response Coordinator who will determine the appropriate plan of action depending on the severity of the emergency, the people affected, and the need to evacuate.

If there is a developing emergency or unusual situation, where an emergency is not imminent, but could occur if no action is taken, the Project Manager (or if the Project Manager is absent the Environmental Manager) is to be

informed immediately. Once the emergency or unusual situation has been managed, the correct incident/near miss must be reported to the General Manager or through Sable's reporting processes.

If an emergency situation poses a direct threat to communities in the area, the Environmental Officer and/or Social Officer will advise persons in the vicinity of the emergency to evacuate due to the potential risk. The appropriate government authorities will immediately be notified of such an emergency evacuation. The Emergency Response Coordinator will be tasked with responding to the potential risk. Should the emergency situation be such that it can be managed by the Project Company, equipment and personnel will be deployed to the maximum extent necessary, so as to prevent/minimise potential risks.

8.6.3 RESPONSE TO INCIDENTS

An incident is any occurrence that has caused, or has the potential to cause, a negative impact on people, the environment or property (or a combination thereof). It also includes any significant departure from standard operating procedures. The reporting and investigation of all potential and actual incidents that could have a detrimental impact on human health, the natural environment or property is required so that remedial and preventive steps must be taken to reduce the potential or actual impacts because of all such incidents.

Any incident must immediately be reported to the relevant authorities and all the necessary documentation must be completed and submitted to the relevant authorities within the prescribed timeframes.

The actions resulting from any formal or informal investigations will be used to update the EMPr.

8.6.4 VERIFICATION

An environmental emergency response system will be developed for the execution of emergency drills that will include the following, inter alia:

- Fire Drills;
- Emergency Evacuation Drills; and
- Medical and Environmental Drills.

Reporting and monitoring requirements for the plan will include:

- Monthly inspections and audits;
- Quarterly reporting of accidents/ incidents;
- Reporting at the time of the incident and monthly spill reporting developed by the Environmental and Quality, Health and Safety departments;
- Bi-annual emergency response drills; and
- Annual reporting on training.

Emergency response drills and reporting will be maintained by the Project Manager and will provide information regarding required revisions to training or the emergency response actions. Each incident reported will be reviewed and investigated upon occurring. Actions will be identified where possible to improve the site's overall response to emergencies. Updates/revisions that are necessary to protect worker or community health and safety will be implemented immediately after approval by the General Manager.

This plan will be amended periodically in light of operational changes, learning experienced during its implementation and other activities that can affect the risk profiles.

8.6.5 POTENTIAL RISKS

The following emergency situations have been identified as potential threats on the proposed construction of a storage warehouse:

- Fire and explosions
- Spills

It must be noted that there is a very minor risk associated with these risks as only a very small quantity of chemicals or hazardous substances are actually stored on site.

Fire	Responsibility
■ Raise the alarm	Employee who detected the fire
■ Switch of all automated systems within the facility	ER Team
■ Evacuate all personnel in the building	ER Team
■ Contact all relevant emergency services	Emergency Coordinator
■ Report to the emergency Assembly Point and await further instructions	All Staff
■ Remove all vehicles from the premises	ER Team and security
■ Undertake roll call and report all missing staff to the ER team	ER Coordinator
■ Evacuate remaining staff to a safe location outside the site boundaries	ER Team
■ Contain fire until Emergency services arrives	Fire warden
■ Provide First Aid, if required	First Aid representative
Spill	**Responsibility**
■ Contain the spillage using an onsite spill kit	Employee who discovered/caused the spill
■ Advice emergency services (if required)	Emergency coordinator
■ Provide First Aid (if required)	First Aid representative
■ Determine if there is any soil, groundwater or other environmental impact	Emergency coordinator
■ Ensure that all absorbents used from the spill kits are disposed of in the correct manner.	Emergency coordinator
■ Inform the GDARD and DWS of any major spillages.	Emergency coordinator
■ Ensure that the incident is recorded in the incidents register.	Emergency coordinator

The following emergency centres were identified along with the corresponding emergency telephone numbers.

Emergency Centre	Telephone Number
■ Emergency Services	10177 (Ambulance / Fire Brigade)
■ Police Emergency Services	10111
■ Ambulance Service	10177
■ Suicide Crisis Line	0800 12 13 14

8.7 COVID-19

8.7.1 PREVENTION AND RESPONSE

A dedicated team with responsibilities to identify and implement actions to mitigate the effects of COVID-19 on the company and community should be appointed.

8.7.2 INFORMATION

Information dissemination and training are an effective way to reduce the risk for both the company and the general public.

COVID-19 symptoms include: fever, tiredness, difficulty breathing, dry cough, chills, repeated shaking with chills, muscle pain, headache, sore throat, and new loss of taste or smell. Some patients may have nasal congestion, runny nose, or diarrhoea. Symptoms may appear two to 14 days after exposure to the virus.

8.7.3 EMPLOYEE QUESTIONNAIRE

To prevent potentially infected staff from entering the workplace and infecting co-workers, a short questionnaire could be used. Workers should only report to work if they answer "no" to all the questions.

The following is an example:

- Have you, in the last two weeks, been in close contact with a person who has COVID-19?
- Have you, in the last two weeks, been in a country/region with a high number of cases of COVID-19?
- Do you have a fever?
- Have you used medications such as paracetamol or aspirin to suppress fever in the last 24 hours?
- Are you coughing (even mildly)?
- Do you currently experience shortness of breath?

8.7.4 PREVENTION METHODS

SICK PERSONS TO STAY HOME

Workers requested to stay away from work in cases where they exhibit any COVID-19 symptoms or have been in close contact with a confirmed COVID-19 patient during the previous 14 days.

Workers who do not feel well should seek immediate medical advice. An employee who works while evidencing mild COVID-19 symptoms can risk spreading this infectious disease to others.

COUGH HYGIENE

To reduce the risk of infected persons spreading the virus by coughing and sneezing, workers are to be instructed to follow the cough etiquette outlined below:

- Cover the mouth and nose with a tissue when coughing or sneezing and dispose of the used tissue in a wastebasket.
- When no tissue is available, cough or sneeze into the upper sleeve or elbow, not into the hands.
- Clean hands after coughing or sneezing, preferably by thorough water-soap handwashing, following the recommendations of health organizations. If soap and water are not available, use a hand sanitizing gel.

SOCIAL DISTANCING

To prevent person-to-person infection, it is important to minimize direct contact as much as possible. The contractor is to inform workers about the hazards of close contacts, including with direct co-workers, and promote alternative behaviours, such as maintaining safe distances and using alternatives for handshakes.

HAND SANITATION

Promote frequent and thorough water-soap hand washing and provide enough places for workers to wash their hands. If soap and running water are not immediately available, provide alcohol-based hand rubs containing at least 60% alcohol. Ensure that these facilities are sufficient in number and are available close to the work area.

CLEANING AND DISINFECTING

Frequently – and at least daily - clean touched surfaces, such as tables, light switches, appliances, countertops, handles, desks, phones, keyboards, toilets, taps, sinks, and so forth. Use the cleaning agents that are routinely used in these areas and follow the directions on the labels. For multiuse equipment, clean after every use.

Workers are to be instructed to clean their work areas and equipment at the end of each shift. Equipment and instructions on how to do this are to be provided.

8.8 CONCEPTUAL STORMWATER MANAGEMENT PLAN

The Conceptual Stormwater Management Plan (SWM) as attached in **Appendix E** must be implemented. The Conceptual Stormwater Management Plan must be approved by the City of Ekurhuleni Metropolitan Municipality.

Based on observations made during the desktop study and development of the SWMP for the Jet Park Development, the following recommendations are proposed:

- The SWMP should be revisited after any major changes to the current operations.
- The pipes and channels need to be constructed to facilitate routine maintenance (i.e. simple, effectual housekeeping).
- It is recommended that stone pitching channels and concrete pipes are used to transfer runoff. Stone pitching is recommended to reduce high runoff velocities in channels and sulphate-resistant concrete to reduce sulphate content generated in 'dirty' areas with sulphate contaminants.
- To prevent clogging of the grated channel covers and maintain channel capacity, best practice and proper housekeeping practices must be ensured.
- All pipes and channels must be checked after any major rainfall events to ensure that there are no blockages and that the water flow will not be restricted in any way.
- Sediment that accumulates within pipes, channels and retention facilities needs to be removed directly after the storm events and appropriately disposed of to ensure design capacity is maintained.
- It is recommended that the SWAPs be operated empty or at a storage level low enough to accommodate storm water inflows, whilst meeting the required spillage frequency and freeboard requirements

8.9 EROSION MANAGEMENT PLAN

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this erosion management plan and the revegetation and rehabilitation plan are closely linked to one another and must not operate independently, but must rather be seen as complementary activities within the broader environmental management of the site and must therefore be managed together. This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion, including:

- Material stockpiled for long periods (2 weeks) must be retained in a bermed area.
- Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.
- Sensitive areas need to be identified prior to construction so that the necessary precautions must be implemented.
- Vegetation clearance must be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.
- Areas to be cleared must be clearly demarcated and this footprint strictly maintained.
- Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks.
- Silt fences and erosion control measures must be implemented in areas where these risks are more prevalent.
- Wind screening and stormwater control must be undertaken to prevent soil loss from the site.
- Other erosion control measures that must be implemented are as follows:
  - Brush packing with cleared vegetation;
  - Mulch or chip packing;
  - Planting of vegetation; and
  - Hydroseeding / hand sowing.
- All erosion control mechanisms need to be regularly maintained.

- Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. This must be done through seeding with indigenous grasses.
- No impediment to the natural water flow other than approved erosion control works is permitted.

Should erosion control fail the following measures must be implemented:

- Contain eroded material by means of silt traps, hay bales, logs etc.
- Notify the ECO.
- Repair and replace damaged materials.
- Replace eroded material, being careful not to damage vegetation.
- Remove material from site.

Should slope failure occur the following measures must be implemented:

- Stabilise the toe of the slope with bags, silt fences, hay bales etc.
- Prevent water from flowing towards silt fence.
- Protect the area from further collapse.
- Notify the ECO.
- Discuss options for restoration with the ECO and follow the restoration methods as discussed.
- Monitor the restoration until the area has stabilised.

To prevent stormwater damage, the increase in stormwater run-off resulting from construction activities must be estimated and the drainage system assessed accordingly.

9 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.

Sable 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 construction of a storage warehouse will be mitigated. A Sable appointed ECO can monitor the site periodically throughout construction to ensure that the required environmental controls are in place and working effectively, while the Site Manager monitors environmental controls during operation.

If you have any further enquiries, please feel free to contact:

WSP Environmental (Pty) Ltd
Attention: Anri Scheepers
PO Box 98867, Sloane Park, 2152
Tel: 011 361 1390
E-mail: Anri.Scheepers@wsp.com

APPENDIX

A EAP CV

ANRI SCHEEPERS, BA

Principal Consultant (Environmental Services), Environment & Energy

Years with the firm

8

Years of experience

13

Areas of expertise

Stakeholder Engagement

Water Use License Applications

Environmental Authorisation Processes

Environmental Management Plans

Waste Management

Legal Compliance Assessments

Environmental Due Diligence and Liability Assessments

Environmental Management Systems

Languages

English

Afrikaans

CAREER SUMMARY

Anri graduated from the University of Johannesburg with a BA honours in Geography in 2007, and has thirteen years work experience. Anri is a principal environmental consultant and team coordinator for the Planning and Advisory Services unit.

Anri has been involved in numerous mining and industrial projects in South Africa. Anri has experience with diamond, gold, platinum, chrome, coal and manganese mining and processing operations. The projects include Environmental and Social Impact Assessments, Amendment processes and Environmental Management Programme consolidation and alignment processes. She has project managed numerous multi disciplinary projects in various sectors in South Africa and has experience with the International Finance Corporation Performance Standards and African Development Bank Guidelines.

Anri is qualified as a Lead Auditor and has undertaken legal compliance auditing, including environmental authorisations, waste management licences, water use licences and environmental performance assessments. In addition, she has undertaken general site assessments to determine compliance against, local, provincial and national environmental legislation. Anri has also been involved in environmental due diligence and liability assessments.

Anri's roles and responsibilities include the management of Environmental Authorisation and Waste Management Licence Processes (Basic Assessments and Scoping and Environmental Impact Assessment Reporting), Water Use Licence Application Processes and Auditing.

EDUCATION

Bachelor of Arts (Honours), Geography, University of Johannesburg, Gauteng, South Africa	2007
Bachelor of Arts, Geography, University of Johannesburg, Gauteng, South Africa	2006

ADDITIONAL TRAINING

Environmental-Law Mine Closure, Centre for Environmental Management, South Africa	2019
Snake Awareness, Scorpion Awareness and First Aid for Snakebite and Scorpion Sting, African Snakebite Institute	2016
Environmental Management Systems ISO 14001 Audit: Lead Auditor, Centre for Environmental Management, South Africa	2014
IWRM, Water Use Authorisations, and Water Use Licence Applications – Procedures, Guidelines, IWWMPs and Pitfalls, Carin Bosman Sustainable Solutions, South Africa	2012
ISO 14001 Environmental Management Systems (EMS), Implementation and Auditing, Centre for Environmental Management, South Africa	2011
IEMA Approved Foundation Course in Environmental Auditing, Aspects International, South Africa	2009

PROFESSIONAL EXPERIENCE

Environmental Authorisation Processes

- Jet Park Warehouse Development, Gauteng (2020-2021). Project Manager. Basic Assessment Process for the development of a commercial park within a 30m from a wetland and within a critical biodiversity area. Client: Sable Place Properties
- Vosloorus Filling Plant, Vosloorus, Gauteng (2019-2020). Project Manager. Environmental authorisation process for the proposed dangerous goods filling plant. Client: Richbay Chemicals
- Mbabane – Manzini Corridor Dam (Nondvo Dam), Hhohho Region, Eswatini (2018-2019). Project Manager. An Environmental and Social Impact Assessment for the proposed Nondvo Dam in Eswatini (previously Swaziland). Client: Government of the Kingdom of Eswatini, Ministry of Natural Resources and Energy, Department of Water Affairs
- Sappi Ngodwana Reservoir, Mpumalanga (2020): Project Manager. Basic Assessment Process for the construction of a reservoir within a critical biodiversity area. Client: Sappi Southern Africa
- Demolition and Rehabilitation of Infrastructure at West Wits Business Operations, Carletonville, Gauteng (2019): Project Manager. A contaminated land assessment and environmental authorisation process for the decommissioning and rehabilitation of selected infrastructure West Wits Operations. Client: AngloGold Ashanti
- Kranspoort Cattle Feedlot Basic Assessment Process, Kranspoort, Mpumalanga, South Africa (2018): Project Director. A Basic Assessment Process and Waste Management Plan for the proposed development of a cattle feedlot. Client: Department of Rural Development and Land Reform
- Amandelbult Section Dangerous Goods and Railway Extension Final Basic Assessment Report, Thabazimbi, Limpopo (2017-2018): Project Director. The Basic Assessment Process for the proposed installation of diesel tanks and the extension of a railway line at the Amandelbult Section, Tumela Mine. Client: Anglo American Platinum Limited
- Anglo Platinum Water Separation Project, Rustenburg, North West, (2016-2017): Project Manager. The Basic Assessment process for the proposed refurbishment of an existing pipeline and installation of new pipelines as part of the Water Infrastructure Upgrade Project. Client: Anglo American Platinum Limited
- Sasol Energy Technology Blending Facility Upgrade Project, Sasolburg, Free State, South Africa (2017): Project Manager. Basic Assessment Process for the installation of dangerous goods tanks at the Sasol One Site. Client: Sasol Energy Technology, a Division of Sasol Oil (Pty) Ltd
- Sasol Energy Technology Blending Facility Upgrade Project, Sasolburg, Free State, South Africa (2017-2018): Project Manager. Basic Assessment process for the construction of a fuel drum storage warehouse adjacent to the existing underground fuel storage tanks at the Fuel Blending Facility on the Sasol One site. Client: Sasol Energy Technology, a Division of Sasol Oil (Pty) Ltd
- Section 24G Application Process for Rappa Holdings, Germiston, Gauteng (2017-2018): Project Manager. Undertaking the rectification process for six historic rectification applications. Client: Rappa Holdings (Pty) Ltd
- Environmental Authorisation Process for the SO_2 Abatement Plant at Mortimer Smelter, Swartklip, North West, South Africa (2016-2017): Project Manager. Undertaking a Scoping and Environmental Impact Reporting Process to ensure compliance with the National Environmental Management Air Quality Act (No. 39 of 2004). Client: Anglo American Platinum Limited

- Environmental Authorisation Process for the SO_2 Abatement Plant at Polokwane Smelter, Polokwane, Limpopo, South Africa (2016-2017): Project Manager. Undertaking a Scoping and Environmental Impact Reporting Process to ensure compliance with the National Environmental Management Air Quality Act (No. 39 of 2004). Client: Anglo American Platinum Limited
- Environmental Authorisation for a Private Vehicle Proving Ground Development, Northern Cape, South Africa (2016): Project Manager. A Scoping and Environmental Impact Reporting Process for a private vehicle proving ground. Client: Ingen | Aix GmbH
- Establishment of the Proposed Rietvlei Opencast Coal Mine, Mpumalanga, South Africa (2016-2018): Project Manager. This project involved repeating the environmental authorisation process with the DMR as the competent authority, for the establishment of an opencast coal mine north of Middelburg. Client: Rietvlei Mining Company
- Environmental Authorisation for Blue Sphere, Nigel, Gauteng, South Africa (2014): Consultant. This project includes an environmental impact assessment, environmental management programme report, water use license application, waste management license application and an atmospheric emissions licence application as well as the public participation process for the existing and proposed processes for Blue Sphere in Nigel. Client: Blue Sphere Investments and Trading 103 (Pty) Ltd
- Environmental Authorisation for the Proposed Construction and Operation of Two Furnaces and Associated Infrastructure at Transalloys, eMalahleni, Mpumalanga, South Africa (2014): Consultant. The project entailed undertaking an environmental authorisation (by way of a scoping and environmental impact reporting process), including an atmospheric emissions licence application and waste management licence application process for the construction of two new 75MVA submerged arc furnaces that will primarily produce silicomanganese. Client: Transalloys (Pty) Ltd
- Section 24G Rectification Process for the Storage of Dangerous Goods for Much Asphalt, Gauteng, South Africa (2014): Project Manager. Much Asphalt was required to undertake a Section 24G Rectification Process for the unlawful storage of dangerous goods on a number of their sites. Zaffar was involved in the compilation of the Section 24G application forms. Client: Much Asphalt (Pty Ltd
- M14 Furnace Environmental Authorisation, Meyerton, Gauteng, South Africa (2012): Consultant. The project entailed undertaking an environmental authorisation, including an atmospheric emissions licence application process, in terms of the National Environmental Management Act (No. 107 of 1998) for the construction of an 81MVA furnace that will produce Ferromanganese and Silicomanganese. Client: Samancor Manganese (Pty) Ltd
- Basic Assessment Process for the Proposed Expansion and Upgrading of the Raw Materials Stockyard at Metalloys, Meyerton, Gauteng, South Africa (2011): Consultant. The project included the undertaking of an environmental authorisation process, by way of a basic assessment process, and the amendment application of an atmospheric emissions licence. The project involved the expansion and The project entailed undertaking an environmental authorisation, including an atmospheric emissions licence application process, in terms of the National Environmental Management Act (No. 107 of 1998) for the construction of an 81MVA furnace that will produce Ferromanganese and Silicomanganeseupgrading of the existing Raw Materials Stockyard at the Samancor Meyerton Works (Metalloys site). Client: Samancor Manganese (Pty) Ltd
- Proposed new Sinter Plant: Mamatwan Mine, Hotazel, Northern Cape, South Africa (2010): Consultant. This project included an environmental impact assessment, environmental management programme report addendum and water

use license application as well as the public participation process for a proposed sinter plant at the Mamatwan Mine in the Northern Cape. Client: Hotazel Manganese

Environmental Management Plans

- Refurbishment (Fit-Out) of the 8th Floor in 140 West Building, South Africa (2020): Project Manager. Compilation of the Environmental Management Plan for the refurbishment of an office space in order to acquire a Green Star SA – Office v1 certification by the Green Building Council of South Africa. Client: Goldman Sachs
- Environmental Management Plan for the South Sudan Feeder Roads, South Sudan (2019): Project Director. Compilation of an Environmental Management Plan for the construction of the Kayango Market to A43 Road in South Sudan. Client: United Nations Office for Project Services (UNOPS)
- Environmental Programme for the Proposed Knightsbridge Development, Bryanston, Gauteng, South Africa (2015): Project Manager. Compilation of a Green Star Rating Environmental Programme for the Proposed Knightsbridge Development. Client: Emira Property Fund
- J.P Morgan Chase & Company, 1 Fricker Road EMP ECO, Illovo, Gauteng, South Africa (2017): Project Manager. An EMP was compiled for the proposed refurbishment of the office building to attain a Green Star rating and is also responsible for conducting the first EMP compliance audit and training of the DEO to carry out subsequent audits. Client: J.P Morgan Chase & Company
- Compilation of Environmental Management Plans - West Plant Metalloys, Meyerton, Gauteng, South Africa (2011): Consultant. The project included the undertaking of an environmental risk assessment for all facilities and activities at West Plant. Environmental management plans were compiled from the results of the risk assessments. Client: Samancor Manganese (Pty) Ltd Metalloys

Environmental Management Programme Reports

- Separation of the Union Section Operational Environmental Management Programme (and Addendums) into 'Carved Out' versus 'Retained' categories, Swartklip, North West Province, South Africa (2017): Project Manager. The Section is in possession of an approved Environmental Management Programme as well as numerous addendums for mining, concentrating and smelting, operations. The Section is in a restructuring process which involves the selling and/or disenfranchising of certain of the operations. WSP/PB restructured the Sections's consolidated Environmental Management Programme to align with the future goals/strategies of the Mine. Client: Anglo Platinum Limited - Rustenburg Platinum Mines Limited
- EMPR Updates – Vaal River and West Wits Operations, Gauteng and North West, South Africa (2014-2016): Project Manager. The alignment of the West Wits (WW) and Vaal River (VR) Operations Environmental Management Programme Reports (EMPR) in accordance with the requirements of the Mineral and Petroleum Resources Development Act (No. 28 0f 2002) (MPRDA). Client: AngloGold Ashanti (Pty) Ltd
- Environmental Management Programme Report Consolidation and Alignment of Union Mine: Rustenburg Platinum Mines, North-West, South Africa (2014): Project Manager. The EMPR consolidation and alignment process combined the original EMPR and authorised EMPR amendments into a complete and comprehensive document, which will become the overarching EMPR for the mine lease area and will be used as a concise management tool for all employees operating within mine lease area. Client: Anglo American Platinum Ltd

Waste Management

- Construction and Operation of a Waste Treatment Facility, Middelburg, Mpumalanga (2016-2018): Project Manager. The Scoping and Environmental Impact Reporting process for the construction and operation of a Health Care Risk Waste treatment facility in Middelburg. Client: Vikela Afrika Waste Care CC
- Applications for Samancor Manganese (Pty) Ltd Metalloys in terms of section 20 of the Environment Conservation Act 73 of 1989, Meyerton, Gauteng, South Africa (2014): Consultant. The project entailed applications, by way of risk assessments, in terms of section 20 of the Environmental Conservation Act, for the North Plant Sludge Dam, West Plant Sludge Dam, Bag Filter Material storage Facilities and Slag Stockpiles at Metalloys. Subsequent to the receipt of the waste management licences in terms of the National Environmental management: Waste Act (No. 59 of 2009) an amendment process was also undertaken. Client: Samancor Manganese (Pty) Ltd
- Applications for Afrisam, Vanderbijlpark, in terms of section 20 of the Environment Conservation Act 73 of 1989. Vanderbijlpark, Gauteng, South Africa (2014): Consultant. The project entailed applications in terms of section 20 of the Environmental Conservation Act, for the slag stockpiles at Afrisam, Vanderbijlpark. Subsequent to the receipt of the waste management licences in terms of the National Environmental management: Waste Act (No. 59 of 2009) an amendment process was also undertaken. Client: AfriSam South Africa (Pty) Ltd
- Waste Management Licence Application for The Existing And New Waste Management Facilities At Columbus Stainless Complex In Middleburg, Mpumalanga Province, South Africa (2014): Project Manager. Columbus Stainless (Pty) Ltd (Columbus) proposes to license existing waste management facilities and a new hazardous waste store within the footprint of the Columbus Complex. The Environmental Authorisation process by way of Scoping and Environmental Impact Reporting is required in order to license the said facilities. The facilities requiring licensing involve, but is not limited to: storage, recovery, bailing and treatment. WSP is responsible for obtaining a Waste Management License for the said activities via the Department of Environmental Affairs in line with relevant legislation. Client: Columbus Stainless (Pty) Ltd
- Establishment of a Waste Monitoring Committee, Meyerton, Gauteng, South Africa (2011): Consultant. The project included the identification of potential members for the monitoring committee and the establishment of the committee. The establishment of the committee included the compilation of the constitution and committee meetings. Client: Samancor Manganese (Pty) Ltd

Water Use Licence Applications

- Water Use Licence Application Process for the SO_2 Abatement Plant at Anglo American Platinum Limited: Polokwane Smelter, Polokwane, Limpopo, South Africa (2017-2018): Project Manager. The project involved the management of specialist along with the compilation and submission of the technical documentation. Client: Anglo American Platinum Ltd: Polokwane Metallurgical Complex
- Rietvlei Coal Mine Water Use Licence Application and Integrated Water and Waste Management Plan, Middelburg, Mpumalanga, South Africa (2016 – 2017): Project Manager. The project involved the compilation of the Integrated Water and Waste Management plan for all water uses proposed at the Greenfileds Rietvlei Opencast Coal Mining Operation. Client: Rietvlei Mining Company (Pty) Ltd
- Metalloys Water Use Licence Application, Meyerton, Gauteng, South Africa (2009): Assistant. This project involved compiling and submitting water use licence applications for all water use licence activities being undertaken at Metalloys. Subsequently a water use licence amendment process was also undertaken. Client: Samancor Manganese (Pty) Ltd

Environmental Authorisation Amendments/Renewals

- Amendment of the Vodacom Dangerous Good Environmental Authorisations, Midrand, Gauteng (2021): Project Manager. The amendment process of the environmental authorisations to amend auditing and monitoring conditions. Client: Vodacom South Africa
- Transfer of the West Wits Operations EMPR to Harmony Gold (2020): Project Manager. The amendment of the EMPR to transfer the West Wits Operations EMPR to Harmony Gold. Client: AngloGold Ashanti Limited
- Amandelbult Section Bus and Taxi Terminal Part 2 Amendment Process, Thabazimbi, Limpopo (2020-2021): Project Manager. The amendment process of the existing Environmental Management Programme Report to formalise the bus and taxi terminal. Client: Rustenburg Platinum Mines
- Sibanye Rustenburg Platinum Mine Part 2 Amendment Process, Rustenburg, North West (2018): Project Manager. The proposed amendment of the Environmental Management Programme Report to excluded activities which will not take place and to ensure alignment of the management measures. Client: Sibanye-Stillwater
- Zibulo Colliery Part 2 Amendment Process, Mpumalanga (2018-2019): Project Manager. The amendment of the Zibulo Colliery Environmental Management programmes for the inclusion of a new coal stockpile. Client: Anglo American Inyosi Coal
- Scaw Metal Waste Treatment and Disposal Facility Part 2 Amendment (2018-2019): Project Manager. The amendment of the Scaw Waste Management Licence to include different waste types. Client: Scaw South Africa
- The transfer of Authorisations for Union Mine (2018): Project Manager. The transfer a Waste Management Licence and ECA Permit in terms of the Part 1 Amendment Process. Client: Anglo American Platinum Limited
- The transfer of Authorisations for Anglo American Platinum Rustenburg Section (2018): Project Manager. The transfer a two Waste Management Licences in terms of the Part 1 Amendment Process. Client: Anglo American Platinum Limited
- Amendment of the Sibanye Rustenburg Platinum Mines Environmental Management Programme, Rustenburg, North West (2018): Project Manager. A Part 2 Amendment Process was undertaken to limit the EMPR to activities have commenced or will be undertaken. Client: Sibanye-Stillwater
- Amendment Process for the Copper Smelting and Casting Plant at Rappa Resources, Germiston, Gauteng (2017-2018): Project Manager. A Part 2 Amendment Process for the installed Copper Smelting and Casting Plant at Rappa Resources. Client: Rappa Resources (Pty) Ltd
- Renewal of the Technopack Eastern Cape Waste Management Licence, Springs, Gauteng (2017): Project Manager. The Waste Management Licence was renewed to ensure the continuation of the plant operations at Enstra. Client: Technopack Eastern Cape (Pty) Ltd
- The Impala Platinum Springs Waste Management Licence Amendment, Springs, Gauteng (2018): Project Manager. A Part 1 Amendment Process was undertaken in order to amend some of the conditions of the Waste Management Licence. Client: Impala Platinum Refineries
- Environmental Authorisation Amendment Process for the Ventilation Shaft at Siphumelele 1 Mine, Rustenburg, North-West, South Africa (2016): Project Manager. Part 2 Amendment Process for the proposed establishment of the Ventilation Shaft at Siphumelele 1 Mine. Client: Rustenburg Platinum Mines Limited

Stakeholder Engagement

- Minimum Emissions Standard Postponement Application for Nulandis Lilianton and Modderfontein (2018-2019): Project Manager. Undertaking the stakeholder engagement process in support of the Nulandis Lilianton and Modderfontein Minimum Emissions Standard Postponement Application. Client: Nulandis
- Minimum Emissions Standard Postponement Application for Sappi Ngodwana (2019): Project Manager. Undertaking the stakeholder engagement process in support of the Sappi Ngodwana Minimum Emissions Standard Postponement Application. Client: Sappi Southern Africa
- Minimum Emissions Standard Postponement Application for AEL Interlligent Blasting Modderfontein (2018-2019): Project Manager. Undertaking the stakeholder engagement process in support of the Modderfontein Site Minimum Emissions Standard Postponement Application. Client: AEL Intelligent Blasting
- Identification of Interested and Affected Parties for Omnia Sasolburg, Sasolburg, Free State, South Africa (2018): Project Manager. The identification of interested and affected parties in terms of Clause 4.1 and 4.2 of ISO 14001:2015. Client: Omnia Fertilizer a Division of Omnia Group (Pty) Ltd
- Re-establishment of a Monitoring Committee for Metalloys, Meyerton, Gauteng, South Africa (2015 – 2016): Project Manager. The re-establishment of a Monitoring Committee for four of the Waste Management Facilities at Samancor Manganese, Metalloys. Client: BHP Billiton Metalloys (Pty) Ltd
- Stakeholder Engagement for Mooi-Mgeni Transfer Scheme Phase 2, Rosetta Village, Kwazulu- Natal, South Africa (2009): Assistant. This project involved undertaking the public participation process for the Mooi-Mgeni Transfer Scheme Phase 2, which will primarily encompass the construction of the proposed Spring Grove Dam and an associated transfer pipeline from the proposed dam to the Mpofana River. Client: Department of Water Affairs and Forestry (DWAF)

Legal Compliance

- AfriSam Regulation 34 Audits (2020-2021): Lead Auditor. Undertaken the Regulation 34 Compliance Audits for various AfriSam Operations (Eikenhof, Roodekrans, Ladysmith, Umlaas, Pietermaritzburg, Rooikraal). Client: AfriSam
- EMPR Regulation 34 Audits at Mogalakwena Section, Limpopo, South Africa (2020): Lead Auditor. Undertaking nine compliance audits in accordance with Regulation 34 of the EIA Regulations and compilation of seven statements of confirmation that the activities have not yet commenced. Client: Rustenburg Platinum Mines.
- Desktop Review of the Impala EMPR 2019 Audit (2020): Lead Auditor. A desktop review was undertaken to determine whether any changes has been made to the operations at Impala that could influence compliance. Client: Impala Platinum
- External Waste Management Licence Audit at Impala Platinum, Gauteng, South Africa (2016, 2018 and 2020): Lead Auditor. External compliance audit of the WML for the Salvage Yard at Impala Springs. Client: Impala Platinum Refiners
- External Water Use Licence Audit of the Rustenburg Operations, North West, South Africa (2020): Lead Auditor. Undertaking the Water Use Licence for the Waterval Smelter and Anglo Convertor Plant, Rustenburg Base Metal Refinery and Precious Metals Refinery. Client: Rustenburg Platinum Mines.
- Impala Platinum Regulation 34 and Waste Management Licence Audits, Rustenburg (2019): Lead Auditor. Undertaking seven compliance audits in accordance with Regulation 34 of the EIA Regulations. Client: Impala Platinum

- Surface Operations Regulation 34 Audits (2019): Lead Auditor. Undertaking the Regulation 34 audits for the Vaal River, Mine Waste Solution and West Wits Operations. Client: AngloGold Ashanti Limited
- Used Oil Industry Audits, Countrywide, South Africa (2014-2019): Lead Auditor. Country-wide environmental compliance auditing of the South African recycled oil industry, comprising sixteen oil refinery operations, and twenty nine drum re-conditioning plants. The audits are primarily focussed on compliance to legislation and ensuring that each site follows international best practice. The audits include a review of the refineries ISO14000 auditor's findings, and tracking of compliance in regards to corrective actions. Client: OSE Foundation
- Sasol Third Party Audits, Johannesburg, Gauteng, South Africa (2017): Project Manager. Undertaken compliance assessments of three environmental authorisations and two water use licence for Sasol Gas. Client: Sasol Gas
- External Environmental Compliance Audit - Tarlton Intermixture Fractionator Plant, Gauteng, South Africa (2014 and 2016): Lead Auditor. An external environmental compliance audit of the record of decision for the Transnet Pipelines Tarlton Intermixture Fractionator Plant was undertaken in order to establish whether Transnet Pipelines are compliant with the conditions specified therein. The audit was undertaken by means of site observations, interviews and verification of available information. Client: Transnet Pipelines (GOC) Ltd
- Waste Management Licence for the Remediation and Decommissioning of Tar Residue Pits, Rustenburg, North-West, South Africa (2015): Lead Auditor. A c lose-out audit was undertaken to compile compliance with the Waste Management Licence conditions during remediation and decommissioning. Client: Anglo Platinum Limited - Rustenburg Platinum Mines Limited
- Water Use Licence Audit for the Landau Colliery, Mpumalanga, South Africa (2014): Auditor. The audit of the Water Use Licence was conducted in accordance with the relevant requirements of the National Water Act and conditions stipulated therein. The audit report included a summary of findings and compliance criteria, as well as recommendations for future corrective and preventative actions if required. Client: Anglo American Thermal Coal
- Waste Management License Audit for the Slagment Operation, Vanderbijlpark, Gauteng, South Africa (2014): 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 South Africa (Pty) Ltd
- Legal Compliance Audit, Olifantsfontein, Province, South Africa (2012): Lead Auditor. The project included undertaking a legal compliance audit of the atmospheric emissions licence and waste management licence at A-Thermal Retort Technologies (Pty) Ltd. A-Thermal, in Olifantsfontein. Client: A-Thermal retort Technologies (Pty) Ltd
- Metalloys Water Use Licence Audit, Meyerton, Gauteng, South Africa (2012): Auditor. The project entailed undertaking a compliance verification audit of the water use licence conditions of Metalloys. Recommendations were also provided in the audit report for non-compliance or potential concerns. Client: Samancor Manganese (Pty) Ltd
- M14 Furnace Legal Compliance Audit, Meyerton, Gauteng, South Africa (2010 & 2012): Auditor. The project included undertaking a legal compliance audit at Samancor Manganese (Pty) ltd (Metalloys) to verify their compliance to the conditions of the record of decision issued for the M14 Furnace and the associated atmospheric emissions licence. Client: Samancor Manganese (Pty) Ltd
- Annual Audit of the Record of Decision and Environmental Management Plan for the Fouriespruit Stream diversion and Old Slag Area, Meyerton, Gauteng, South

Africa (2009 & 2010): Lead Auditor. A legal compliance audit on the record of decision and the associated environmental management plan was undertaken to establish whether the upgrading of the existing stream diversion and the closure and rehabilitation of the old slag disposal area comply with the conditions contained therein. Client: Samancor Manganese (Pty) Ltd

- Goedgevonden Mine Water Use Licence Audit, Ogies, Mpumalanga, South Africa (2009): Auditor. The project entailed undertaking a compliance verification audit of the water use licence conditions of Goedgevonden Mine. Recommendations were also provided in the audit report for non-compliance or potential concerns. Client: Xtrata Coal South Africa

Environmental Due Diligence and Liability Assessments

- Environmental Due Diligence for Rolfes Chemicals, Germiston, Gauteng, South Africa (2014): Auditor. Environmental Due Diligence for the acquisition of a Processing Plant and associated facilities. Client: Rolfes Chemicals Alberton
- Environmental and Social Due Diligence of 22 FMCG facilities, Country-wide, South Africa (2014): Lead Auditor. Transactional Environmental and Social Due Diligence for the acquisition of 22 FMCG facilities mainly in the food manufacturing and consumer formulated chemical sectors situated across South Africa for an international private equity and real estate investor. Client: Confidential
- Environmental and Social Due Diligence of Medrock, Johannesburg, South Africa (2014): Lead Auditor. Transactional Environmental and Social Due Diligence for the acquisition of three medical supplies facilities situated in Johannesburg. Client: Confidential

Site Assessments

- The development and expansion at Two Rives Platinum Mine (2021): Project Manager. Environmental Screening for the proposed expansions at the existing Two Rivers Platinum Mine. Client: Two Rivers Platinum Mine
- The Development of a Filling Plant, Vosloorus, Gauteng (2019): Project Manager. Environmental screening for the proposed chemical filling plant. Client: Richbay Chemicals
- Springfield Coal Mine, Meyerton, Gauteng (2019): Project Manager. Site and Legal Review for the Proposed Springfield Coal Mine. Client: Glubay Coal
- The Development of Thermal Power Plant and Solar PV Plant, Nacala, Mozambique (2018): Project Manager. Environmental and social screening for the alternative sites in terms of the International Finance Corporation Performance Standards on Environmental and Social Sustainability. Client: Confidential
- Gap Analysis for the Northern Pit Development at Zibulo Colliery, Mpumalanga (2018): Project Manager. Undertaking a gap analysis of the proposed development of an opencast pit in the northern section of the approved mining right area for Zibulo Colliery, Mpumalanga. Client: Anglo American Inyosi Coal (Pty) Ltd
- Screening Assessment of Proposed Waste Management Facility at Vodacom Campus, Midrand, Gauteng, South Africa (2017). Project Manager. Screening assessment to prepare a business case based on the facts so that the options for Vodacom's development vs. the potential requirement to identify an alternative site can be objectively evaluated by Vodacom. Client: Vodacom Group Limited
- Site Assessment of a culvert on Sappi Forest Property, plantation Nooitgedacht – Camelot South, Ngodwana, Mpumalanga, South Africa (2015): Project Manager. A site assessment of a recently completed culvert development on Sappi Forest property, plantation Nooitgedacht – Camelot South, Mpumalanga. The purpose of the site assessment is to evaluate the works undertaken on site in respect of the National Environmental Management Act (107 of 1998) as amended and National

Water Act (36 of 1998) and relevant regulations promulgated under these acts. Client: Sappi Southern Africa Limited

- Legal Assessment for the a Proposed Development of a barley Malting Process in Alrode, Germiston, Gauteng, South Africa (2013): Senior Consultant. Undertaking of legal assessment to identify and assess potential scenarios based on environmental assessment triggers for the proposed development at erven 283, 289 and 1607 in Alrode Extension 2. Client: South African Breweries (Pty) Ltd

Environmental Management Systems

- Voorspoed Internal ISO 14001 Audit, Klerksdorp, Free State, South Africa (2010): Auditor. An internal audit was undertaken of the Voorspoed Mine, ISO 14001 System. During the audit conformance to ISO 14001 and the effective implementation of such was assessed. Client: De Beers Group Services (Pty) Ltd
- Venetia Internal ISO 14001 Audit, Musina, Limpopo, South Africa (2009): Auditor. An internal audit was undertaken of the Venetia Mine, ISO 14001 System. During the audit conformance to ISO 14001 and the effective implementation of such was assessed. Client: De Beers Group Services (Pty) Ltd

APPENDIX

B EAP DECLARATION OF INTEREST AND UNDERTAKING

ADDENDUM 3

9. DECLARATION OF THE EAP

I Anri Scheepers, declare that -

· I act as the independent environmental practitioner in this application for ;

· I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant

· I declare that there are no circumstances that may compromise my objectivity in performing such work;

· I have expertise in conducting environmental impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;

· I will comply with the Act, Regulations and all other applicable legislation, policies and guidelines;

· I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

· I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public at large and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties, state department and competent authority will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;

· I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;

· I will keep a register of all interested and affected parties that participated in a public participation process; and

· all the particulars furnished by me in this form are true and correct;

· I will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and

Signature of the Environmental Assessment Practitioner:

WSP Group Africa (Pty) Ltd

Name of company:

19/10/2021

Date:

Signature of the Commissioner of Oaths:

19.10.2021

Date:

HR Professional

Designation:

Commissioner of Oaths Official stamp (below)

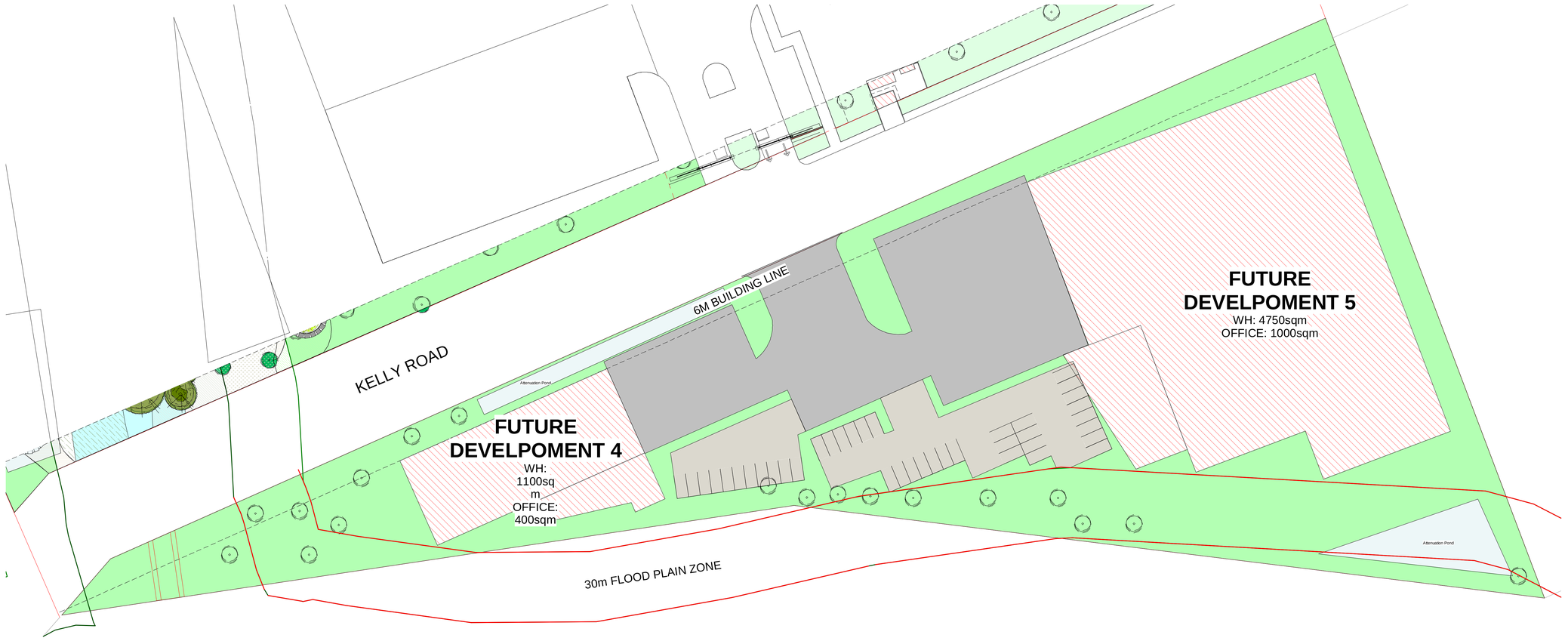
SABPP™ SA BOARD FOR PEOPLE PRACTICES Setting HR standards

CHARLENE BOND
Commissioner of Oaths
HR Professional (HRP)
Member number: 43302096
Medupi Power Station
Steenbokpan Road
Lephalale

In the event where the EAP or specialist is not independent (Regulation 13(2) and (3) of the EIA Regulations, 2014), the proponent or applicant must, prior to conducting public participation, appoint another EAP or specialist which meets all the general requirements including being independent, to externally review all work undertaken by the EAP or specialist, at the applicant's cost appointed to manage the application.

APPENDIX

C LAYOUT MAP



1 000 Full Site Plan- 30m Floodplain 01
1 : 350

GENERAL NOTES:

DRAINAGE NOTES:

ALL PLUMBING AND DRANAGE WORK AND INSTALLATION OF SANITARY
FITTINGS TO COMPLY WITH THE NATIONAL BUILDING REGULATIONS

PROVIDE I.E.'S TO ALL BENDS AND JUNCTIONS WITH SUITABLE MARKERS AT GROUND LEVEL

MINIMUM FALL TO ALL DRAINS PIPES TO BE 1:40.

PROVIDE A.E. TO FOOT OF ALL SOIL STACKS.

PROVIDE APPROVED RESEAL TRAPS TO ALL WASTE FITTINGS.

I.E.'S TO WASTE PIPES TO BE FULLY ACCESSIBLE AT ALL TIMES.

ALL SOIL PIPES PASSING UNDER BUILDINGS OR FOOTINGS TO BE
ENCASED IN CONCRETE OF MINIMUM 100MM THICKNESS ALL ROUND
PIPE.
ALL WASTE FITTINGS ON THE ONE-PIPE STYSTEM TO HAVE 75MM DEAP-SEAL RESEALING TRAP AND AN APPROVED VENT VALVE WHERE REQUIRED

STRUCTURAL NOTES.

ALL STRUCTURAL STEEL AND CONC. WORK TO STRUCTURAL ENGINEERS
DETAIL.

FIRE PREVENTION NOTES

ALL NEW WORK TO BE DONE IN ACCORDANCE WITH PART T OF SANS 10-400 THE FIRE-PREVENTION REGULATIONS AS PROMULGATED IN THE NATIONAL BUILDING REGULATIONS.

SAFETY DISTANCES IN COMPLIANCE WITH TT2.

FIRE DEPARTMENT MUST BE NOTIFIED ON COMPLETION OF INSTALL-
ATION IN ORDER TO OBTAIN A CLEARANCE CERTIFICATE PRIOR TO
ELECTRICAL CONNECTION
FIRE FIGHTING EQUIPMENT TO COMPLY WITH TT32, TT33 AND TT34
INCONSPICUOUS FIRE APPLIANCES AND ALL EMERGENCY EXITS TO
BE INDICATED BY SYMBOLIC SIGNS

HEALTH NOTES

1. DUST CONTROL MEASURES TO BE TAKEN
   DURING DEVELOPMENT AND CONSTRUCTION
2. CHEMICAL TOILETS TO BE PROVIDED
   ON SITE BEFORE CONSTRUCTION
3. NOISE CONTROL MEASURES TO BE
   TAKEN DURING CONSTRUCTION
4. ALL PARITITIONING TO BE VERMIN PROOF
5. REFUSE AREA TO BE PROVIDED WITH CONCRETE FLOOR SLOPED TO A GULLY WITH A TRAP
6. BUILDING RUBBLE TO BE TAKEN TO AN
   APPROVED DUMPING SITE.
7. THE MAKING OF OPEN FIRES AND THE BURNING OF
   REFUSE WILL NOTE BE PERMITTED.

LIGHT AND VENTILATION

ALL LIGHT AND AIR TO BE IN ACCORDANCE WITH PART O OF SANS 10-400

Revision Schedule

Rev	Date	Description
A	2020 07 09	FOR INFORMATION

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unit 18
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248 kent avenue/cnr republic road
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Project Name:
Sandvik

Project Address:
Portion 12 Witkoppie
Jet Park Ext 64.

CLIENT SIGN.	
ENG. SIGN.	

Drawing:
Master Plan 01

Scale:	Drawn:	Checked:	Date:
1 : 350	Author	Checker	07/09/20

Status: **FOR INFORMATION**

Drawing Number		Revision
1477	053	A

SABLE PLACE PROPERTIES 131 (PTY) LTD

JETPARK WAREHOUSE DEVELOPMENT
ENVIRONMENTAL SENSITIVITIES

Legend

- Site Boundary
- Wetland
- 30m_buffer
- 15m_buffer

Polygons

- Riperian
- Transformed
- Degraded Grassland
- Ecological Support Area
- Important Area

N

0 10 20 30 40 50

Metres

DATA SOURCE:
ARC GIS 10.2

PROJECTION: UTM Zone 35S (WSG1984)

PROJECT TITLE: Jet Park Development

PROJECT NO: 41101262

SCALE: 1:1 908 AT A4 | DATE: 2022/01/24

DRAWN BY: ANRI SCHEEPERS

REVIEWED BY: ROBERT ELS

WWW.WSP.COM

APPENDIX

D REHABILITATION PLAN

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BOKAMOS
Landscape Architects & Environmental Consultants CC

Wetland Assessment and Rehabilitation Plan

Jet Park

Erf 487 on Jet Park Extension 21, Ekurhuleni Metropolitan Municipality

April 2020

Prepared by:

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BOKAMOS
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Declaration of Independence

I, **Lizette Venter**, in my capacity as a specialist consultant, hereby declare that I -

- Act as an independent specialist and will perform the study in an objective manner free of influence and prejudice, even if the resultant findings are unfavourable to the applicant;
- Have the relevant expertise in conducting the report relevant to this application;
- Will comply with all regulations, Acts and other applicable guidelines that are applicable to the activity;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended;
- Do not have any conflicting interests in the preparation of this report;
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision taken with respect to the application by the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended;
- As a registered member of the South African Council for Natural Scientific Professions (SACNASP), will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member; and
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.

This report has been prepared according to the requirements of Appendix 6 of the Environmental Impact Assessments Regulations, 2014 as amended; and GN 267, 2017 of the National Water Act, 1998 (Act No. 36 of 1998, as amended).

Lizette Venter (*Cand.Sci.Nat.*)
Wetland specialist
SACNASP Reg. No. 100144/15

Indemnity

This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as information available at the time of study. Therefore, the author reserves the right to modify aspects of the report, including the recommendations, if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although the author exercised due care and diligence in rendering services and preparing documents, she accepts no liability, and the client, by receiving this document, indemnifies the author against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by the author and by the use of this document.

Disclaimer

This report is aimed at evaluating site specific conditions as determined in context of relevant legislation and guidelines and to ensure the conservation and management of the water resources found on the site. However, the intention of this study is not to function as one of several attempts made by the proponent in order to gain favourable outcomes for the application. Rather, this report functions as an independent study and not as a comparative study between wetland specialists.

This report may be submitted directly to the competent authority should a prolonged correspondence occur between specialists and the applicant due to delineation comparisons.

Specialists	
Field work, data analysis and report writing	Lizette Venter MSc (Aquatic Health) BSc Hons (Environmental Management) Environmental Scientist / Wetland Specialist SACNASP Reg. No. 100144/15

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1. INTRODUCTION

Bokamoso Landscape Architects and Environmental Consultants cc, Specialist Division was appointed by WSP to conduct a wetland assessment and rehabilitation plan for the proposed warehousing development to be situated on Erf 487, Jet Park Extension 21, Ekurhuleni.

A Wetland Assessment was conducted by WSP in January, 2019 and is referred to for background information regarding the study site.

The site visit was conducted on 4 March 2020.

1.1 Terms of Reference

The focus of the investigation is to:

- Delineate and classify watercourses within the study site according to standardised and accepted methods;
- Undertake the ecological functional assessment, including the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS), of wetland areas (if present) within the area assessed;
- Recommend suitable buffer zones;
- Conduct a comprehensive assessment of the area affected by the activities conducted within the regulated area of the watercourses.
- A description of the process (based on best practice methodology) recommended for the rehabilitation, including timelines and responsible persons. To this effect, comprehensive measures and recommendations for the rehabilitation of the affected area must be provided.

1.2 Assumptions and Limitations

- The assessment is confined to the proposed development and 500m outside the boundary of the study site.
- The GPS used for delineations is accurate to within five meters. Therefore, the delineation plotted digitally may be offset by at least five meters in any direction. It is therefore suggested to measure and peg boundary areas in the field for higher accuracy.
- The on-site assessment is based on environmental indicators such as vegetation that are subjected to seasonal variation as well as factors such as fire and drought. Wherever available,

background information was gathered to aid in analysis of the site characteristics. Information provided within this report is based on observations made during the site survey on the specified date.

- Wetlands form transitional areas where vegetation species change from terrestrial to wetland species. Within this transition zone, some variation of opinion on the wetland boundary may occur, although all assessors should obtain relatively similar results when using the DWS methodology.

1.3 Definitions and Legal Framework

The National Water Act, 1998 (Act No. 36 of 1998, as amended) [NWA] defines a wetland as "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*." In addition to water at or near the surface, other distinguishing indicators of wetlands include hydromorphic soils and vegetation adapted to or tolerant of saturated soils (DWS, 2005).

Riparian habitat is described as "*the physical structure and associated vegetation of the areas associated with a watercourse, which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas"*. Riparian habitats often perform important ecological and hydrological functions, some similar to those performed by wetlands (DWS, 2005). Riparian habitat is also the accepted indicator used to delineate the extent of a river's footprint (DWAF, 2005).

This document was prepared according to the Gauteng Department of Agriculture and Rural Development (GDARD) Requirements for Biodiversity Assessments Version 3, February 2014, as well as key legislative requirements and guiding principles of the wetland study and the Water Use Authorisation process. The proponent must also comply with the provisions of the following relevant national legislation, conventions and regulations applicable to wetlands and riparian zones:

- The National Water Act, 1998 (Act No. 36 of 1998, as amended) [NWA]
- Convention on Wetlands of International Importance - the Ramsar Convention and the South African Wetlands Conservation Programme (SAWCP)

- National Environmental Management Act, 1998 (Act No. 107 of 1998, as amended) [NEMA]
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
- National Environment Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
- Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983)
- Regulations and Guidelines on Water Use under the NWA
- South African Water Quality Guidelines under the NWA
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002, as amended).

Water uses for which authorisation must be obtained from DWS, are indicated in Section 21 of the NWA. Section 21 (c) and (i) is applicable to any activity related to a wetland:

Section 21(c): Impeding or diverting the flow of water in a watercourse; and

Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

Wetlands situated within 500 m of proposed activities should be regarded as sensitive features potentially affected by the proposed development (GN 509, 2016). Such an activity requires a Water Use Licence (WUL) from the relevant authority. The regulation of wetlands is normally based on a water use licence, although a general authorisation can be applied for under GN 509. General Authorisation does not apply:
(a) to the use of water in terms of section 21(c) or (i) of the Act for the rehabilitation of a wetland as contemplated in General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009,
(b) to the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High as determined by the Risk Matrix.

This Risk Matrix must be completed by a suitably qualified SACNASP professional member;
(c) in instances where an application must be made for a water use license for the authorisation of any other water use as defined in section 21 of the Act that may be associated with a new activity;
(d) where storage of water results from the impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse; and
(e) to any water use in terms of section 21(c) or (i) of the Act associated with construction, installation or maintenance of any sewerage pipelines, pipelines carrying hazardous materials and to raw water and wastewater treatment works.

2. METHODOLOGY

An initial desktop study was conducted in order to gather background information on the site. The use of maps, aerial photographs and digital satellite imagery were consulted in order to assess the site conditions. GIS data was used to create maps describing the receiving environment, such as locality, soils, vegetation, critical biodiversity areas and hydrology.

A hand held GPS was used to capture co-ordinates in the field and a hand held camera for photographs. 1:50 000 cadastral maps and available GIS data were used as reference material for the mapping of the preliminary watercourse boundaries. These were converted to digital images containing delineation lines and buffers according to the field data received.

The delineation method documented by the Department of Human Settlements, Water and Sanitation (DHSWS), in their document "Updated manual for the identification and delineation of wetlands and riparian areas" (DWAF, 2008), and the Minimum Requirements for Biodiversity Assessments (GDACE, 2009) as well as the Classification System for Wetlands and other Aquatic Ecosystems in South Africa User Manual: Inland Systems (SANBI 2013) was followed throughout the field survey. These guidelines describe the use of indicators to determine the outer edge of the wetland and riparian areas.

2.1 Wetland and Riparian Classification and Delineation

2.1.1 Wetland indicators

Wetlands are delineated by means of the DHSWS guideline named 'A practical field procedure for identification and delineation of wetlands and riparian areas' (DWAF, 2008).

Wetlands are identified based on one or more of the following characteristic indicators (Figures 1 and 2):

- ***The Terrain Unit Indicator*** helps to identify those parts of the landscape where wetlands are more likely to occur. These include valley bottoms as well as slopes where groundwater discharge may occur.
- ***The Vegetation Indicator*** for the presence of plants adapted to saturated soils (hydrophytes). Vegetation growth helps in identifying the outer boundaries of a wetland since species composition changes dramatically between zones. Emphasis is placed on the group of species that dominate the plant community, and not on individual indicator species.

- ***The Soil Form Indicator*** identifies hydromorphic soils that display characteristics resulting from prolonged and frequent saturation and which are indicative of permanent, seasonal and temporary wetland zones. Gleyed soil has a grey, green or blue colour due to iron being dissolved out of the soil during anaerobic conditions. Seasonal or temporary wetlands generally have a fluctuating water table which creates alternating aerobic and anaerobic conditions in the soil. This causes iron to deposit over decades as yellow or orange patches, called mottles.
- ***The Soil Wetness Indicator*** to identify morphological changes due to anaerobic conditions developing in the first 50cm of the soil surface as a result of saturation. Specific soil colours and the presence of mottles are indicative of permanent or temporary saturation. The higher the frequency and duration, the greyer the soil matrix becomes. Hydromorphic soils that are permanently saturated generally do not show mottles.

According to the NWA, vegetation is the primary indicator, which must be present under normal circumstances. However, in practice the soil wetness indicator is used as the primary indicator since it shows long term morphological changes from saturation, whereas vegetation is seasonal and responds quickly to changes in soil moisture, human activities and climate. All other indicators are used to confirm the presence of a wetland.

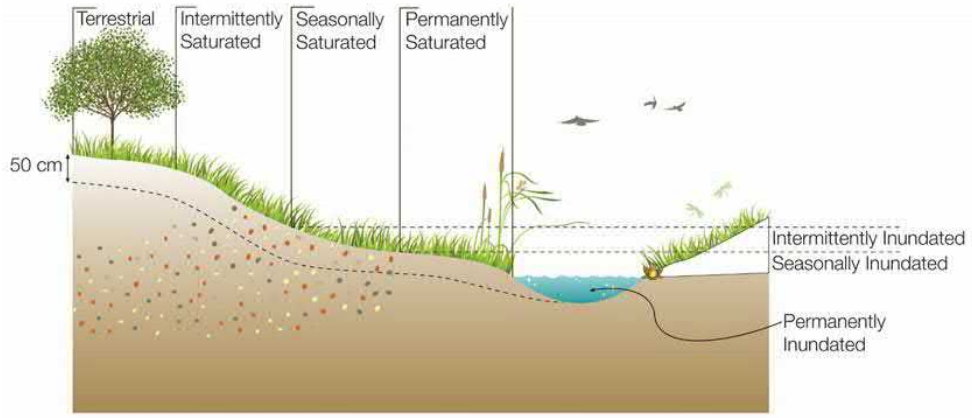

Figure 1: Typical cross-section of a wetland (Ollis, 2013)

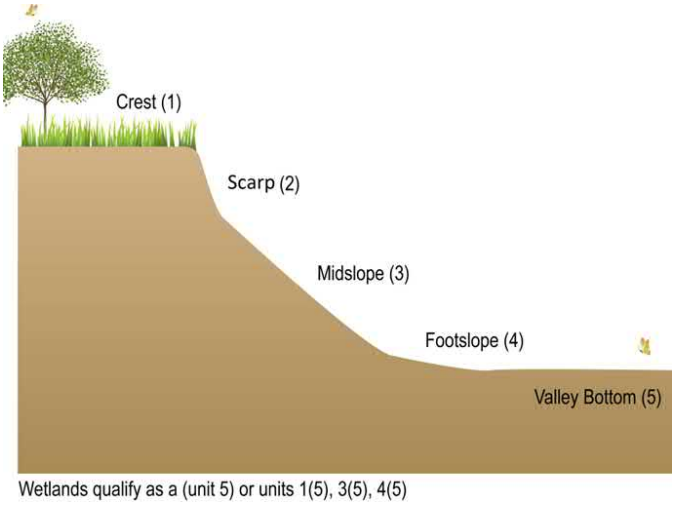

Figure 2. Terrain units (DWAF, 2005).

The boundary of the wetland is defined as the outer edge of the temporary zone of wetness, which is characterised by:

- A minimal grey matrix (<10%)
- Few mottles
- Short periods of saturation of less than 3 months per annum.

2.1.2 Riparian Area

Riparian areas have specific characteristics, namely:

- Are associated with a watercourse
- Contain distinctively different plant species than adjacent areas, exhibiting more vigorous or robust growth
- May have alluvial soils.

River channels flow within a confined valley or within an incised macro-channel. The "river" includes both the active channel (the portion which carries the water) as well as the riparian zone (Kotze, 1999). Riparian habitat is classified primarily by identifying riparian vegetation along the edge of the macro stream channel. Rich alluvial soils deposit nutrients making the riparian area a highly productive zone. This causes a very distinct change in vegetation structure and composition along the edges of the riparian area (DWAF, 2008). Riparian vegetation is supported by perennial and non-perennial streams.

Riparian areas perform valuable functions including:

- store water and help reduce floods
- stabilize stream banks
- improve water quality by trapping sediment and nutrients
- maintain natural water temperature for aquatic species
- provide shelter and food for birds and animals
- provide corridors for movement and migration of species
- act as a buffer between aquatic ecosystems and adjacent land uses
- can be used as recreational sites
- provide material for human use.

It is possible to delineate riparian areas by checking for the presence of specific indicators. Some areas may display both wetland and riparian indicators, and can accordingly be classified as both. The riparian delineation process requires that the following be taken into account:

- Topography associated with the watercourse
- Vegetation
- Alluvial soils and deposited material.

The most important indicator is vegetation, where the outer edge is adjacent to the watercourse where a distinct change in vegetation occurs. Topography and the presence of alluvial soils are the next indicators used to confirm the riparian area.

Riparian areas can be grouped into different categories based on their inundation period per year. Perennial rivers are rivers with continuous surface water flow, intermittent rivers are rivers where surface flow disappears but some surface flow remains, and temporary rivers are rivers where surface flow disappears for most of the channel. Two types of temporary rivers are recognized, namely “ephemeral” rivers that flow for less time than they are dry and support a series of pools in parts of the channel, and “episodic” rivers that only flow in response to extreme rainfall events, usually occurring high in their catchments (Seaman *et al,* 2010).

2.1.3 Wetland Classification

The classification system developed for the National Wetlands Inventory is based on the principles of the hydro-geomorphic (HGM) approach to wetland classification as described by SANBI, 2009 (Figure 3). In general, HGM units encompass three key elements (Semeniuk & Semeniuk 1995; Finlayson *et al*., 2002; Ellery *et al*., 2008; Kotze *et al*., 2008, Kotze *et al*., 2005), namely:

- Geomorphic setting - This refers to the landform characteristics and processes
- Water source - Precipitation, groundwater flow, stream flow, etc.
- Hydrodynamics – the presence and movement of water through the wetland.

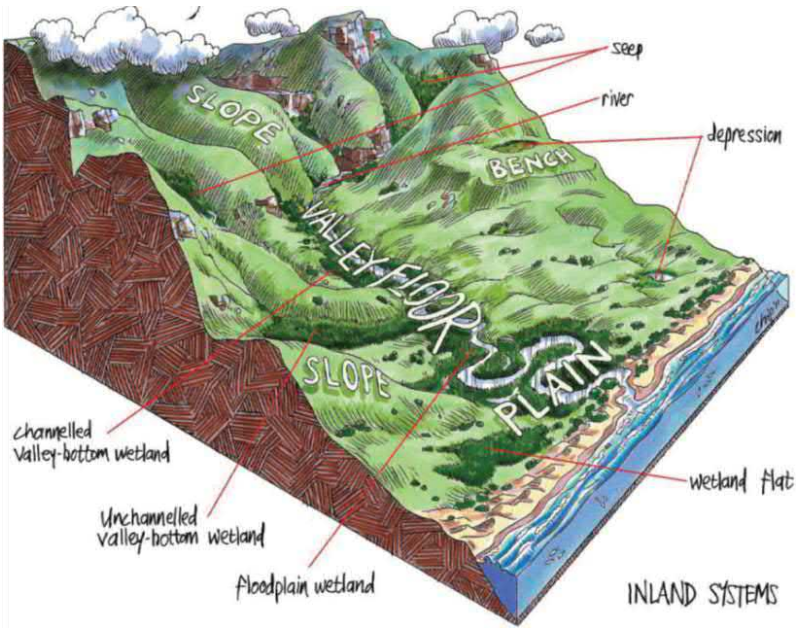

Figure 3: Wetland Units based on hydrogeomorphic types (Ollis et al. 2013)

2.2 Buffer Zones

A buffer zone is defined as *"a strip of land surrounding a wetland or riparian area in which activities are controlled or restricted"* (DWAF, 2005). A development has several impacts on the surrounding environment and on a wetland. The development changes habitats, the ecological environment, infiltration rate, amount of runoff and runoff intensity of the site, and therefore the water regime of the entire site. An increased volume of stormwater runoff, peak discharges, and frequency and severity of flooding is therefore often characteristic of transformed catchments. The buffer zone serves to highlight an ecologically sensitive area in which activities should be conducted with this sensitivity in mind.

Despite limitations, buffer zones are well suited to perform functions such as sediment trapping, erosion control and nutrient retention which can significantly reduce the impact of activities taking place adjacent to water resources. Buffer zones are therefore proposed as a standard mitigation measure to reduce impacts of land uses / activities planned adjacent to water resources. These must however be considered in conjunction with other mitigation measures.

Local government policies require that protective buffer zones be calculated from the outer edge of the temporary zone of a wetland (KZN DAEA, 2002; CoCT, 2008; GDARD, 2012).
Wetland buffer requirements:

- 30 meters from the temporary zone for wetlands occurring inside the urban edge;
- 50 meters from the temporary zone for wetlands occurring outside the urban edge; or
- Larger buffer areas for wetlands supporting sensitive faunal or floral species.

Rivers (non-perennial/perennial) buffer requirements:

- A 100-meter buffer zone from the edge of the temporary zone outside the urban edge;
- A 32-meter buffer zone from the edge of the temporary zone inside the urban edge; or
- Larger buffer areas for aquatic ecosystems supporting sensitive species.

The DHSWS Buffer Guideline (McFarlane *et al*., 2013) is used to determine the scientific buffer requirements which may be more or less than the generic values.

2.3 Functionality, Status and Sensitivity

Wetland functionality is defined as "a measure of the deviation of wetland structure and function from its natural reference condition." The natural reference condition is based on a theoretical undisturbed state extrapolated from an understanding of undisturbed regional vegetation and hydrological conditions. The hydrological, geomorphological and vegetation integrity are assessed for the wetland units associated with the study site, to provide a Present Ecological Status (PES) score (Macfarlane *et al*., 2007) and an Environmental Importance and Sensitivity category (EIS) (DWAF, 1999).

2.3.1 Present Ecological Status (PES) – WET-Health

A summary of the three components of the WET-Health method namely Hydrological, Geomorphological and Vegetation Health assessment for the wetlands found on site is described in Table 1.

Table 1: Health categories used by WET-Health for describing the integrity of wetlands (Macfarlane *et al.*, 2007)

Description	Impact Score Range	PES Score	Summary
Unmodified, natural.	>0.9	**A**	**Very High**
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1 - 1.9	**B**	**High**
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2 - 3.9	**C**	**Moderate**
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4 - 5.9	**D**	**Moderate**
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6 - 7.9	**E**	**Low**
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	**F**	**Very Low**

2.3.2 Ecological Importance and Sensitivity (EIS)

Ecological importance is an expression of a wetland's importance to the maintenance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (DWAF, 1999). The EIS methodology can also be applied to other water resources such as rivers and lakes.

This classification of water resources allows for an appropriate management class to be allocated to the water resource and includes the following:

- Ecological Importance in terms of ecosystems and biodiversity
- Ecological functions including groundwater recharge, provision of specialised habitat and dispersal corridors
- Basic human needs including subsistence farming and water use.

Explanations of the scores are given in Table 2.

Table 2: Environmental Importance and Sensitivity rating scale used for the estimation of EIS scores (DWAF, 1999)

Ecological Importance and Sensitivity Categories	Rating	Recommended Ecological Management Class
Very High Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water in major rivers	>3 and <=4	**A**
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers	>2 and <=3	**B**
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers	>1 and <=2	**C**
Low/Marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water in major rivers	>0 and <=1	**D**

3. RESULTS

3.1 Locality of the study site

The proposed warehousing development is situated in Jet Park, Ekurhuleni Metropolitan Municipality. The site boundaries are the R21 to the east, Marlin Avenue to the north and south, and Kelly Road to the west. The OR Tambo International Airport is situated across the R21 in the east. The development includes culverts and water pipelines.

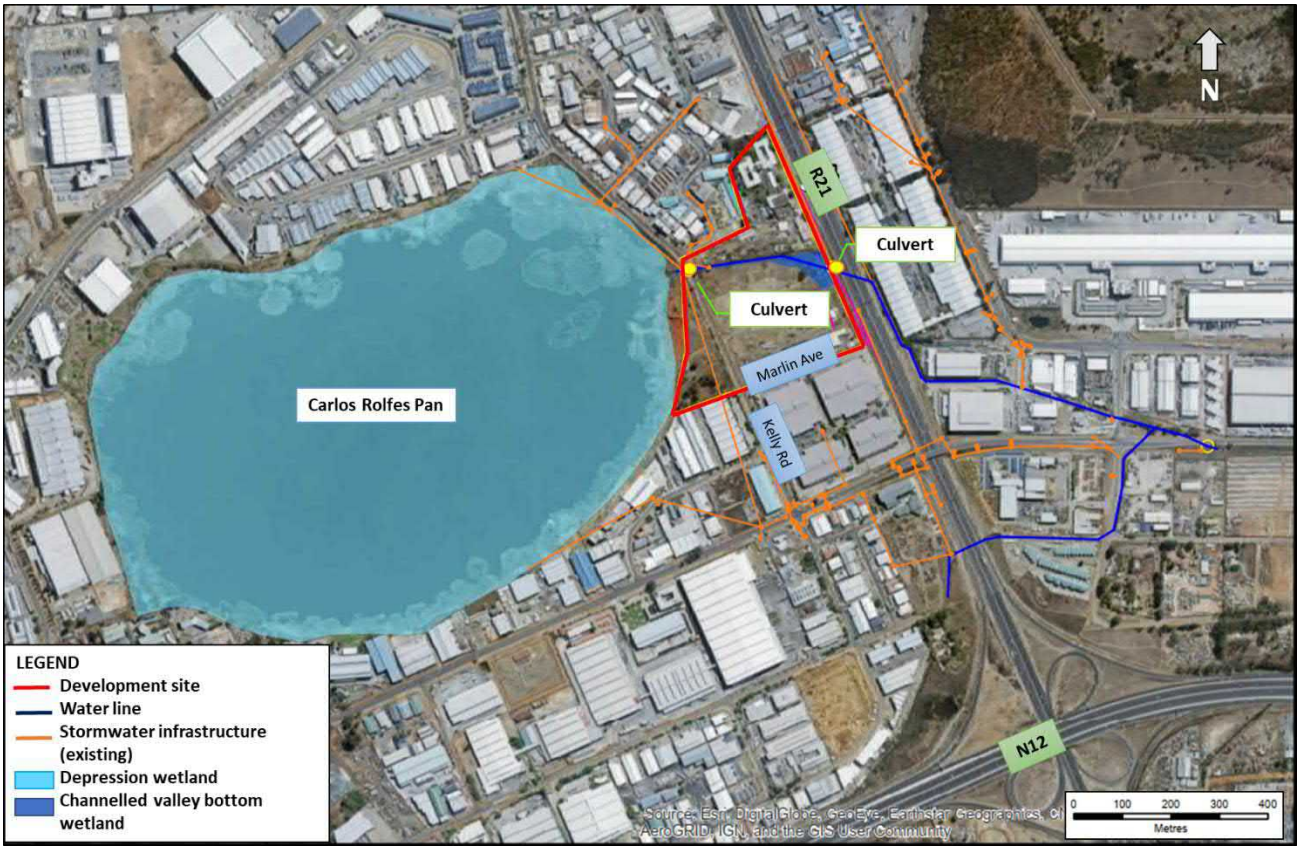

Figure 4: Locality Map indicating infrastructure and wetlands

3.2 Description of the Receiving Environment

3.2.1 Land Use

The surrounding areas are light industrial and business developments.

3.2.2 Hydrology

The site is situated in quaternary catchment C21D of the Vaal water management area. The Carlos Rolfes Pan is situated to the west.

3.2.3 Regional vegetation

The site is situated in the Soweto Highveld Grassland vegetation unit of the Mesic Highveld Grassland Bioregion in the Grassland Biome (Mucina & Rutherford, 2010).

Soweto Highveld Grassland vegetation is characterised by

3.2.4 Geology and Soils

According to available geological maps, the study site is underlain by Quartzite geology.

3.2.5 Gauteng Conservation Plan (C-Plan)

The proposed warehousing development is situated within an urban area and the Carlos Rolfes pan is classified as Ecological Support Area.

3.3 Watercourse Classification and Delineation

Two wetland HGM units occur within 500m of the study site. A Channelled Valley Bottom wetland borders the north of the site and is connected to a Pan / Depression to the west (Carlos Rolfes Pan), which covers approximately 85 hectares in extent. It was confirmed during the site survey that the wetlands have not changed since the WSP study was conducted in 2019. However, the impacts on the channelled valley bottom have increased due to the new development.

Augering of the wetland areas showed gley soils with mottling and increasing clay content at depth.

Refer to Figure 5 for the WSP wetland delineation map.

Figure 5: Wetlands of the study site (WSP 2019)

3.4 Wetland Impacts

The channelled valley bottom wetland initially extended further to the south and north, however, due to development over time, the wetland has become channelled and narrowed. Invasive and alien vegetation growth is high surrounding both wetlands, although the pan is impacted to a lesser degree. Due to development, parts of the wetland have been scraped clean for vehicle access and the vegetation removed. An earthen berm has been placed along the buffer line for the channelled valley bottom. A vehicle crossing was created previously between the sites north and south of the stream channel which has led to erosion and sedimentation.

The pan is in generally good condition, except for sections west of the development site boundary. These areas have been cleared for access roads to the pan. Dumping of builder's rubble and growth of the invasive blue gum trees and weeds are additional impacts to the area.

Refer to Figure 6-7 for historic and current site condition aerial imagery and Figure 8-10 for photos of site characteristics and impacts.

Figure 6: current site conditions (2020)

Figure 7: Site conditions in January 2019

Figure 8: Wetland characteristics for the channelled valley bottom

a – b) Wetland vegetation showing high growth of alien and invasiev species (trees and weeds). c) Stream channel. d) Wetland edge with *Typha capensis* stands within the stream channel. e-f) Soils showing clay content / gleying and mottles

Figure 9: Wetland characteristicsand impacts for the depression / pan

a – b) Pan characteristics. c – e) Site impacts

Figure 10: Wetland impacts for the channelled valley bottom

a-b) Clearing for access roads and stream crossing, showing sedimentation in the stream channel. c) Energy dissipating structure with retaining walls for stormwater. d – e) Clearing of the construction site with earth berm visible.

3.5 Present Ecological Status (PES) and Ecological Importance and Sensitivity (EIS)

The PES and EIS scores were calculated for the wetlands that occur within 500m of the proposed development. Refer to Table 3 to 5 below.

The combined **PES** score for the Channelled Valley Bottom wetland area is **5.5** and **D - Largely modified**. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural features are evident. Wetland conditions are not expected to deteriorate as limited space for additional development is available.

The combined **PES** score for the Hillslope Seep wetland area is **7.0** and **E - Seriously modified**. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable. The developer plans to rehabilitate the site and should the rehabilitation be conducted correctly, then the overall condition of the wetland will not deteriorate. Maintenance of the site is also required long term.

Table 3: The estimated Present Ecological State (PES) of the wetland

	Hydrology		Geomorphology		Vegetation	
	Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
Depression / Pan						
Area weighted impact scores	6.0	→	4.0	→	6.6	→
PES Category	**D**		**D**		**E**	
Channelled Valley Bottom						
Area weighted impact scores	7.0	→	6.4	→	7.6	→
PES Category	**E**		**E**		**E**	

Table 4: The Ecological Importance and Sensitivity (EIS) of the Channelled Valley Bottom

RIVER IMPORTANCE AND SENSITIVITY		
	Importance	***Confidence***
ECOLOGICAL IMPORTANCE & SENSITIVITY	1.3	*4.6*
HYDROLOGICAL/FUNCTIONAL IMPORTANCE	0.9	*4.5*
DIRECT HUMAN BENEFITS	0.2	*4.5*

The **EIS** scores indicate that the Channelled Valley Bottom is classed as **Low**. The wetland is ecologically important and sensitive on a local scale for stormwater management.

Table 5: The Ecological Importance and Sensitivity (EIS) of the Depression / Pan

RIVER IMPORTANCE AND SENSITIVITY		
	Importance	***Confidence***
ECOLOGICAL IMPORTANCE & SENSITIVITY	2.0	*4.6*
HYDROLOGICAL/FUNCTIONAL IMPORTANCE	1.9	*4.5*
DIRECT HUMAN BENEFITS	1.2	*4.6*

The **EIS** scores indicate that the Depression / Pan is classed as **Moderate / High**. The wetland is ecologically important and sensitive on a local scale. The biodiversity of the wetland is moderate and slightly sensitive to flow and habitat modifications. The wetland provides habitat for birds, fish, reptiles and small mammals.

3.6 Buffer recommendation

A **30m buffer** is required for both the wetlands adjacent to the study site, although this buffer has been reduced to **15m** around the depression / pan. Considreding the risks of flooding in the area (the channel is very shallow and could overflow easily), it is recommended to retain the 30m buffer around the valley bottom wetland. However, the northern sid eof the wetland has been cleared many years ago and does not have sufficient space to apply the 30m buffer, therefore the 15m buffer is accepted for the northern side.

Application of buffers around the depression / pan is limited as the majority of the surronding areas have already been developed.

4. REHABILITATION PLAN

The developer wishes to rehabilitate the wetland areas and to create open spaces where people can rest and enjoy the wetlands. Rehabilitation measures will be aimed at improving the vegetation species composition and ground cover, removal of dumping and resloping of disturbed areas.

For the valley bottom wetland, some natural and indigenous landscaping will be applied between the buffer and buildings. The developer wishes to construct a bird hide at the edge of the depression / pan for people to enjoy the significant bird life.

Figure 10 shows the areas to be rehabilitated. Table 6 and 7 describes the rehabilitation measures to be applied for the site before any landscaping activities can occur.

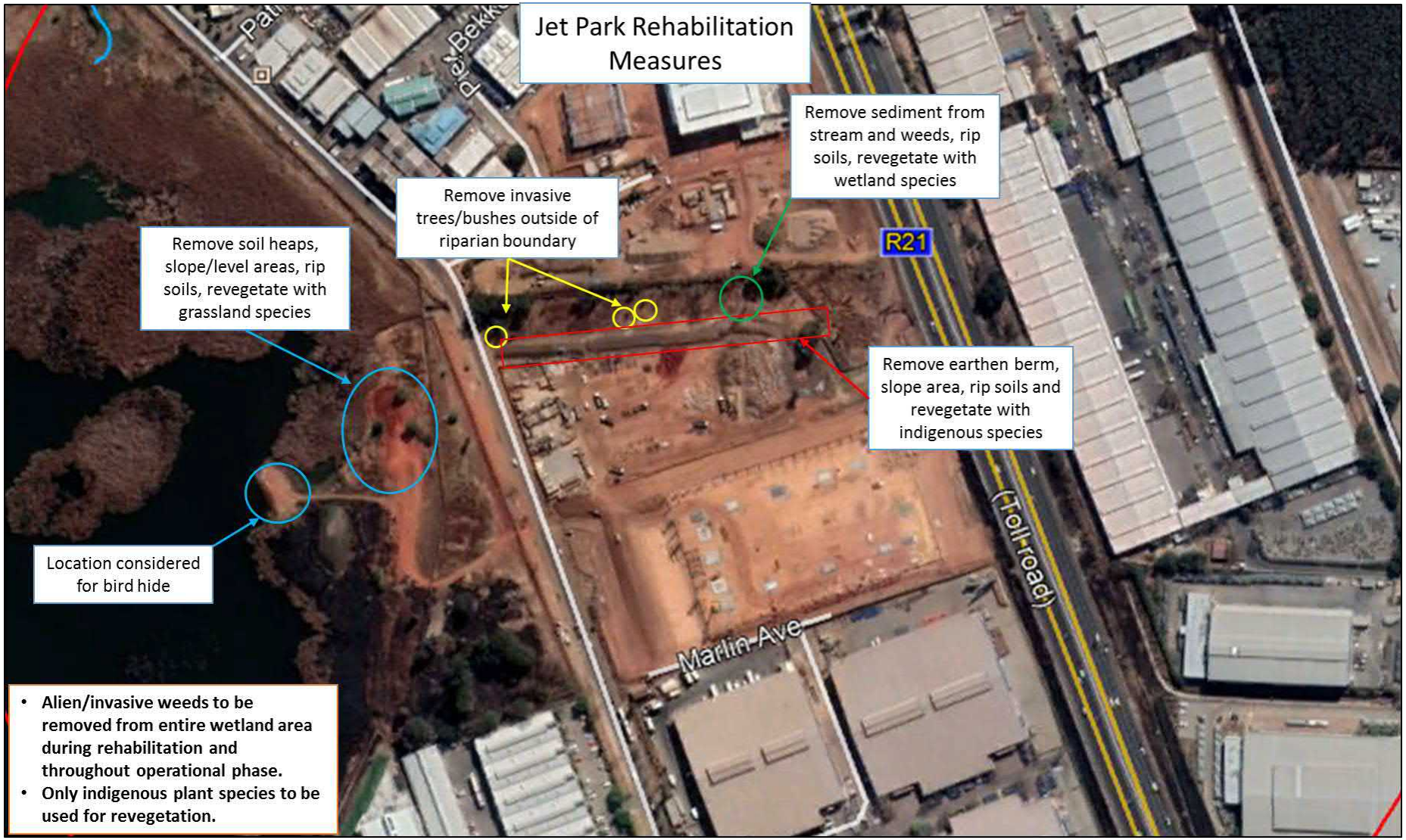

Figure 11: Rehabilitation sites and measures for the wetland areas

Table 6: Table of rehabilitation activities for the Jet Park development

REHABILITATION ACTIVITIES			
Activity	**Applicable areas**	**Method**	**Timeframe (approximate)**
Planning	• All areas planned for rehabilitation	• Plan the access and construction areas for the site. • The rehabilitation plan must be made available to all parties involved. • Plan the areas to be rehabilitated in stages so as to work on one area at a time.	• Prior to rehabilitation commencing
Access control	• Stream channel / pan edges	• Access must be restricted to as few people as possible. • Only vehicles required for the work may access the wetland channel during resloping and infilling activities. • All works should be supervised.	• Duration of rehabilitation activities
Storm water management	• Stream channel / pan edges	• Erosion and siltation prevention must be applied throughout the rehabilitation process. • Sand bags, hay bales and silt nets can be used.	• Duration of rehabilitation activities
Waste removal	• All areas for rehabilitation	• Designate an area for the temporary storage of waste and stockpiling. • The area must be located outside of sensitive areas. • Waste and rubble removal to occur daily. • Waste must be disposed of to a suitable landfill site.	• Daily during rehabilitation activities
Site clearing	• Dump areas	• All dumped soils and materials to be removed and cleared. • All materials to be removed to an approved dumping site.	• Prior to sloping activities
Site preparation	• Areas to be rehabilitated	• Areas for revegetation must be cleared of alien and invasive plants. • Indigenous vegetation must be cut to just above ground level and stockpiled for use in brush packing and seeding. • Activities must commence in areas that are small enough to be revegetated and stabilised before working on another area. • Areas where indigenous grass clump growth are unaffected by resloping activities should be preserved in order to stabilise the banks.	• Day 1-7 • Commence in early rain season (September to October)

		• The use of fertiliser should be avoided. Organic fertiliser to only be used if needed. • Soils must be moist for revegetation activities. • If needed, topsoil must be placed at a depth of 100mm in open areas to be vegetated.	
Resloping	• All cleared areas	• In order to promote vegetation growth and establishment, the slope angle must be a maximum of 1(V):3(H). The site is generally flat; however, the original topography of the area must be restored. • Slope reshaping must follow the natural slope and topography of the surrounding undisturbed areas. • Areas for resloping must be ripped or loosened to a depth of 150mm to prepare soils for revegetation and allow water penetration into the soils. • Ripping must be done manually with hand tools wherever possible. • No vehicles are permitted in the area once ripping is completed in order to prevent further disturbance to the wetland.	• Day 8-14
Revegetation	• All disturbed areas	• A suitable grass mixture must be spread by hand along the extent of the ripped areas. The species to be used must only be indigenous and endemic to the area. • The seed mixture may be purchased in the required amounts from co-ops. • Seeds must be thorough mixed before applying. • The seeds must be applied according to the required rates. • Application rates can be increased in areas that are unfavourable or steep, but no more than double the recommendations. • Seeds can be mixed with a spreading agent such as river sand, bran or finely sifted kraal to ensure even distribution. • Once complete, the seeded area must be watered and patted down gently. • Indigenous vegetation removed from the area must be applied over the seeded area as mulch.	• Day 15-16 • Directly after resloping.

		• Areas to be watered daily until vegetation has established (about 2 weeks).	

Table 7: Long Term maintenance

LONG TERM REHABILITATION ACTIVITIES			
Activity	**Applicable area**	**Method**	**Timeframe (approximate)**
Vegetation growth maintenance	• Revegetated areas	• Cordon off areas for new plant growth with danger tape and droppers. • No access must be permitted for vehicles, pedestrians or animals. • Monitoring for the establishment of alien plants must be done regularly, and these should be removed by hand.	• 3 months
Alien invasive control	• All wetland areas / open spaces	• Alien and invasive vegetation to be removed regularly.	• Throughout the operational phased of the development

5. ROLES AND RESPONSIBILITIES

5.1 Site Supervisor

- Planning of rehabilitation activities and timeframes.
- Appointment of contract team/ staff to perform the rehabilitation measures.
- Assign roles and responsibilities for contract team.
- Ensure rehabilitation activities are done in accordance to this document.
- Record keeping of dates when measures are applied, take photos and notes of the progress of the rehabilitation works.

5.2 Environmental Control Officer (ECO)

An independent environmental control officer shall be appointed for the duration of the rehabilitation works.

The ECO will:

- Ensure compliance of rehabilitation works to the approved Rehabilitation Plan.
- Ensure the owner is aware of all specifications relating to the Rehabilitation Plan.
- Ensure that all staff are aware of and adhering to the stipulations in the Rehabilitation Plan.
- Monitor the rehabilitation throughout its implementation.

6. INCIDENT MANAGEMENT

6.1 Failure of erosion control

- Contain eroded material by means of silt traps, hay bales, logs etc.
- Notify the ECO.
- Repair and replace damaged materials.
- Replace eroded material, being careful not to damage vegetation.
- Remove material from site.

6.2 Slope failure

- Stabilise the toe of the slope with bags, silt fences, hay bales etc.
- Prevent water from flowing towards silt fence.
- Protect the area from further collapse.
- Notify the ECO.

- Discuss options for restoration with the ECO and follow the restoration methods as discussed.
- Monitor the restoration until the area has stabilised.

7. REFERENCES

Department of Water Affairs (2008): Updated Manual for the Identification and Delineation of Wetlands and Riparian areas.

Department of Water Affairs (2010). National Water Act, 1998 (Act No 36 of 1998) S21(c) & (i) Water Uses. Version: February 2010. Training Manual.

Ewart-Smith J., Ollis D., Day J. and Malan H. (2013). National Wetland Inventory: Development of a Wetland Classification System for South Africa. Water Research Council project number K8/652

Gauteng Department of Agriculture, Conservation & Environment (2014) GDARD Minimum Requirements for Biodiversity Assessments Version 3. Directorate Nature Conservation, Johannesburg.

Gauteng Department of Agriculture and Rural Development, (2011): Gauteng Conservation Plan Version 3 ArcGIS Spatial data

Kleynhans CJ, Mackenzie J, Louw MD. 2007. Module F: Riparian Vegetation Response Assessment Index in River EcoClassification: Manual for EcoStatus Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry report.

Kleynhans CJ, Louw MD. 2007. Module A: EcoClassification and EcoStatus determination in River EcoClassification: Manual for EcoStatus Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry report.

Kotze D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.S. and Collins, N.B. (2005). WET-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands

Macfarlane D.M., Kotze D.C., Ellery W.N., Walters D, Koopman V, Goodman P and Goge C. (2008). WET-Health: A technique for rapidly assessing wetland health. Water Research Commission, Pretoria. WRC Rport TT340/08 February 2008

Macfarlane D.M., Teixeira-Leite A., Goodman P., Bate G and Colvin C. (2010) Draft Report on the Development of a Method and Model for Buffer Zone Determination. Water Research Commission project K5/1789. The Institute of Natural Resources and its Associates

Macfarlane D.M., Bredin I.P., Adams J.B., Zungu M.M., Bate G.C., and Dickens C.W.S. (2014) Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries. Water Research Commission report TT610/14.

Mucina L., & Rutherford M. C. (2006). Vegetation Map of South Africa, Lesotho and Swaziland, 1:1 000 000 scale sheet maps. South African National Biodiversity Institute., Pretoria.

APPENDIX A: GLOSSARY OF TERMS

Activity	a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation
Buffer	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Duration	the length of time over which the stressor will cause a change in the resource or receptor.
EIS	ecological importance and sensitivity. Key indicators in the ecological classification of water resources. Ecological importance relates to the presence, representativeness and diversity of species of biota and habitat. Ecological sensitivity relates to the vulnerability of the habitat and biota to modifications that may occur in flows, water levels and physico-chemical conditions.
Impacts/ Risks	the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
MC	management class representative of those attributes that the DWA (as the custodian) and society require of different water resources (consultative process). The process requires a wide range of trade-offs to assessed and evaluated at a number of scales. Final outcome of the process is a set of desired characteristics for use and ecological condition each of the water resources in a

	given catchment. The WRCS defines three management classes, Class I, II, and III based on extent of use and alteration of ecological condition from the predevelopment condition.
PES	present ecological state. The current state or condition of a water resource in terms of its biophysical components (drivers) such as hydrology, geomorphology and water quality and biological responses viz. fish, invertebrates, riparian vegetation). The degree to which ecological conditions of an area have been modified from natural (reference) conditions.
Seepage	A type of wetland occurring on slopes, usually characterised by diffuse (i.e. unchannelled, and often subsurface) flows.
Sedges	Grass-like plants belonging to the family Cyperaceae, sometimes referred to as nutgrasses. Papyrus is a member of this family.
Wetland	"land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil." (National Water Act; Act 36 of 1998).
Wetland delineation	the determination and marking of the boundary of a wetland on a map using the DWAF (2005) methodology. This assessment includes identification of suggested buffer zones and is usually done in conjunction with a wetland functional assessment. The impact of the proposed development, together with appropriate mitigation measures are included in impact assessment tables
WMA	water management area

APPENDIX B: CV OF SPECIALIST

Lizette Venter

South African Wetland Society
SACNASP (Reg. No. 100144/15)

Work History

DELTERRA CONSULTING – Environmental Consultant

Wetland delineation
Ecological/ risk and impact assessments
Desktop analysis
Environmental Compliance

WETREST – Research as part of MSc in Aquatic Health

- "A Holocene Wetland: Hydrological Response to Rehabilitation at Colbyn Valley Wetland, Pretoria, Gauteng"
- Weekly groundwater level and pressure monitoring
- Isotope analysis
- Water quality monitoring
- Vegetation growth mapping

Education

MSC IN AQUATIC HEALTH – University of Johannesburg
BSC HONS IN ENVIRONMENTAL MANAGEMENT (CUM LAUDE) – UNISA
BSC AGRICULTURE – University of the Free State

Short Courses

FEB 2017	Taxonomy of wetland Plants (SANBI)
FEB 2016	Grass identification and veld management
NOV 2015	WRC/ ECO-PULSE Workshop in determination of buffers for rivers, wetlands and estuaries
APR 2015	Workshop on environmental compliance, enforcement and risk management

Projects

Wetland delineation, PES/EIS, functional assessment, Impacts and Mitigation, VEGRAI, QHI, Risk Assessments

Riverwalk Electrical

Lanseria x66 Mixed-use Development, Johannesburg

Lanseria x65 Filling Station, Johannesburg

TUT Ga-Rankuwa Expansion, Ga-Rankuwa, Gauteng. (in progress)

Waterfall Ridge Mixed-use Development, Johannesburg. (in progress)

Glen Vista Residential Development, Gauteng

Nkosi City Mixed-Use Development, Mpumalanga

Slovo Park/ Nancefield Residential Development, Gauteng

Kudube Unit 9 Sewer Outfall, Gauteng

Mooibosch Resort Development, Gauteng

Hartebeeshoek Mixed-use Development, Gauteng

Wheatlands Solar Farm, Gauteng

Thula Mall, Bushbuckridge, Mpumalanga

Mthatha – Bedford City Mixed-use Development, Mthatha, Eastern Cape

Expansion of Transnet Railway Loops at Thabazimbi, Ferrogate and Northam, Limpopo

Riverwalk Electrical Line, Pretoria

Ormonde Residential Development, Johannesburg

Coal mining rights application for Berenice, Limpopo Province.

Ekhuthuleni Roads and Stormwater Upgrades

Proposed Housing Development on the Farm Middbuilt Position 11 and 81 and Eloff Er 675, Delmas.

Kagisa and Environs Integrated Development and Housing Project, West Rand, Gauteng.

Witpoortjie Residential Development, Krugersdorp, Gauteng

Moretele Distribution Powerlines and Substations, Pretoria, Gauteng

Panfontein Access Road for Rand Water in Midvaal Local Municipality, Gauteng

Hawerklip Coal Siding at Brazen Algar, Delmas, Mpumalanga

Eskom Westgate - Ntshona Powerline, Gauteng Province

Ecological Importance and Sensitivity, and Present Ecological Status assessment for water use application for Soweto, Gauteng Province

Diepsloot East Powerline and Substation, Gauteng Province

Gem Valley Residential Development, Pretoria North

Amberfield Residential Development, Centurion

Wetland Rehabilitation Plans

Kameeldrift Feedlot, Cullinan

Thula Mall, Bushbuckridge, Mpumalanga

Waterfall 5IR Wetland Rehabilitation and Action Plan, Gauteng (in progress)

Eagle's Creek Flight Academy, Centurion

Risk Assessments

Hazeldean Bouleavrd Rd amended WUL, Pretoria

Kudube Unit 9 Sewer Pump Station, Shoshanguve

Thema Babelegi Sewer Pump Station and Pipeline, Shoshanguve

Kikuyu/Waterfall Fields Electrical Lines, Johannesburg

Kikuyu/ Waterfall Fields Water Pipelines, Johannesburg

Parkdene x7 Mixed-use Development services and road upgrades, Johannesburg

Reiger Park x19 Mixed-use Development services and road upgrades, Johannesburg

Slovo Park/ Nancefield Informal Settlement, Johannesburg

Waterfall Fields Electrical Line, Johannesburg

Winterveld x5 Residential Development Sewer, Soshanguwe

Winterveld North Sewer Outfall, Soshanguve

Winterveld South Sewer Outfall, Soshanguve

Riverwalk Electrical Line, Pretoria

Thula Mall, Bushbuckridge, Mpumalanga

Leeuwpoort South Mixed-use Development, Johannesburg

Kudube Sewer Outfall and Pump Stations, Shoshanguve

Environmental Authorisations - Approved

DK Pharmaceutical Building, Lesotho - Scoping and EMPr

Peach Tree x21&22 Industrial Township, Centurion – BAR, Pt1 amendment

Peach Tree x23 Industrial Township, Centurion – Pt1 amendment

Peach Tree x24 Industrial Township, Centurion– Pt1 amendment

Peach Tree x25 Industrial Township, Centurion - BAR

Varsity College Expansion, Pretoria – Ecological Opinion

Fairlands Interchange, Johannesburg – EIA

PWV17 Freeway, Pretoria – EIA

Environmental Authorisations in Progress

Glencoe Abattoir – Integrated EIA, AEL and WL for coagulation pond and deboning plant.

Hazeldean Boulevard Road – EIA

Lanseria x 66 Mixed-use Development – BAR

Knopjeslaagte Filling Station and Shopping Centre, Centurion – BAR

La Montagne Reservoirs, Pretoria – BAR

PWV18 Route Determination – Environmental Scan

Welgedacht Filling Station – BAR

Thula Mall – S24G and Wetland Rehabilitation Plan

APPENDIX

E CONCEPTUAL STORMWATER MANAGEMENT PLAN

ABBEYDALE BUILDING AND CIVILS (PTY) LTD

ABBEYDALE JET PARK WULA ADDITIONAL SPECIALIST STUDIES

CONCEPTUAL STORM WATER MANAGEMENT PLAN

23 APRIL 2021

ABBEYDALE JET PARK WULA ADDITIONAL SPECIALIST STUDIES

CONCEPTUAL STORM WATER MANAGEMENT PLAN

ABBEYDALE BUILDING AND CIVILS (PTY) LTD

FINAL

PROJECT NO.: 41102515
DATE: APRIL 2021

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QUALITY MANAGEMENT

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1 INTRODUCTION

Abbeydale Building and Civils (Pty) Ltd (Abbeydale) proposes to construct industrial warehousing and commercial offices ('proposed development') on Jet Park Extension 64 in Boksburg. The majority of the site is currently highly disturbed from previous development and commercial activities. Abbeydale propose to re-develop the property. WSP Environmental (Pty) Ltd (WSP) was appointed by Abbeydale to undertake a Conceptual Stormwater Management Plan (SWMP), which forms part of the specialist studies in support of a Water Use License Application (WULA) process for a development at Jet Park Extension 64 in Boksburg. This report outlines both the methodology adopted to develop the conceptual SWMP, as well as the associated infrastructure requirements.

2 APPROACH

The objective of the SWMP is to prevent contamination of receiving watercourses through 'dirty' surface water runoff generated at the proposed development, through the appropriate separation and/or containment of 'clean' and 'dirty' storm water. The following scope of work was conducted as part of the assessment:

- Desktop Review;
- Conceptual Storm Water Management; and
- Numerical Modelling.

These aspects are elaborated on further in the sections that follow.

2.1 DESKTOP REVIEW

A conceptual understanding of the sites was developed which involved the identification of potential clean areas and their isolation from likely dirty areas. An overview of the site's geo-environmental characteristics (climate, vegetation cover, geology etc.), and a comprehensive understanding of expected surface water flow dynamics and site catchment boundaries was compiled from the following sources:

- Water Research Commission (WRC), 1994. The Surface Water Resources of South Africa, 1990, Volume VI, Eastern Escarpment (WRC Report No 298/6.1/94 and 298/6.2/94).
- Kunz, RP, 2004. Daily Rainfall Extraction Utility Version 1.4 (software). Institute for Commercial Forestry Research, Pietermaritzburg.

The development of the SWMP for the site took into account the following guidelines:

- Department of Water and Sanitation (DWS) Government Notice No.704 (GN704) (June 1999);
- DWAF Best Practice Guidelines (BPGs):
  - BPG G1 – Storm Water Management (August 2006); and
  - BPG A4 – Pollution Control Dams (August 2007).

These documents support Section 26 of the National Water Act (Act No. 36 of 1998) which regulates any activity that may have an impact on a water resource, and the conservation and protection of this water resource. The main principles adopted in these documents include:

- Confine or divert any unpolluted water to a 'clean' water system, and polluted water to a 'dirty' water system;
- 'Clean' and 'dirty' water systems should be designed and constructed to prevent cross-contamination between the 'clean' and 'dirty' water systems;
- 'Clean' and 'dirty' water systems should contain the 1:50-year storm event, and should not lie within the 1:100-year flood line or within a horizontal distance of 100m from any watercourse; and
- Appropriate maintenance and management of storm water related infrastructure should be undertaken.

2.2 CONCEPTUAL STORM WATER MANAGEMENT PLAN

Based on the information gathered during the desktop review, a conceptual SWMP was developed for the proposed development. The discretisation of the catchments factored in existing storm water infrastructure, overall functionality and the most practical and feasible implementation of the final SWMP.

Based on the discretised catchments, the required storm water management drainage and storage elements (including channels, pipes and Storm Water Attenuation Ponds (SWAPs)) were defined to ensure appropriate storm water management according to the management principles outlined in the GN704 and the relevant BPGs.

2.3 NUMERICAL MODELLING

The PCSWMM storm water drainage model was used to size the proposed storm water management infrastructure. PCSWMM is a hydrological rainfall-runoff numerical simulation model suitable for application to both rural and urban environments. PCSWMM can be used to determine the design requirements for various drainage elements as well as analyse the performance of existing drainage systems. PCSWMM requires a number of input parameters for each of the elements, including:

- Design and daily rainfall;
- Catchment characteristics including catchment area, overland flow length, slope, impervious areas, surface cover and soil characteristics.
- Proposed design characteristics of the drainage infrastructure, including the channels, pipes and PCDs.

The conceptual SWMP was assessed in terms of the 1:50-year recurrence interval storm event (as per the GN704 requirements) to define the required capacity of the storm water infrastructure (i.e. channels, pipes and SWAPs).

3 BASELINE RECEIVING ENVIRONMENT

3.1 SITE LOCALITY

The proposed development site is located within the Jet Park Extension 64 in Boksburg, within the Ekurhuleni Metropolitan Municipality of the Gauteng Province. The site (**Figure 1**), which consists of Extensions 64 and 70, is located approximately 14 km northwest of the Boksburg CBD and 21 km east of the city of Johannesburg (Latitude: -26.1650; Longitude: 28.2265). The study site is located within the Vaal Water Management Area (WMA), specifically the C21D quaternary catchment. Immediately upstream of the development site (to the west) is the Carlos Rolfes Pan, which is a formally protect area (Ekurhuleni Metropolitan Municipality, 2008). The pan drains in an easterly direction through an existing canal, which passes through the proposed development site.

3.2 ENVIRONMENTAL SETTING

3.2.1 CLIMATE

The area is characterised as a summer rainfall region, as 80% of the rainfall occurs between October to March. The Mean Annual Precipitation (MAP) is 698 mm and the Mean Annual Evaporation (MAE) is 1625 mm. The Summer months are characterised with mild temperatures of around 30°C with temperatures of above 30°C seldom recorded. Winter months experience temperatures of below 0°C, with severe frost occurring.

3.2.2 LAND COVER

The study area falls within the Soweto Highveld Grassland (Gm8) vegetation type (Mucina & Rutherford 2006). The area is highly developed and characterised by various economic land uses, including residential and urban industrial.

3.2.3 TOPOGRAPHY

The study site area lies on fairly flat terrain with a slight slope toward the east. The elevation of the site ranges from 1665 to 1680 masl.

3.2.4 GEOLOGY AND SOILS

The underlain geology of the study site is dominated by Quartzite. Soils within the study area consist of soils from the Avalon (Av 26), Ruston (Av16) and Soetmelk (Av36) soil series. These soils are characterised by their red/yellow colour with a sandy clay loam texture. The soils are macrostructureless, with a plinthic horizon. The soils have favourable water-holding properties, with drainage being unfavourable in areas of high rainfall.

3.2.5 HYDROGEOLOGY

The study area is dominated by dolomite of the Chuniespoort Group (part of the Transvaal Sytem) and tillites of the Dwyka Group (part of the Karoo System), both of which carry water. The presence of various geological structures, such as faults, fissures, and fracture zones, as well as contact zones of intrusions such as dykes and sills, dictate the occurrence of groundwater (Ekurhuleni Metropolitan Municipality, 2008). Karst, Intergranular and Fractured Aquifers are the dominant aquifer types in the EMM. The Karst Aquifers occur in the dolomites of the Chuniespoort Group.

3.3 HYDROLOGICAL SETTING

The site is bounded by the following:

— Industrial activities to the South;

— R21 Regional Route Freeway to the East;

— Prepared area (recently demolished commercial buildings) to the North; and,

— Carlos Rolfes Pan to the West.

The R21 Freeway serves as a cut-off drain to the natural flow path of stormwater within the catchment. The commercial building areas to the North of the earth-lined channel currently drain into existing storm water networks. The site is very flat with a slight fall in the south easterly direction. The run-off through the properties considered originate from two sources; the overflow of Carlos Rolfes Pan as well as a 900mm diameter concrete storm water pipe alongside Kelly Road discharge into the natural earth canal drain running through the properties.

Figure 1: Locality Map

3.4 RAINFALL

The Daily Rainfall Extraction Utility, developed by the Institute for Commercial Forestry Research (ICFR) in conjunction with the School of Bio-resources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal, Pietermaritzburg, was used to obtain summary data for all rainfall stations within the vicinity of the site. This data was assessed in terms of length of record, completeness of the data set, MAP and location of the rainfall station with respect to the site and the catchment

Table 1: Rainfall Gauging Station Summary (Kunz, 2003)

Rainfall Station	Station Number	Latitude	Longitude	Distance from site (km)	Record (years)	Reliable data (%)	MAP (mm)
JAN SMUTS WK 30 L	0476399W	26.151	28.234	1.846	9	99.3	729
JAN SMUTS AIRPORT	0476398W	26.134	28.234	3.693	109	19.7	619
JAN SMUTS (WK)	0476398AW	26.134	28.234	3.963	97	5.7	719
RIETFONTEIN (GM)	0476309 W	26.151	28.201	3.810	97	35.3	697

Daily rainfall data for the station Rietfontein was acquired from the Daily Rainfall Utility and presented in **Figure 2** for the period 1903 to 2000.

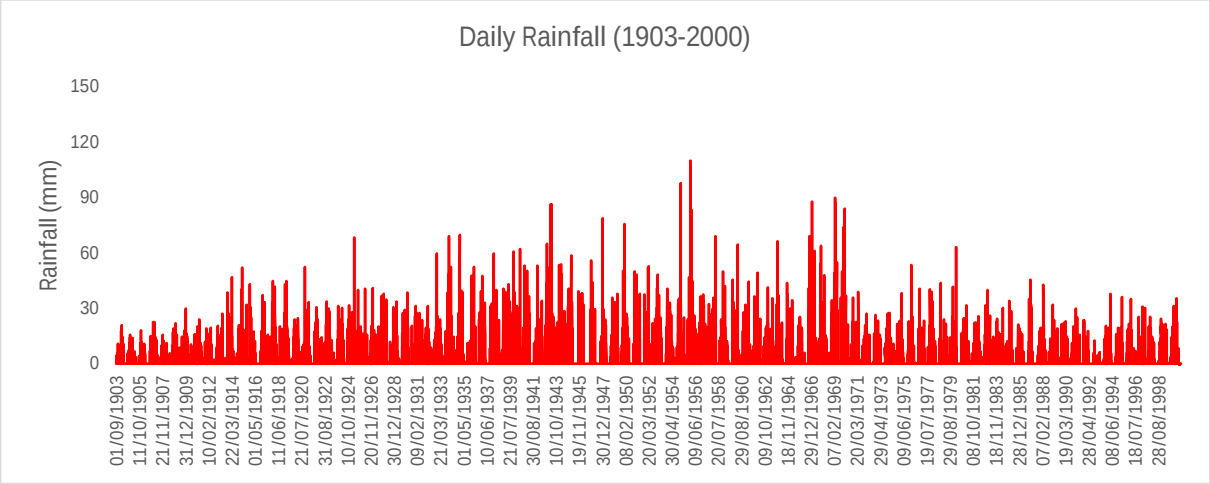


Figure 2: Daily rainfall around the Jet Park Development

3.5 DESIGN RAINFALL DEPTHS

The design rainfall depths for the centroid of the site were extracted using the Design Rainfall Estimation software for South Africa (Smithers and Schulze, 2003). The design rainfall depths (mm) for the 1:2-year, 1:5-year, 1:10-year, 1:20-year, 1:50-year, 1:100-year and 1:200-year return periods were extracted (**Table 2**).

Table 2: Design rainfall depths

	Return Period in Years						
Duration	**2**	**5**	**10**	**20**	**50**	**100**	**200**
24-hour	62.9	86.9	105.1	124.4	152.5	176.1	202.1

4 CONCEPTUAL STORM WATER MANAGEMENT PLAN

4.1 TOPOGRAPHICAL AND SITE LAYOUT

The site layout used in the numerical modelling was obtained from the client (Abbeydale). Five meter, readily available contour data was used to define the current topographical surface of the site.

4.2 CLEAN AND DIRTY CATCHMENTS

The site will be used for industrial warehousing and commercial offices, therefore, the runoff generated on the site will be clean, however measures must be put in place, such as oil traps in the parking areas, to ensure that the water being discharged from the site is not “dirty”.

Table 3: PCSWMM catchment details

Name	Area (ha)	Width (m)	Flow Length (m)	Imperv. (%)
S1	0.2413	25	96.52	100
S2	0.3055	40	76.375	100
S3	0.0595	18	33.056	100
S4	0.5139	51	100.765	85
S5	0.057	10	57	100
S6	0.0536	10	53.6	100
S7	0.0198	7.5	26.4	95
S8	0.7793	63	123.698	70
S9	0.7784	48.5	160.495	100
S10	0.786	48.5	162.062	100
S11	0.0546	14	39	95
S12	0.219	13.5	162.222	90
S13	0.3564	34.5	103.304	95
S14	0.2076	43	48.279	85
S15	0.4374	30	145.8	100
S16	0.4055	30	135.167	100
S17	0.0644	17	37.882	100
S18	0.0699	100	6.99	25
S19	0.0703	25	28.12	100

S20	0.2551	49	52.061	95
S21	0.1148	20	57.4	100
S22	0.1373	20	68.65	100
S25	0.4188	29	144.414	100
S26	0.3998	29	137.862	100
S28	0.1112	17	65.412	100
S29	0.1049	17	61.706	100
S30	0.0097	8.5	11.412	25
S31	0.2329	31	75.129	65
S32	0.0854	15.5	55.097	80
S33	0.0765	12	63.75	50
S34	0.0668	9	74.222	90
S35	0.0682	7	97.429	90
S36	0.2645	45	58.778	90
S37	0.153	25	61.2	90
S38	0.0662	20	33.1	95
S39	0.2597	35	74.2	95
S40	0.1554	35	44.4	90
S41	0.1543	17	90.765	25
S42	0.0852	13.5	63.111	60
S43	0.1169	19	61.526	95
S44	0.1883	13	144.846	90
S45	0.0431	11.5	37.478	20
S46	0.0608	12.5	48.64	85

The proposed site contains seven SWAPs (**Figure 3**), which serve as flood protection and flood alleviation mechanisms by slowing down the high flow rate during a flood. Of the seven SWAPs, SWAP 1, 2, 4 and 5 are proposed, whilst SWAP 3, 6 and 7 are existing.

In order to ensure that the water generated from the proposed development is adequately contained and routed to the SWAPs, a storm water management plan was developed for the site **Figure 4**. The proposed plan includes the use of channels, to manage the runoff from the various contributing catchment areas.

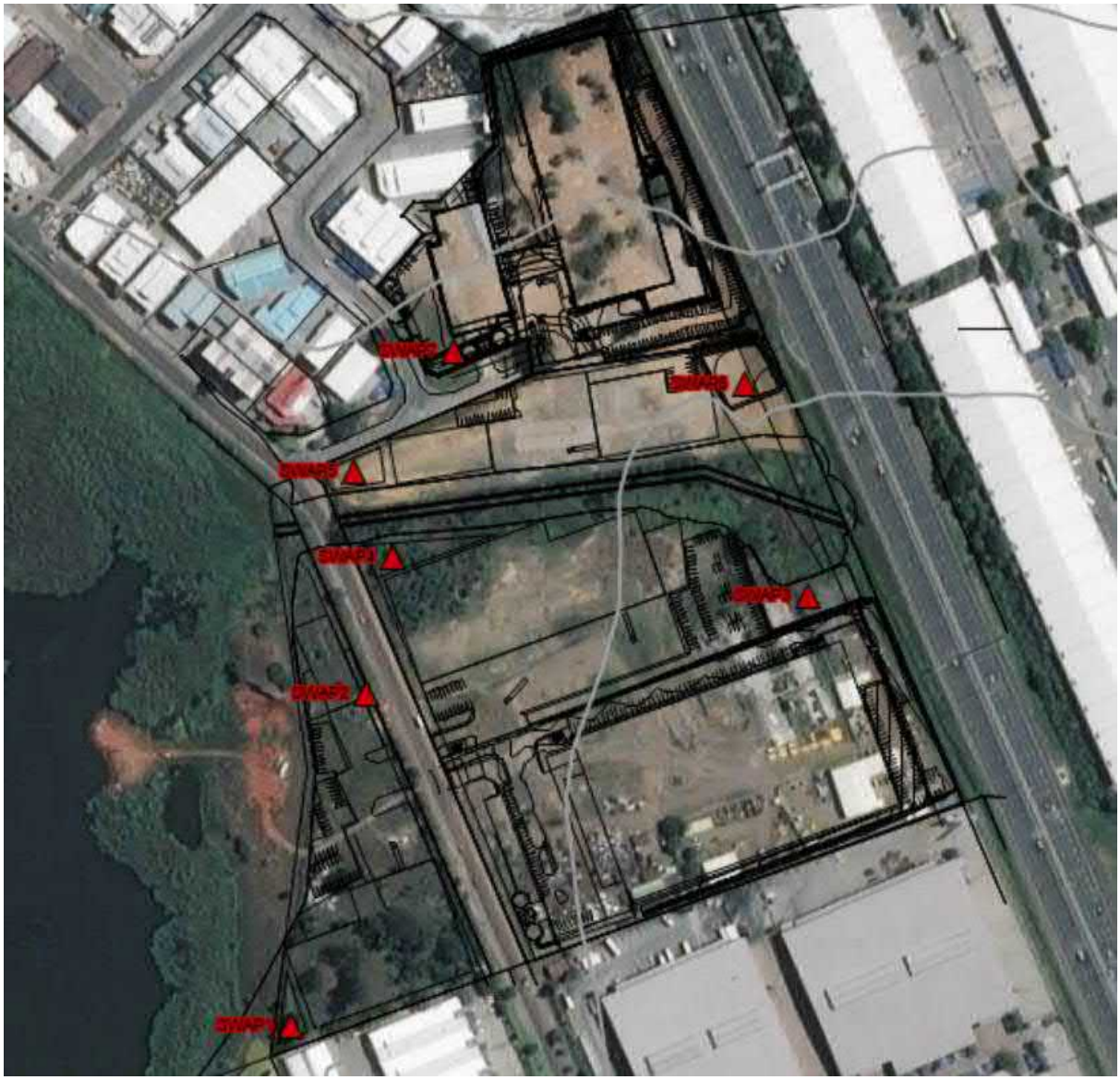


Figure 3: SWAPs within the proposed Jet Park Development

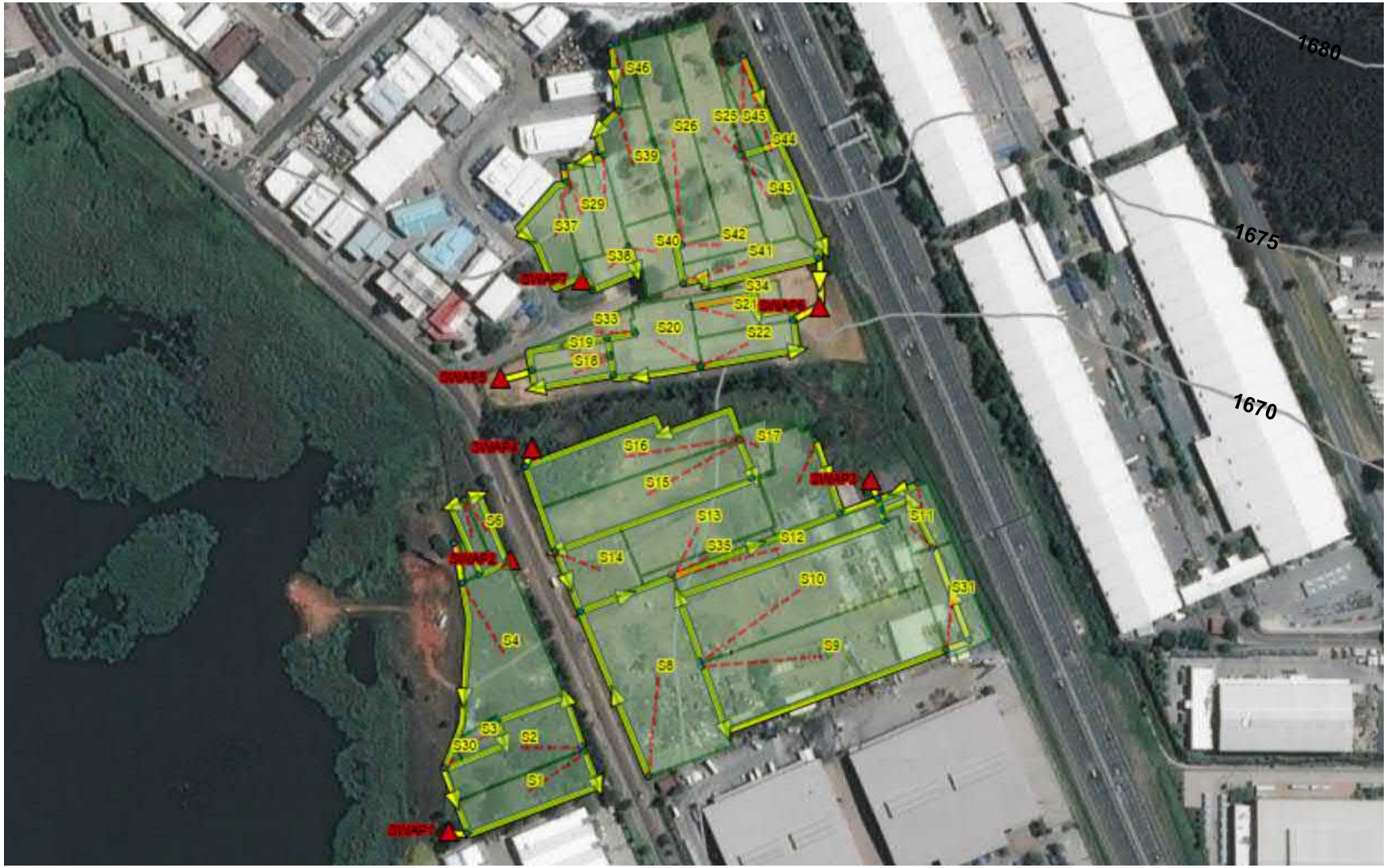


Figure 4: Discretised catchment and proposed storm water management plan

5 NUMERICAL MODELLING

In order to determine the required sizing of the storm water management infrastructure, storm event modelling using the PCSWMM model was undertaken. The numerical modelling was based on the proposed infrastructure and layout of the operations. The results for each infrastructure component is elaborated on in the sections that follow.

5.1 DESIGN RAINFALL

The 1:50-year design rainfall was fitted to the SCS-SA type 3 rainfall distribution and applied to the proposed development to determine the peak flow and volume reporting to the various infrastructure. The rainfall distribution graph is shown below:

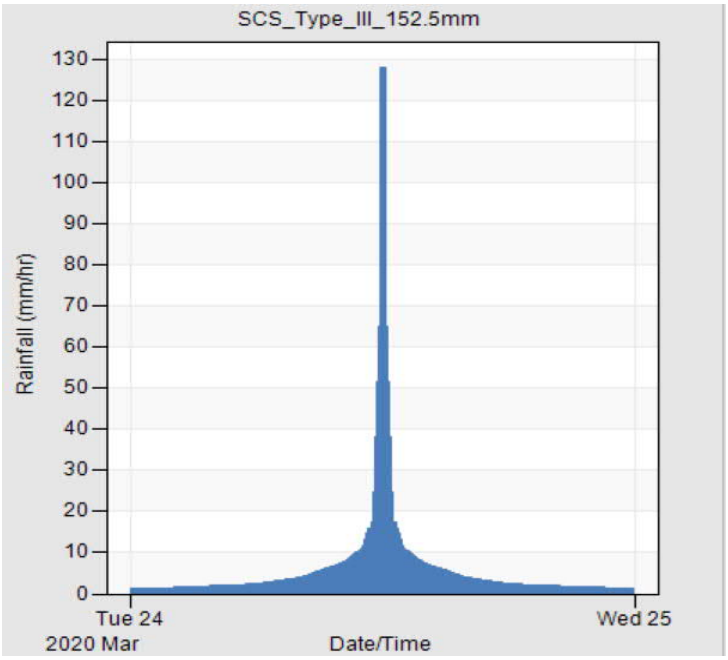


Figure 5: 1:50-year rainfall distribution for the Jet Park Development

5.2 MODELLING OUTPUTS

The sub-catchment characteristics and the flow rates and volumes are shown in **Table 4** and the flow rates and volumes reporting to the channels is shown in **Table 5**.

Table 4: Catchment details

Name	Outlet	Precipitation (mm)	Infiltration (mm)	Runoff Depth (mm)	Runoff Volume (ML)	Peak Runoff (m^3/s)
S1	J6	152.5	0	152.29	0.37	0.09
S2	J26	152.5	0	152.32	0.47	0.11
S3	J5	152.5	0	152.36	0.09	0.02
S4	J32	152.5	10.12	142.24	0.73	0.18
S5	J11	152.5	0	152.34	0.09	0.02
S6	J12	152.5	0	152.35	0.08	0.02

S7	J27	152.5	3.37	149.01	0.03	0.01
S8	J37	152.5	20.31	132.11	1.03	0.27
S9	J8	152.5	0	152.18	1.18	0.28
S10	J7	152.5	0	152.17	1.2	0.28
S11	J10	152.5	3.37	149.02	0.08	0.02
S12	J33	152.5	6.75	145.51	0.32	0.08
S13	J33	152.5	3.37	148.94	0.53	0.13
S14	J36	152.5	10.11	142.31	0.3	0.07
S15	J3	152.5	0	152.21	0.67	0.16
S16	J1	152.5	0	152.23	0.62	0.14
S17	J1	152.5	0	152.55	0.1	0.02
S18	J16	152.5	50.52	102.07	0.07	0.02
S19	J15	152.5	0	152.38	0.11	0.03
S20	J42	152.5	3.37	149.01	0.38	0.09
S21	J18	152.5	0	152.36	0.17	0.04
S22	J19	152.5	0	152.34	0.21	0.05
S25	J49	152.5	0	152.2	0.64	0.15
S26	J47	152.5	0	152.21	0.61	0.14
S28	J53	152.5	0	152.35	0.17	0.04
S29	J54	152.5	0	152.35	0.16	0.04
S30	J28	152.5	50.55	102.07	0.01	0
S31	J9	152.5	23.66	128.82	0.3	0.08
S32	J31	152.5	13.49	138.95	0.12	0.03
S33	J44	152.5	33.82	118.71	0.09	0.03
S34	J18	152.5	6.74	145.64	0.1	0.02
S35	j33	152.5	6.74	145.61	0.1	0.02
S36	J38	152.5	6.74	145.65	0.39	0.09
S37	J55	152.5	6.74	145.65	0.22	0.05
S38	J50	152.5	3.37	149.02	0.1	0.02
S39	J52	152.5	3.37	148.99	0.39	0.09
S40	J50	152.5	6.74	145.66	0.23	0.06
S41	J22	152.5	50.97	101.6	0.16	0.05
S42	J47	152.5	27.03	125.58	0.11	0.03
S43	J49	152.5	3.37	149	0.17	0.04
S44	J46	152.5	6.75	145.54	0.27	0.07
S45	J46	152.5	54.1	98.53	0.04	0.01
S46	J51	152.5	10.11	142.31	0.09	0.02

Table 5: Flow rate and volumes reporting to the channels

Name	Length (m)	Roughness	Max. |Flow| (m^3/s)	Max. |Velocity| (m/s)	Contributing Area (ha)
C1	178.545	0.015	0.166	0.92	0.47
C2	26.732	0.015	0.19	1.27	0.536
C3	13.169	0.015	0.318	2.35	0.907
C4	86.453	0.015	0.105	0.24	0.306
C5	120.142	0.015	0.082	0.28	0.241
C6	13.483	0.015	0.377	1.67	1.15
C7	208.634	0.015	0.284	1.24	0.778
C8	17.069	0.015	0.594	1.17	1.011
C9	20.89	0.015	0.02	0.48	0.057
C10	2.903	0.015	0.039	0.81	0.111
C11	61.732	0.015	0.02	0.3	0.057
C12	61.244	0.015	0.019	0.44	0.054
C13	21.759	0.015	0.166	1.58	0.472
C14	19.939	0.015	0.026	0.38	0.076
C15	62.209	0.015	0.091	0.8	0.255
C16	88.653	0.015	0.065	0.46	0.182
C17	87.438	0.015	0.049	0.36	0.137
C18	21.643	0.015	0.112	0.44	0.319
C19	99.478	0.015	0.221	1.33	0.639
C20	32.207	0.015	0.492	2.59	1.406
C21	118.508	0.015	0.245	1.46	0.69
C22	12.126	0.015	0.079	0.36	0.222
C23	4.076	0.015	0.323	1.82	0.911
C24	57.165	0.015	0.386	0.57	1.066
C25	67.988	0.015	0.343	1.27	0.987
C26	52.875	0.015	0.094	0.58	0.264
C27	13.411	0.015	1.306	2.59	3.832
C28	29.283	0.015	0.032	0.1	0.085
C29	44.138	0.015	0.073	0.33	0.208
C30	122.149	0.015	0.271	0.95	0.779
C31	68.447	0.015	0.479	0.61	1.011
C32	29.604	0.015	0.172	1.16	0.485
C33	88.716	0.015	0.271	2.17	0.767

C34	49.132	0.015	0.079	0.61	0.222
C35	44.445	0.015	0.022	0.45	0.061
C36	38.649	0.015	0.114	1.31	0.32
C37	28.408	0.015	0.153	1.67	0.432
C38	10.039	0.015	0.191	1.83	0.537
C39	11.749	0.015	0.025	0.22	0.07
C40	67.599	0.015	0.051	0.66	0.147
C41	12.062	0.015	0.024	0.3	0.07
C42	67.546	0.015	0.115	0.85	0.325
C43	29.434	0.015	0.155	0.6	0.437
C44	205.216	0.015	0.154	0.83	0.437
C45	64.388	0.015	0.081	0.96	0.231
C46	0.839	0.015	0.604	2.53	1.725
C47	63.753	0.015	0.119	0.25	0.365
C48	47.464	0.015	0.299	0.79	0.908
C49	27.646	0.015	0.009	0.03	0.02
C50	130.367	0.015	0.183	0.47	0.534
C51	8.177	0.015	0.293	0.44	0.786
C52	8.229	0.015	0.626	0.98	1.852
C53	123.451	0.015	0.569	1.74	1.63
C54	27.127	0.015	0.662	1.41	1.895
C55	198.742	0.015	0.278	0.82	0.786

The 1:50-year flood event was routed through the proposed development area to determine the SWAP volume requirements to contain the 1:50-year flood event. The cumulative flood volumes can be seen in the table below:

Table 6: Flow volumes reporting to the SWAPs

Name	Contributing Area (ha)	Max. Flow (m^3/s)	Total Flow (ML)	Total Flow (m^3)
SWAP 1	1.15	0.377	1.677	1677
SWAP 2	0.111	0.039	0.168	168
SWAP 3	3.832	1.306	5.512	5512
SWAP 4	0.907	0.318	1.376	1376
SWAP 5	0.472	0.166	0.647	647
SWAP 6	1.725	0.604	2.476	2476
SWAP 7	0.911	0.323	1.347	1347

It is important to note that GN704 is very conservative, as it relates to mining activities. There are currently no surface water legislation pertaining to the industrial sector.

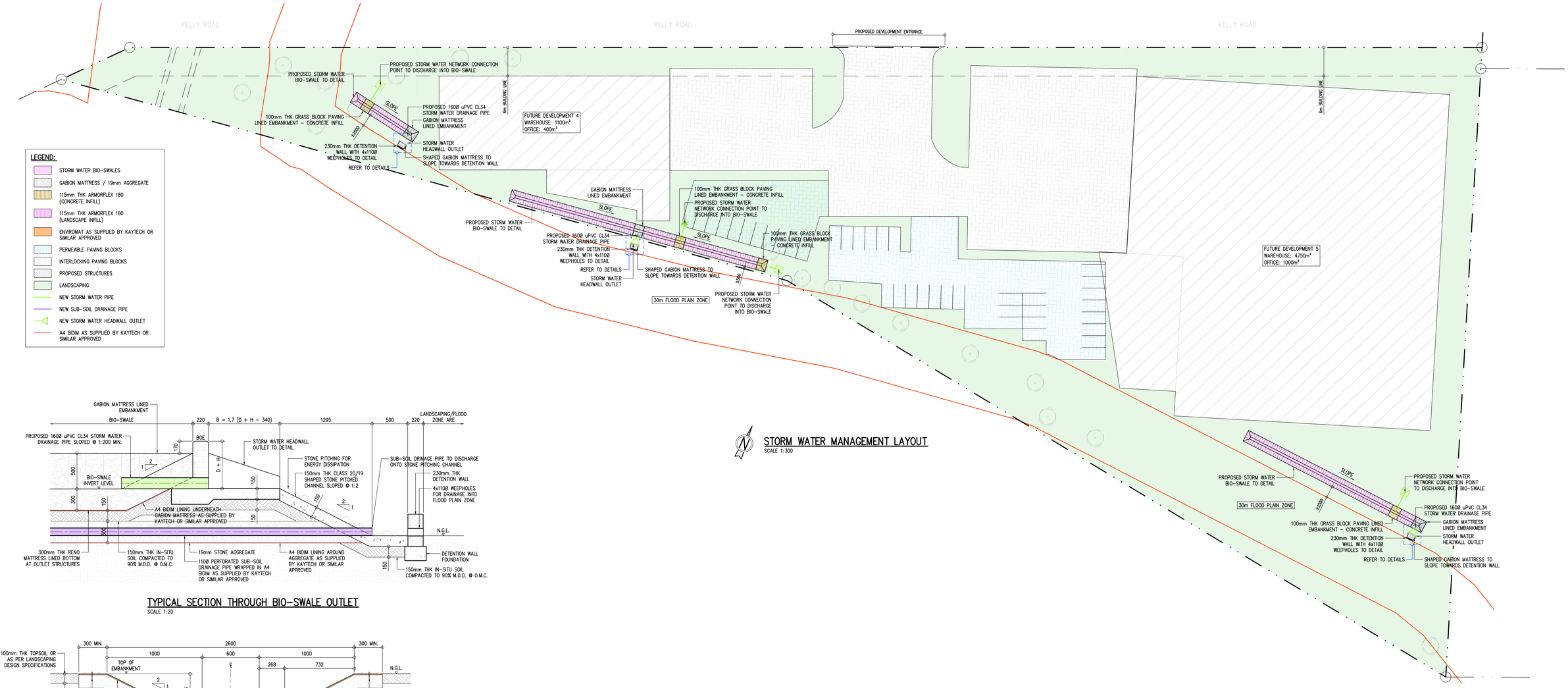
6 RECOMMENDATIONS

Based on observations made during the desktop study and development of the SWMP for the Jet Park Development, the following recommendations are proposed:

- The SWMP should be revisited after any major changes to the current operations.
- The pipes and channels need to be constructed to facilitate routine maintenance (i.e. simple, effectual housekeeping).
- It is recommended that stone pitching channels and concrete pipes are used to transfer runoff. Stone pitching is recommended to reduce high runoff velocities in channels and sulphate-resistant concrete to reduce sulphate content generated in 'dirty' areas with sulphate contaminants.
- To prevent clogging of the grated channel covers and maintain channel capacity, best practice and proper housekeeping practices must be ensured.
- All pipes and channels must be checked after any major rainfall events to ensure that there are no blockages and that the water flow will not be restricted in any way.
- Sediment that accumulates within pipes, channels and retention facilities needs to be removed directly after the storm events and appropriately disposed of to ensure design capacity is maintained.
- It is recommended that the SWAPs be operated empty or at a storage level low enough to accommodate storm water inflows, whilst meeting the required spillage frequency and freeboard requirements.

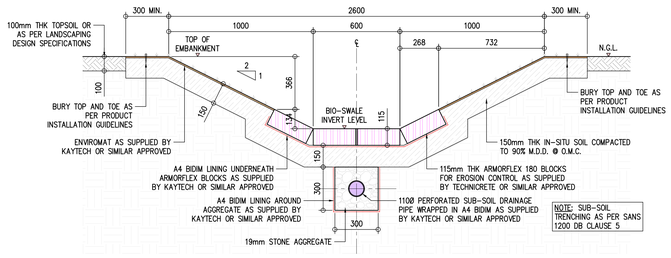
7 REFERENCES

– Mucina, L. and Rutherford, M. C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

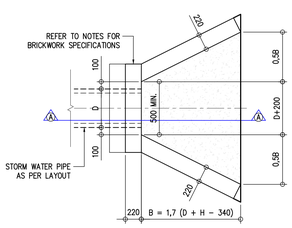


STORM WATER MANAGEMENT LAYOUT
SCALE 1:300

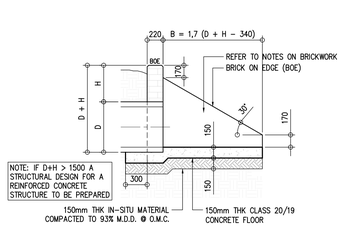
TYPICAL SECTION THROUGH BIO-SWALE OUTLET
SCALE 1:20



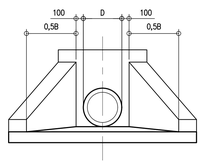
TYPICAL BIO-SWALE CROSS SECTION
SCALE 1:15



PLAN OF TYPICAL STORM WATER OUTLET STRUCTURE



SECTION A–A THROUGH TYPICAL OUTLET STRUCTURE



ELEVATION OF TYPICAL STORM WATER OUTLET STRUCTURE

TYPICAL STORM WATER HEADWALL OUTLET STRUCTURE
SCALE 1:30

OUTLET STRUCTURE NOTES:

APPLICATION:

1. THE TYPICAL STORM WATER OUTLET STRUCTURE MAY ONLY BE USED WHERE;
   - SPECIFIED BY THE ENGINEER
   - THE FLOW VELOCITY AT THE OUTLET PERMITS THE USE
   - D + H < 1500
2. FOR HIGHER FLOW VELOCITIES THE STRUCTURE MUST BE MODIFIED OR ANOTHER TYPE MUST BE USED IN ACCORDANCE WITH THE SPECIFICATIONS OF THE ENGINEER
3. NO SCOURING OR EROSION MAY OCCUR DOWNSTREAM OF THE OUTLET STRUCTURE
4. FOR LARGER STRUCTURES A STRUCTURAL REINFORCED CONCRETE DESIGN IS REQUIRED

MASONRY:

1. MASONRY WALLING SHALL CONFORM IN ALL RESPECTS TO THE REQUIREMENTS OF SANS 10164-1
2. MORTAR SHALL BE CLASS II (COMPRESSIVE STRENGTH OF 7MPa AT 28 DAYS)
3. THE REQUIREMENTS SET OUT IN APPENDIX B OF SANS 10164-1: SHALL BE ADHERED TO UNLESS OTHERWISE APPROVED OR DIRECTED BY THE ENGINEER
4. ALL BRICKS SHALL COMPLY WITH SANS 227 AND SHALL BE ENGINEERING UNITS OF CLASS FBS (FACE BRICK STANDARD) WITH A NOMINAL COMPRESSIVE STRENGTH OF 12MPa

CONCRETE:

1. ALL CONCRETE TO BE CURED FOR A MINIMUM PERIOD OF 7 DAYS

NOTES AND SPECIFICATIONS:

1. CONSTRUCTION:

1.1. ALL CONSTRUCTION, TESTING AND MATERIALS TO COMPLY WITH ALL RELEVANT SANS 1200 SERIES OF SPECIFICATIONS.
1.2. ALL TRENCHING AND BACKFILLING TO COMPLY WITH SANS 1200 DB
1.3. PIPE BEDDING TO BE CLASS B AS PER SANS 1200 LB WITH BEDDING CRADLE OF SELECTED FILL QUALITY

2. MATERIALS:

2.1. ALL CONCRETE STORM WATER PIPES TO BE OGEE CLASS 75D UNLESS OTHERWISE SHOWN
2.2. ALL GRID INLETS IN ROADS AND PARKING AREAS TO BE 450 x 600 H/D WITH HINGED GRATINGS UNLESS OTHERWISE SHOWN
2.3. ALL GABION BASKETS AND RENO MATTRESSES TO BE HEXAGONAL WOVEN MESH. CLASS A GALVANISED OR WITH ADDITIONAL 0.5mm THK GREY PVC COATING, MESH APERTURE OF 80x100mm AND MESH WIRE DIAMTER OF 2.7mm, SALVAGE WIRE DIAMETER OF 3.4mm
2.4. BIDIM LINING UNDERNEATH GABION MATTRESS AND AROUND STONE AGGREGATES TO BE A4 BIDIM AS SUPPLIED BY KAYTECH OR SIMILAR APPROVED

NO	DATE	REVISION	DRAWN	CHECKED
A	10/12/2021	ISSUED FOR INFORMATION	S.V.	R.T.

CONSULTING ENGINEERS (PTY) LTD
9 Hibiscus Street – c/o Hibiscus & Freesia Streets
Lynnwood Ridge – 0040
P.O. Box 76294 – Lynnwood Ridge – 0040
Tel: 012 369 6720 – Fax: 012 348 9978

SIGNATURE	DATE	12022-008-540.dwg
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DRAWN: S. VENTER	12/2021	SHEET SIZE: A0
		D&G DRAWING NUMBER: 12022-008-540

CLIENT
CLIENT

ARCHITECT/MAIN AGENT
ICM ARCHITECTURAL STUDIOS

PROJECT
FRASER ALEXANDER
JET PARK X64

DRAWING TITLE
STORM WATER MANAGEMENT LAYOUT AND DETAILS

Stefan Venter

APPENDIX

OTHER INFORMATION

APPENDIX

I-1 EAP CV'S

APPENDIX

ANRI SCHEEPERS

ANRI SCHEEPERS, BA

Principal Consultant (Environmental Services), Environment & Energy

Years with the firm

8

Years of experience

13

Areas of expertise

Stakeholder Engagement

Water Use License Applications

Environmental Authorisation Processes

Environmental Management Plans

Waste Management

Legal Compliance Assessments

Environmental Due Diligence and Liability Assessments

Environmental Management Systems

Languages

English

Afrikaans

CAREER SUMMARY

Anri graduated from the University of Johannesburg with a BA honours in Geography in 2007, and has thirteen years work experience. Anri is a principal environmental consultant and team coordinator for the Planning and Advisory Services unit.

Anri has been involved in numerous mining and industrial projects in South Africa. Anri has experience with diamond, gold, platinum, chrome, coal and manganese mining and processing operations. The projects include Environmental and Social Impact Assessments, Amendment processes and Environmental Management Programme consolidation and alignment processes. She has project managed numerous multi disciplinary projects in various sectors in South Africa and has experience with the International Finance Corporation Performance Standards and African Development Bank Guidelines.

Anri is qualified as a Lead Auditor and has undertaken legal compliance auditing, including environmental authorisations, waste management licences, water use licences and environmental performance assessments. In addition, she has undertaken general site assessments to determine compliance against, local, provincial and national environmental legislation. Anri has also been involved in environmental due diligence and liability assessments.

Anri's roles and responsibilities include the management of Environmental Authorisation and Waste Management Licence Processes (Basic Assessments and Scoping and Environmental Impact Assessment Reporting), Water Use Licence Application Processes and Auditing.

EDUCATION

Bachelor of Arts (Honours), Geography, University of Johannesburg, Gauteng, South Africa	2007
Bachelor of Arts, Geography, University of Johannesburg, Gauteng, South Africa	2006

ADDITIONAL TRAINING

Environmental-Law Mine Closure, Centre for Environmental Management, South Africa	2019
Snake Awareness, Scorpion Awareness and First Aid for Snakebite and Scorpion Sting, African Snakebite Institute	2016
Environmental Management Systems ISO 14001 Audit: Lead Auditor, Centre for Environmental Management, South Africa	2014
IWRM, Water Use Authorisations, and Water Use Licence Applications – Procedures, Guidelines, IWWMPs and Pitfalls, Carin Bosman Sustainable Solutions, South Africa	2012
ISO 14001 Environmental Management Systems (EMS), Implementation and Auditing, Centre for Environmental Management, South Africa	2011
IEMA Approved Foundation Course in Environmental Auditing, Aspects International, South Africa	2009

PROFESSIONAL EXPERIENCE

Environmental Authorisation Processes

- Jet Park Warehouse Development, Gauteng (2020-2021). Project Manager. Basic Assessment Process for the development of a commercial park within a 30m from a wetland and within a critical biodiversity area. Client: Sable Place Properties
- Vosloorus Filling Plant, Vosloorus, Gauteng (2019-2020). Project Manager. Environmental authorisation process for the proposed dangerous goods filling plant. Client: Richbay Chemicals
- Mbabane – Manzini Corridor Dam (Nondvo Dam), Hhohho Region, Eswatini (2018-2019). Project Manager. An Environmental and Social Impact Assessment for the proposed Nondvo Dam in Eswatini (previously Swaziland). Client: Government of the Kingdom of Eswatini, Ministry of Natural Resources and Energy, Department of Water Affairs
- Sappi Ngodwana Reservoir, Mpumalanga (2020): Project Manager. Basic Assessment Process for the construction of a reservoir within a critical biodiversity area. Client: Sappi Southern Africa
- Demolition and Rehabilitation of Infrastructure at West Wits Business Operations, Carletonville, Gauteng (2019): Project Manager. A contaminated land assessment and environmental authorisation process for the decommissioning and rehabilitation of selected infrastructure West Wits Operations. Client: AngloGold Ashanti
- Kranspoort Cattle Feedlot Basic Assessment Process, Kranspoort, Mpumalanga, South Africa (2018): Project Director. A Basic Assessment Process and Waste Management Plan for the proposed development of a cattle feedlot. Client: Department of Rural Development and Land Reform
- Amandelbult Section Dangerous Goods and Railway Extension Final Basic Assessment Report, Thabazimbi, Limpopo (2017-2018): Project Director. The Basic Assessment Process for the proposed installation of diesel tanks and the extension of a railway line at the Amandelbult Section, Tumela Mine. Client: Anglo American Platinum Limited
- Anglo Platinum Water Separation Project, Rustenburg, North West, (2016-2017): Project Manager. The Basic Assessment process for the proposed refurbishment of an existing pipeline and installation of new pipelines as part of the Water Infrastructure Upgrade Project. Client: Anglo American Platinum Limited
- Sasol Energy Technology Blending Facility Upgrade Project, Sasolburg, Free State, South Africa (2017): Project Manager. Basic Assessment Process for the installation of dangerous goods tanks at the Sasol One Site. Client: Sasol Energy Technology, a Division of Sasol Oil (Pty) Ltd
- Sasol Energy Technology Blending Facility Upgrade Project, Sasolburg, Free State, South Africa (2017-2018): Project Manager. Basic Assessment process for the construction of a fuel drum storage warehouse adjacent to the existing underground fuel storage tanks at the Fuel Blending Facility on the Sasol One site. Client: Sasol Energy Technology, a Division of Sasol Oil (Pty) Ltd
- Section 24G Application Process for Rappa Holdings, Germiston, Gauteng (2017-2018): Project Manager. Undertaking the rectification process for six historic rectification applications. Client: Rappa Holdings (Pty) Ltd
- Environmental Authorisation Process for the SO_2 Abatement Plant at Mortimer Smelter, Swartklip, North West, South Africa (2016-2017): Project Manager. Undertaking a Scoping and Environmental Impact Reporting Process to ensure compliance with the National Environmental Management Air Quality Act (No. 39 of 2004). Client: Anglo American Platinum Limited

- Environmental Authorisation Process for the SO_2 Abatement Plant at Polokwane Smelter, Polokwane, Limpopo, South Africa (2016-2017): Project Manager. Undertaking a Scoping and Environmental Impact Reporting Process to ensure compliance with the National Environmental Management Air Quality Act (No. 39 of 2004). Client: Anglo American Platinum Limited
- Environmental Authorisation for a Private Vehicle Proving Ground Development, Northern Cape, South Africa (2016): Project Manager. A Scoping and Environmental Impact Reporting Process for a private vehicle proving ground. Client: Ingen | Aix GmbH
- Establishment of the Proposed Rietvlei Opencast Coal Mine, Mpumalanga, South Africa (2016-2018): Project Manager. This project involved repeating the environmental authorisation process with the DMR as the competent authority, for the establishment of an opencast coal mine north of Middelburg. Client: Rietvlei Mining Company
- Environmental Authorisation for Blue Sphere, Nigel, Gauteng, South Africa (2014): Consultant. This project includes an environmental impact assessment, environmental management programme report, water use license application, waste management license application and an atmospheric emissions licence application as well as the public participation process for the existing and proposed processes for Blue Sphere in Nigel. Client: Blue Sphere Investments and Trading 103 (Pty) Ltd
- Environmental Authorisation for the Proposed Construction and Operation of Two Furnaces and Associated Infrastructure at Transalloys, eMalahleni, Mpumalanga, South Africa (2014): Consultant. The project entailed undertaking an environmental authorisation (by way of a scoping and environmental impact reporting process), including an atmospheric emissions licence application and waste management licence application process for the construction of two new 75MVA submerged arc furnaces that will primarily produce silicomanganese. Client: Transalloys (Pty) Ltd
- Section 24G Rectification Process for the Storage of Dangerous Goods for Much Asphalt, Gauteng, South Africa (2014): Project Manager. Much Asphalt was required to undertake a Section 24G Rectification Process for the unlawful storage of dangerous goods on a number of their sites. Zaffar was involved in the compilation of the Section 24G application forms. Client: Much Asphalt (Pty Ltd
- M14 Furnace Environmental Authorisation, Meyerton, Gauteng, South Africa (2012): Consultant. The project entailed undertaking an environmental authorisation, including an atmospheric emissions licence application process, in terms of the National Environmental Management Act (No. 107 of 1998) for the construction of an 81MVA furnace that will produce Ferromanganese and Silicomanganese. Client: Samancor Manganese (Pty) Ltd
- Basic Assessment Process for the Proposed Expansion and Upgrading of the Raw Materials Stockyard at Metalloys, Meyerton, Gauteng, South Africa (2011): Consultant. The project included the undertaking of an environmental authorisation process, by way of a basic assessment process, and the amendment application of an atmospheric emissions licence. The project involved the expansion and The project entailed undertaking an environmental authorisation, including an atmospheric emissions licence application process, in terms of the National Environmental Management Act (No. 107 of 1998) for the construction of an 81MVA furnace that will produce Ferromanganese and Silicomanganeseupgrading of the existing Raw Materials Stockyard at the Samancor Meyerton Works (Metalloys site). Client: Samancor Manganese (Pty) Ltd
- Proposed new Sinter Plant: Mamatwan Mine, Hotazel, Northern Cape, South Africa (2010): Consultant. This project included an environmental impact assessment, environmental management programme report addendum and water

use license application as well as the public participation process for a proposed sinter plant at the Mamatwan Mine in the Northern Cape. Client: Hotazel Manganese

Environmental Management Plans

- Refurbishment (Fit-Out) of the 8th Floor in 140 West Building, South Africa (2020): Project Manager. Compilation of the Environmental Management Plan for the refurbishment of an office space in order to acquire a Green Star SA – Office v1 certification by the Green Building Council of South Africa. Client: Goldman Sachs
- Environmental Management Plan for the South Sudan Feeder Roads, South Sudan (2019): Project Director. Compilation of an Environmental Management Plan for the construction of the Kayango Market to A43 Road in South Sudan. Client: United Nations Office for Project Services (UNOPS)
- Environmental Programme for the Proposed Knightsbridge Development, Bryanston, Gauteng, South Africa (2015): Project Manager. Compilation of a Green Star Rating Environmental Programme for the Proposed Knightsbridge Development. Client: Emira Property Fund
- J.P Morgan Chase & Company, 1 Fricker Road EMP ECO, Illovo, Gauteng, South Africa (2017): Project Manager. An EMP was compiled for the proposed refurbishment of the office building to attain a Green Star rating and is also responsible for conducting the first EMP compliance audit and training of the DEO to carry out subsequent audits. Client: J.P Morgan Chase & Company
- Compilation of Environmental Management Plans - West Plant Metalloys, Meyerton, Gauteng, South Africa (2011): Consultant. The project included the undertaking of an environmental risk assessment for all facilities and activities at West Plant. Environmental management plans were compiled from the results of the risk assessments. Client: Samancor Manganese (Pty) Ltd Metalloys

Environmental Management Programme Reports

- Separation of the Union Section Operational Environmental Management Programme (and Addendums) into 'Carved Out' versus 'Retained' categories, Swartklip, North West Province, South Africa (2017): Project Manager. The Section is in possession of an approved Environmental Management Programme as well as numerous addendums for mining, concentrating and smelting, operations. The Section is in a restructuring process which involves the selling and/or disenfranchising of certain of the operations. WSP/PB restructured the Sections's consolidated Environmental Management Programme to align with the future goals/strategies of the Mine. Client: Anglo Platinum Limited - Rustenburg Platinum Mines Limited
- EMPR Updates – Vaal River and West Wits Operations, Gauteng and North West, South Africa (2014-2016): Project Manager. The alignment of the West Wits (WW) and Vaal River (VR) Operations Environmental Management Programme Reports (EMPR) in accordance with the requirements of the Mineral and Petroleum Resources Development Act (No. 28 0f 2002) (MPRDA). Client: AngloGold Ashanti (Pty) Ltd
- Environmental Management Programme Report Consolidation and Alignment of Union Mine: Rustenburg Platinum Mines, North-West, South Africa (2014): Project Manager. The EMPR consolidation and alignment process combined the original EMPR and authorised EMPR amendments into a complete and comprehensive document, which will become the overarching EMPR for the mine lease area and will be used as a concise management tool for all employees operating within mine lease area. Client: Anglo American Platinum Ltd

Waste Management

- Construction and Operation of a Waste Treatment Facility, Middelburg, Mpumalanga (2016-2018): Project Manager. The Scoping and Environmental Impact Reporting process for the construction and operation of a Health Care Risk Waste treatment facility in Middelburg. Client: Vikela Afrika Waste Care CC
- Applications for Samancor Manganese (Pty) Ltd Metalloys in terms of section 20 of the Environment Conservation Act 73 of 1989, Meyerton, Gauteng, South Africa (2014): Consultant. The project entailed applications, by way of risk assessments, in terms of section 20 of the Environmental Conservation Act, for the North Plant Sludge Dam, West Plant Sludge Dam, Bag Filter Material storage Facilities and Slag Stockpiles at Metalloys. Subsequent to the receipt of the waste management licences in terms of the National Environmental management: Waste Act (No. 59 of 2009) an amendment process was also undertaken. Client: Samancor Manganese (Pty) Ltd
- Applications for Afrisam, Vanderbijlpark, in terms of section 20 of the Environment Conservation Act 73 of 1989. Vanderbijlpark, Gauteng, South Africa (2014): Consultant. The project entailed applications in terms of section 20 of the Environmental Conservation Act, for the slag stockpiles at Afrisam, Vanderbijlpark. Subsequent to the receipt of the waste management licences in terms of the National Environmental management: Waste Act (No. 59 of 2009) an amendment process was also undertaken. Client: AfriSam South Africa (Pty) Ltd
- Waste Management Licence Application for The Existing And New Waste Management Facilities At Columbus Stainless Complex In Middleburg, Mpumalanga Province, South Africa (2014): Project Manager. Columbus Stainless (Pty) Ltd (Columbus) proposes to license existing waste management facilities and a new hazardous waste store within the footprint of the Columbus Complex. The Environmental Authorisation process by way of Scoping and Environmental Impact Reporting is required in order to license the said facilities. The facilities requiring licensing involve, but is not limited to: storage, recovery, bailing and treatment. WSP is responsible for obtaining a Waste Management License for the said activities via the Department of Environmental Affairs in line with relevant legislation. Client: Columbus Stainless (Pty) Ltd
- Establishment of a Waste Monitoring Committee, Meyerton, Gauteng, South Africa (2011): Consultant. The project included the identification of potential members for the monitoring committee and the establishment of the committee. The establishment of the committee included the compilation of the constitution and committee meetings. Client: Samancor Manganese (Pty) Ltd

Water Use Licence Applications

- Water Use Licence Application Process for the SO_2 Abatement Plant at Anglo American Platinum Limited: Polokwane Smelter, Polokwane, Limpopo, South Africa (2017-2018): Project Manager. The project involved the management of specialist along with the compilation and submission of the technical documentation. Client: Anglo American Platinum Ltd: Polokwane Metallurgical Complex
- Rietvlei Coal Mine Water Use Licence Application and Integrated Water and Waste Management Plan, Middelburg, Mpumalanga, South Africa (2016 – 2017): Project Manager. The project involved the compilation of the Integrated Water and Waste Management plan for all water uses proposed at the Greenfileds Rietvlei Opencast Coal Mining Operation. Client: Rietvlei Mining Company (Pty) Ltd
- Metalloys Water Use Licence Application, Meyerton, Gauteng, South Africa (2009): Assistant. This project involved compiling and submitting water use licence applications for all water use licence activities being undertaken at Metalloys. Subsequently a water use licence amendment process was also undertaken. Client: Samancor Manganese (Pty) Ltd

Environmental Authorisation Amendments/Renewals

- Amendment of the Vodacom Dangerous Good Environmental Authorisations, Midrand, Gauteng (2021): Project Manager. The amendment process of the environmental authorisations to amend auditing and monitoring conditions. Client: Vodacom South Africa
- Transfer of the West Wits Operations EMPR to Harmony Gold (2020): Project Manager. The amendment of the EMPR to transfer the West Wits Operations EMPR to Harmony Gold. Client: AngloGold Ashanti Limited
- Amandelbult Section Bus and Taxi Terminal Part 2 Amendment Process, Thabazimbi, Limpopo (2020-2021): Project Manager. The amendment process of the existing Environmental Management Programme Report to formalise the bus and taxi terminal. Client: Rustenburg Platinum Mines
- Sibanye Rustenburg Platinum Mine Part 2 Amendment Process, Rustenburg, North West (2018): Project Manager. The proposed amendment of the Environmental Management Programme Report to excluded activities which will not take place and to ensure alignment of the management measures. Client: Sibanye-Stillwater
- Zibulo Colliery Part 2 Amendment Process, Mpumalanga (2018-2019): Project Manager. The amendment of the Zibulo Colliery Environmental Management programmes for the inclusion of a new coal stockpile. Client: Anglo American Inyosi Coal
- Scaw Metal Waste Treatment and Disposal Facility Part 2 Amendment (2018-2019): Project Manager. The amendment of the Scaw Waste Management Licence to include different waste types. Client: Scaw South Africa
- The transfer of Authorisations for Union Mine (2018): Project Manager. The transfer a Waste Management Licence and ECA Permit in terms of the Part 1 Amendment Process. Client: Anglo American Platinum Limited
- The transfer of Authorisations for Anglo American Platinum Rustenburg Section (2018): Project Manager. The transfer a two Waste Management Licences in terms of the Part 1 Amendment Process. Client: Anglo American Platinum Limited
- Amendment of the Sibanye Rustenburg Platinum Mines Environmental Management Programme, Rustenburg, North West (2018): Project Manager. A Part 2 Amendment Process was undertaken to limit the EMPR to activities have commenced or will be undertaken. Client: Sibanye-Stillwater
- Amendment Process for the Copper Smelting and Casting Plant at Rappa Resources, Germiston, Gauteng (2017-2018): Project Manager. A Part 2 Amendment Process for the installed Copper Smelting and Casting Plant at Rappa Resources. Client: Rappa Resources (Pty) Ltd
- Renewal of the Technopack Eastern Cape Waste Management Licence, Springs, Gauteng (2017): Project Manager. The Waste Management Licence was renewed to ensure the continuation of the plant operations at Enstra. Client: Technopack Eastern Cape (Pty) Ltd
- The Impala Platinum Springs Waste Management Licence Amendment, Springs, Gauteng (2018): Project Manager. A Part 1 Amendment Process was undertaken in order to amend some of the conditions of the Waste Management Licence. Client: Impala Platinum Refineries
- Environmental Authorisation Amendment Process for the Ventilation Shaft at Siphumelele 1 Mine, Rustenburg, North-West, South Africa (2016): Project Manager. Part 2 Amendment Process for the proposed establishment of the Ventilation Shaft at Siphumelele 1 Mine. Client: Rustenburg Platinum Mines Limited

Stakeholder Engagement

- Minimum Emissions Standard Postponement Application for Nulandis Lilianton and Modderfontein (2018-2019): Project Manager. Undertaking the stakeholder engagement process in support of the Nulandis Lilianton and Modderfontein Minimum Emissions Standard Postponement Application. Client: Nulandis
- Minimum Emissions Standard Postponement Application for Sappi Ngodwana (2019): Project Manager. Undertaking the stakeholder engagement process in support of the Sappi Ngodwana Minimum Emissions Standard Postponement Application. Client: Sappi Southern Africa
- Minimum Emissions Standard Postponement Application for AEL Interlligent Blasting Modderfontein (2018-2019): Project Manager. Undertaking the stakeholder engagement process in support of the Modderfontein Site Minimum Emissions Standard Postponement Application. Client: AEL Intelligent Blasting
- Identification of Interested and Affected Parties for Omnia Sasolburg, Sasolburg, Free State, South Africa (2018): Project Manager. The identification of interested and affected parties in terms of Clause 4.1 and 4.2 of ISO 14001:2015. Client: Omnia Fertilizer a Division of Omnia Group (Pty) Ltd
- Re-establishment of a Monitoring Committee for Metalloys, Meyerton, Gauteng, South Africa (2015 – 2016): Project Manager. The re-establishment of a Monitoring Committee for four of the Waste Management Facilities at Samancor Manganese, Metalloys. Client: BHP Billiton Metalloys (Pty) Ltd
- Stakeholder Engagement for Mooi-Mgeni Transfer Scheme Phase 2, Rosetta Village, Kwazulu- Natal, South Africa (2009): Assistant. This project involved undertaking the public participation process for the Mooi-Mgeni Transfer Scheme Phase 2, which will primarily encompass the construction of the proposed Spring Grove Dam and an associated transfer pipeline from the proposed dam to the Mpofana River. Client: Department of Water Affairs and Forestry (DWAF)

Legal Compliance

- AfriSam Regulation 34 Audits (2020-2021): Lead Auditor. Undertaken the Regulation 34 Compliance Audits for various AfriSam Operations (Eikenhof, Roodekrans, Ladysmith, Umlaas, Pietermaritzburg, Rooikraal). Client: AfriSam
- EMPR Regulation 34 Audits at Mogalakwena Section, Limpopo, South Africa (2020): Lead Auditor. Undertaking nine compliance audits in accordance with Regulation 34 of the EIA Regulations and compilation of seven statements of confirmation that the activities have not yet commenced. Client: Rustenburg Platinum Mines.
- Desktop Review of the Impala EMPR 2019 Audit (2020): Lead Auditor. A desktop review was undertaken to determine whether any changes has been made to the operations at Impala that could influence compliance. Client: Impala Platinum
- External Waste Management Licence Audit at Impala Platinum, Gauteng, South Africa (2016, 2018 and 2020): Lead Auditor. External compliance audit of the WML for the Salvage Yard at Impala Springs. Client: Impala Platinum Refiners
- External Water Use Licence Audit of the Rustenburg Operations, North West, South Africa (2020): Lead Auditor. Undertaking the Water Use Licence for the Waterval Smelter and Anglo Convertor Plant, Rustenburg Base Metal Refinery and Precious Metals Refinery. Client: Rustenburg Platinum Mines.
- Impala Platinum Regulation 34 and Waste Management Licence Audits, Rustenburg (2019): Lead Auditor. Undertaking seven compliance audits in accordance with Regulation 34 of the EIA Regulations. Client: Impala Platinum

- Surface Operations Regulation 34 Audits (2019): Lead Auditor. Undertaking the Regulation 34 audits for the Vaal River, Mine Waste Solution and West Wits Operations. Client: AngloGold Ashanti Limited
- Used Oil Industry Audits, Countrywide, South Africa (2014-2019): Lead Auditor. Country-wide environmental compliance auditing of the South African recycled oil industry, comprising sixteen oil refinery operations, and twenty nine drum re-conditioning plants. The audits are primarily focussed on compliance to legislation and ensuring that each site follows international best practice. The audits include a review of the refineries ISO14000 auditor's findings, and tracking of compliance in regards to corrective actions. Client: OSE Foundation
- Sasol Third Party Audits, Johannesburg, Gauteng, South Africa (2017): Project Manager. Undertaken compliance assessments of three environmental authorisations and two water use licence for Sasol Gas. Client: Sasol Gas
- External Environmental Compliance Audit - Tarlton Intermixture Fractionator Plant, Gauteng, South Africa (2014 and 2016): Lead Auditor. An external environmental compliance audit of the record of decision for the Transnet Pipelines Tarlton Intermixture Fractionator Plant was undertaken in order to establish whether Transnet Pipelines are compliant with the conditions specified therein. The audit was undertaken by means of site observations, interviews and verification of available information. Client: Transnet Pipelines (GOC) Ltd
- Waste Management Licence for the Remediation and Decommissioning of Tar Residue Pits, Rustenburg, North-West, South Africa (2015): Lead Auditor. A c lose-out audit was undertaken to compile compliance with the Waste Management Licence conditions during remediation and decommissioning. Client: Anglo Platinum Limited - Rustenburg Platinum Mines Limited
- Water Use Licence Audit for the Landau Colliery, Mpumalanga, South Africa (2014): Auditor. The audit of the Water Use Licence was conducted in accordance with the relevant requirements of the National Water Act and conditions stipulated therein. The audit report included a summary of findings and compliance criteria, as well as recommendations for future corrective and preventative actions if required. Client: Anglo American Thermal Coal
- Waste Management License Audit for the Slagment Operation, Vanderbijlpark, Gauteng, South Africa (2014): 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 South Africa (Pty) Ltd
- Legal Compliance Audit, Olifantsfontein, Province, South Africa (2012): Lead Auditor. The project included undertaking a legal compliance audit of the atmospheric emissions licence and waste management licence at A-Thermal Retort Technologies (Pty) Ltd. A-Thermal, in Olifantsfontein. Client: A-Thermal retort Technologies (Pty) Ltd
- Metalloys Water Use Licence Audit, Meyerton, Gauteng, South Africa (2012): Auditor. The project entailed undertaking a compliance verification audit of the water use licence conditions of Metalloys. Recommendations were also provided in the audit report for non-compliance or potential concerns. Client: Samancor Manganese (Pty) Ltd
- M14 Furnace Legal Compliance Audit, Meyerton, Gauteng, South Africa (2010 & 2012): Auditor. The project included undertaking a legal compliance audit at Samancor Manganese (Pty) ltd (Metalloys) to verify their compliance to the conditions of the record of decision issued for the M14 Furnace and the associated atmospheric emissions licence. Client: Samancor Manganese (Pty) Ltd
- Annual Audit of the Record of Decision and Environmental Management Plan for the Fouriespruit Stream diversion and Old Slag Area, Meyerton, Gauteng, South

Africa (2009 & 2010): Lead Auditor. A legal compliance audit on the record of decision and the associated environmental management plan was undertaken to establish whether the upgrading of the existing stream diversion and the closure and rehabilitation of the old slag disposal area comply with the conditions contained therein. Client: Samancor Manganese (Pty) Ltd

- Goedgevonden Mine Water Use Licence Audit, Ogies, Mpumalanga, South Africa (2009): Auditor. The project entailed undertaking a compliance verification audit of the water use licence conditions of Goedgevonden Mine. Recommendations were also provided in the audit report for non-compliance or potential concerns. Client: Xtrata Coal South Africa

Environmental Due Diligence and Liability Assessments

- Environmental Due Diligence for Rolfes Chemicals, Germiston, Gauteng, South Africa (2014): Auditor. Environmental Due Diligence for the acquisition of a Processing Plant and associated facilities. Client: Rolfes Chemicals Alberton
- Environmental and Social Due Diligence of 22 FMCG facilities, Country-wide, South Africa (2014): Lead Auditor. Transactional Environmental and Social Due Diligence for the acquisition of 22 FMCG facilities mainly in the food manufacturing and consumer formulated chemical sectors situated across South Africa for an international private equity and real estate investor. Client: Confidential
- Environmental and Social Due Diligence of Medrock, Johannesburg, South Africa (2014): Lead Auditor. Transactional Environmental and Social Due Diligence for the acquisition of three medical supplies facilities situated in Johannesburg. Client: Confidential

Site Assessments

- The development and expansion at Two Rives Platinum Mine (2021): Project Manager. Environmental Screening for the proposed expansions at the existing Two Rivers Platinum Mine. Client: Two Rivers Platinum Mine
- The Development of a Filling Plant, Vosloorus, Gauteng (2019): Project Manager. Environmental screening for the proposed chemical filling plant. Client: Richbay Chemicals
- Springfield Coal Mine, Meyerton, Gauteng (2019): Project Manager. Site and Legal Review for the Proposed Springfield Coal Mine. Client: Glubay Coal
- The Development of Thermal Power Plant and Solar PV Plant, Nacala, Mozambique (2018): Project Manager. Environmental and social screening for the alternative sites in terms of the International Finance Corporation Performance Standards on Environmental and Social Sustainability. Client: Confidential
- Gap Analysis for the Northern Pit Development at Zibulo Colliery, Mpumalanga (2018): Project Manager. Undertaking a gap analysis of the proposed development of an opencast pit in the northern section of the approved mining right area for Zibulo Colliery, Mpumalanga. Client: Anglo American Inyosi Coal (Pty) Ltd
- Screening Assessment of Proposed Waste Management Facility at Vodacom Campus, Midrand, Gauteng, South Africa (2017). Project Manager. Screening assessment to prepare a business case based on the facts so that the options for Vodacom's development vs. the potential requirement to identify an alternative site can be objectively evaluated by Vodacom. Client: Vodacom Group Limited
- Site Assessment of a culvert on Sappi Forest Property, plantation Nooitgedacht – Camelot South, Ngodwana, Mpumalanga, South Africa (2015): Project Manager. A site assessment of a recently completed culvert development on Sappi Forest property, plantation Nooitgedacht – Camelot South, Mpumalanga. The purpose of the site assessment is to evaluate the works undertaken on site in respect of the National Environmental Management Act (107 of 1998) as amended and National

Water Act (36 of 1998) and relevant regulations promulgated under these acts. Client: Sappi Southern Africa Limited

- Legal Assessment for the a Proposed Development of a barley Malting Process in Alrode, Germiston, Gauteng, South Africa (2013): Senior Consultant. Undertaking of legal assessment to identify and assess potential scenarios based on environmental assessment triggers for the proposed development at erven 283, 289 and 1607 in Alrode Extension 2. Client: South African Breweries (Pty) Ltd

Environmental Management Systems

- Voorspoed Internal ISO 14001 Audit, Klerksdorp, Free State, South Africa (2010): Auditor. An internal audit was undertaken of the Voorspoed Mine, ISO 14001 System. During the audit conformance to ISO 14001 and the effective implementation of such was assessed. Client: De Beers Group Services (Pty) Ltd
- Venetia Internal ISO 14001 Audit, Musina, Limpopo, South Africa (2009): Auditor. An internal audit was undertaken of the Venetia Mine, ISO 14001 System. During the audit conformance to ISO 14001 and the effective implementation of such was assessed. Client: De Beers Group Services (Pty) Ltd

APPENDIX

TUTAYI CHIFADZA

CHIFADZA TUTAYI, Pri.Sci.Nat, B.Sc.H

Environmental Consultant (Environmental Management), Environment & Energy

Years with the firm

3>

Years of experience

>7

Areas of practice

Environmental Management

Environmental and Social Impact Assessment

Compliance Auditing

Environmental, Social and Governance (Due Diligence Services)

Environmental Screening Assessments

Waste Classification and Management

CAREER SUMMARY

Tutayi Chifadza is an Environmental Consultant currently working for WSP at the Johannesburg, Bryanston office in the Environmental Services division. He also serves as a Client Relationship Manager for a strategic set of WSP's clients. He moved to WSP from Sparrow Consulting early 2016 where he was Project Manager for their Technical Manual/Training material development team.

He has experience in Scoping and EIA projects in several industrial sectors including Oil & Gas, Waste Management, Mining and Agricultural sectors applying local legislation. In 2018, he was part of the team that conducted an ESIA in Somaliland for Dubai Port World in their bid to expand the Port of Berbera quay. Furthermore, he has extensive experience in conducting compliance audits in different sectors on Environmental Authorisations, Waste Management Licenses and Environmental Management Programmes. He has been involved on a couple of projects conducting Environmental Health and Safety audits for worker safety.

Tutayi has also been involved in a couple of Due Diligence projects in the Industrial as well as Oil & Gas sectors. This has been through a desktop exercise reviewing documents provided and identifying information gaps as well as conducting site visits with the guidance of checklists generated from IFC Performance Standards.

He is currently part of the Employment Equity Committee at WSP representing foreign nationals as well as the WSP Environmental Fresh Exchange team that provides a link between employees and senior management.

EDUCATION

Bachelor of Science (Honours), Applied Science in Environmental Technology, University of Pretoria, Pretoria, South Africa	2013
Bachelor of Science, Chemistry, University of Pretoria, Pretoria, South Africa	2012

PROFESSIONAL REGISTRATIONS

South African Council for Natural Scientific Professions (SACNASP): *Pri.Sci.Nat*	2021

ADDITIONAL TRAINING

IFC Environmental and Social Risk Management Training Course for Due Diligence with focus on IFC Performance Standards and Equator Principles	2018 & 2019
IFC Environmental and Social Risk Management Training Workshop on publicly available tools for assisting in assessing the IFC performance standards for Due Diligence process	2018
Environmental Legal Compliance and Auditing Training by Janice Tooley & Associates	2017
Certificate of Completion for Project Management Professional (PMBOK), e-careers (Online Learning)	2016

PROFESSIONAL EXPERIENCE

Key Environmental Impact Assessment Process

— Gridflex Battery Energy Storage System Screening Assessment, Gauteng, South Africa (2020): Conducted a screening assessment for a proposed BESS facility in

order to determine the suitability of the proposed sites and technology for the project. The purpose of the BESS facility is to store additional energy and feed the grid when there is no supply. Client: Gridflex Limited.

- Eskom Gemsbok-KwaMhlanga 132kV Powerline Basic Assessment, KwaMhlanga, Mpumalanga, South Africa (2020): Compiled the BA supporting documentation including the BAR, EMPr and the related public participation material. The purpose of the BA was for Eskom to construct a 132kV powerline. Client: Eskom Holding SOC Limited.
- Eskom Hlanganani Customer Network Centre, Mahatlani, Limpopo, South Africa (2019): Compiled the BA supporting documentation including the BAR, EMPr and the related public participation material. The purpose of the BA was for Eskom to clear a 2-hectare area for the purposes of constructing a customer network centre. Client: Eskom Holding SOC Limited.
- Sasol Phenosolvan Plant Decommissioning of Redundant Equipment Basic Assessment (BA), Sasolburg, Free State, South Africa (2019): Compiled the BA supporting documentation including the BAR, EMPr and the related public participation material. The purpose of the BA was for Sasol to decommission redundant equipment on the Phenosolvan Plant to create space and improve the health and safety aspects of the site. Client: Sasol South Africa Limited.
- Eskom Medupi Raw Water Pipeline BA, Lephalale, Limpopo, South Africa (2019): Compiled the BA supporting documentation including the BAR, EMPr and the related public participation material. The purpose of the BA was for Eskom to clear a servitude in order to construct an underground raw water pipeline within the Medupi site in order to supply water for the use in the Flue Gas Desulphurisation process on the facility to reduce sulphur emissions. Client: Eskom Holding SOC Limited.
- AgriProtein Gauteng Nutrient Recycling Facility EIA, Johannesburg, Gauteng, South Africa (2018): Compiled the EIA supporting documentation including the Scoping Reports, EIA Reports, EMPr and the related public participation material. I was also the main contact with the Gauteng Department of Agriculture and Rural Development. The purpose of the EIA was for Agriprotein to develop and build an industrial scale nutrient recycling bio-technology plant at a green field site. Client: Agriprotein Gauteng.
- Wildcoast Special Economic Zone (SEZ) EIA, Mthatha, Eastern Cape, South Africa (2018): Compiled the EIA supporting documentation including the Scoping Reports, EIA Reports, EMPr and the related public participation material. The purpose of the EIA was for the Coega Development Corporation (CDC) to clear an area and develop an SEZ in the Wildcoast area to the immediate north and immediate south of the Mthatha airport. The purpose of the SEZ is to accommodate different economic activities, with agricultural activities to the north and commercial activities to the south (hotels, etc) to boost the local economy and create employment in the region. Client: Coega Development Corporation.
- Port of Berbera Phase 1 Expansion ESIA, Woqooyi Galbeed, Somaliland (2018): Assisted in compiling the ESIA supporting documentation including the Background Information Document, ESIA Report, Environmental and Social Monitoring Plan, Cumulative Impact Assessment methodology and report as well as the Legal Framework. This was done following conducting site assessments using the IFC Performance Standards as a basis. The purposes of the project was to extend the existing quay on the port in order to support larger vessels as well as expand the shipping container storage area including amenities as well as ensure control of the movement of goods around the region. Client: DP World.
- Proposed Animal Feedlot BA, Mpumalanga, South Africa (2018): Compiled the BA supporting documentation including the BAR, EMPr and the related public participation material. The purpose of the feedlot was to support the project was

to support the Agri-Parks programme, which is the cornerstone of rural economic transformation, and support the red meat sector in the region. Client: Department of Rural Development and Land Reform.

— BioTherm Wind and Solar Energy Facilities, Western Cape and Northern Cape, South Africa (2017-2017): Created a consolidated impact assessment rating based on the available specialist studies for all the proposed sites. This assisted in acquiring the cumulative impact from all the projects in the area based on the publicly available information. It also included consolidating the comments and response from commenting authorities and stakeholders in the Comments and Responses Report. Client: BioTherm Energy.

— Transnet Pipelines EIA/BA process, Secunda, Mpumalanga, South Africa (2017): Compiled the BA supporting documentation including the BAR, EMPr and the related public participation material. The purpose of the BA was for Transnet to acquire an authorisation in order to cover an exposed hydrocarbon pipeline using a concrete gabion mattress structure to protect it and prevent contamination of surrounding watercourses. Client: Transnet Pipelines, a Division of Transnet Limited.

— Anglo Platinum Water Separation Project, Rustenburg, North West, Gauteng (2016-2017): Compiled the BA supporting documentation including the BAR, EMPr and the related public participation material. The purpose of the BA was for Anglo to construct a new raw water pipeline and a reservoir for storage of water for use in the event of lack of supply as well as for firefighting purposes. Client: Anglo American Platinum Limited.

— Amandelbult Mine Dangerous Goods Storage and Railway Extension Project BA, Limpopo, South Africa (2017): Compiled the BA supporting documentation including the BAR, EMPr and the related public participation material. The purpose of the BA was for the client to obtain authorisation to install diesel storage tanks to support the mine expansion as well as the extension of the existing railway line in order to support more rail cars. Client: Rustenburg Platinum Mines Limited.

Due Diligence

— Environmental Due Diligence, South Africa (2020): Partnering a Senior Associate on a Phase 1 EDD conducting a desktop assessment of a site in Cape Town the client proposes to buy to extend their operations. My role entails reviewing existing studies as well as analysing GIS and ESG tools to draft a report which gives insight on the current state of the site along with any major findings the client has to be aware of before proceeding with the transaction. Client: Confidential.

— Environmental Due Diligence, South Africa (2019): Partnered a Senior Associate on a Phase 1 EDD conducting a desktop assessment of various sites in South Africa for an explosives manufacturing company which proposed to buy similar operations from another organisation. My role entailed reviewing existing studies and reports on the various sites to provide insight on the state of the sites along with any major findings the client had to be aware of before proceeding with the transaction. Client: Confidential.

— Environmental Social Governance Due Diligence, South Africa/Swaziland (2017): Partnered with two Senior Associates during the project and conducted site visits and conducted facility inspections (Johannesburg sites and at one facility in Swaziland) based on the checklist prepared in line with EHS Guidelines and IFC Performance Standards (1 and 2) at selected WACO Africa facilities in Johannesburg and Swaziland on behalf of the client who intended to invest. Client: The Abraaj Group.

Compliance Auditing: Key Projects

— Refurbishment (Fit-Out) of The 8th Floor in 140 West Building, South Africa (2020) Tutayi compiled the Environmental Management Plan for the

refurbishment/construction of the Goldman Sachs office space in Sandton, Johannesburg. This included understanding the proposed project activities and deriving the potential impacts from the different project aspects (waste, air quality, etc.). The EMP was compiled to provide the environmental management measures for the site for the proposed site activities in order to acquire a Green Star SA – Office v1 certification by the Green Building Council of South Africa. A monitoring programme was also developed as part of the project. Tutayi applied his scientific knowledge in coming up with the relevant management measures for the expected impacts. Client: Goldman Sachs

- Anglo Gold Ashanti Regulation 34 Audits, Klerksdorp, North West (2019): Conducted an EMPR compliance audit for the mine's Mine Waste Solutions business which focuses on tailings recovery based on Regulation 34 of the requirements of the local National Environmental Management Act (NEMA). Client: Anglo Gold Ashanti Limited.
- Impala Platinum Regulation 34 Audits, Rustenburg, North West (2019): Conducted an EMPR compliance audit focusing on the mine's shafts, concentrators, smelters and other ancillary operational activities based on Regulation 34 of the requirements of the local NEMA. Client: Impala Platinum Limited.
- Anglo American Mogalakwena Mine Regulation 34 Audits, Mokopane, North West (2019 & 2020): Conducted an EMPR compliance audit focusing on the mine's opencast pit operations as well as ancillary services based on Regulation 34 of the requirements of the local NEMA. Client: Anglo American Platinum.
- 1 Fricker Road Towers Building Development, South Africa (2018). Tutayi undertook the first compliance audit against the Environmental Management Plan for the refurbishment/construction of the J.P. Morgan Chase & Company office building in Illovo, Johannesburg. This included conducting interviews with the appointed Designated Environmental Officer from the contractor, site personnel on gathering information on the operations and the environmental management measures in place for the site. The purpose of the development was to acquire a Green Star SA – Office v1 certification by the Green Building Council of South Africa. A site walk was conducted to confirm any findings. A monitoring programme was also developed as part of the project. Tutayi applied his scientific knowledge in coming up with the relevant management measures for the expected impacts. Client: J.P. Morgan Chase and Company
- South 32 Water Use Licence (WUL) Audits, Middelburg, Mpumalanga (2016-2019, annual audits): Conducted compliance audits against two WULs focusing on the water uses for two different sections of opencast pits operations based on the requirements of the local National Water Act (NWA). Client: South 32.
- Tubatse Ferrochrome Waste Management Licence (WML) Audits, Steelpoort, Limpopo (2017-2019, annual audits): Conducted WML compliance audits against five licences mainly focusing on management of disposal of baghouse dust from the smelting operations as well as slag disposal facilities. Audits are based on the requirements of the local National Environmental Management: Waste Act (NEM: WA). Client: Samancor Chrome.
- Sasol Regulation 34 Audits, Secunda, Mpumalanga (2019): Conducted compliance audits against project based Environmental Authorisations and corresponding EMPrs for different operations on Sasol's Secunda facility based on Regulation 34 of the requirements of the local National Environmental Management Act (NEMA). Client: Sasol South Africa (Pty) Limited.
- Samancor Manganese South Plant demolition, Meyerton, Gauteng, South Africa (2016): Provide Environmental Control Officer (ECO) services by conducting bimonthly EMPr audits for the demolition of the South Plant site on the premises. This entailed conducting environmental audits to ensure EMP compliance for the

project to minimise impacts and risk during the activities. Client: Samancor Manganese, Metalloys, operated by South 32.

— Sappi External Waste Management Licence Compliance Audit, Springs, Gauteng, South Africa (2016): Conducted the WML environmental compliance audit of the solid waste disposal facility situated at Enstra and compile an audit report according to the requirements of NEMWA. Client: Sappi Southern Africa Limited.

— General Electric Healthcare Environmental Health and Safety Audit, Rosebank, Gauteng, South Africa (2016): Conducted an Environmental Health and Safety (EHS) inspection of the GE Healthcare operations in Rosebank and one field site. The field site was at the Life Carstenhof Hospital were the Field Engineers were installing a new piece of equipment. Client: GE Healthcare, a Division of General Electric.

— Rose Foundation Environmental Compliance Audit of Old Oil Man, Chamdor, Gauteng, South Africa (2016): Conducted an environmental compliance audit to identify and assess key environmental issues pertaining to the operations and facilities against which on-going continuous improvements and modifications of the facility can be evaluated. The audit covered site operational control measures, legal and regulatory compliance, impacts to environment and general environmental practice. Client: Rose Foundation.

Waste Management

— Transnet Port Terminals Waste Classification Survey, South Africa (2020): Tutayi conducted the waste classification survey of the Transnet Port Terminals around the country which included, Durban Car Terminal, Maydon Wharf, Durban Container Terminal 1, Durban Container Terminal 2, Richards Bay, Port Elizabeth, East London, Cape Town and Saldanha Bay. This included conducting interviews with the SHEQ Manager, SHEQ Officers and gathering information on the operations and the waste management measures in place for both general and hazardous waste based on the operations. A survey of the available documentation including the waste inventory and previous classifications and SDSs was done. This was to ensure that the waste management requirements were met. Site walks were conducted at each site to confirm that the same standards were applied and any unclassified waste streams had samples collected for analysis at an accredited laboratory. The results were then analysed internally and Tutayi developed the SDSs for the waste streams identified as hazardous. Tutayi also applied his scientific knowledge when he was advising the clients and contractors when dealing with challenges onsite that had to be solved and providing recommendations for any non-compliances noted during the audit. This was reflected in the waste classification survey reports which were produced for each site. Client: Transnet Port Terminals

— South 32 Dam Sludge Classification Project, South Africa (2018): Tutayi assisted in the waste classification on the sludge from the South 32 Ifalethu Colliery Pollution Control Dams. South 32 intended to do dam clean up and wanted to assess the sludge for disposal. Tutayi collected samples from the dams which were analysed at an accredited laboratory. The results were then analysed internally and Tutayi developed the SDSs for the waste streams identified as hazardous. Client: South 32 Coal Holdings

— Mine Water Reclamation Plant (MWRP) Gypsum Classification Project: Tutayi assisted in the waste classification of the gypsum generated from the South 32 water treatment plant. The MWRP generates a solid waste during the mine water treatment process, which theoretically, should be gypsum based on the chemistry of the plant. The project was to intended to confirm that the gypsum produced was pure and could be sold to farmers for use as a fertilizer. This would help empty the gypsum dams that were getting full and find a way to reuse the by-product. Tutayi collected grab samples which were analysed at an accredited laboratory.

The results were then analysed internally and an SDS and a classification report produced. Client: South 32 Coal Holdings

— PPC Waste Classification, All PPC South Africa sites, South Africa (2016): Consolidated the waste inventories from different sites into one waste inventory, pre-classified the waste, collected samples, conducted waste profiling, waste classification and created SDSs based on laboratory analysis of samples collected. Created generic SDSs for waste were sampling was not required. Client: PPC Ltd.