APPENDIX A: EXISTING AUTHORISATIONS

- A Converted Old MR issued in terms of the MPRDA (DMRE) (previously the DME Ref: 03/2006(MR)) issued on 16 January 2006; and
- An approved amended EMPR issued in terms of the MPRDA (DMRE (previously the DMR Ref: NC30/5/1/2/3/2/1(253) MR) dated 16 March 2018.

SMP/MM/1

#7087

#73922 (Transvaal Cession)

MINING RIGHT

in favour of

SAMANCOR LIMITED

(Wessels Mine)

TABACKS

Form C, Annexure III

DEPARTMENT: MINERALS AND ENERGY

REPUBLIC OF SOUTH AFRICA

MINING RIGHT

[Converted in terms of Item 7 of Schedule II of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)]

TABLE OF CONTENTS

Converted into a Mining right under MPT
No: 03/2006 by application No: NC 5/3/2/268
Date: 16 01 2006
Pp Director-General
Mineral and Pretoleum Titles Registration Office:
PRETORIA

Registered in the MINERAL & PETROLEUM TITLES REGISTRATION OFFICE: PRETORIA
in the Register of Mining Rights
on this 16th day of Jan 2006
under 03/2006 (NC)
PP DIRECTOR-GENERAL
DEPT. OF MINERALS AND ENERGY

Cession: 25/2006
SAMANCOR LTD
in favour of
SAMANCOR MANGANESE (PTY) LTD
registered on the 30 day of MAY 2006
pp DIREKTEUR-GENERAAL: MINERALE EN ENERGIE
DIRECTOR-GENERAL: MINERALS AND ENERGY

pp DIREKTEUR-GENERAAL: MINERALE EN ENERGIE
DIRECTOR-GENERAL: MINERALS AND ENERGY
registered on the ..... day of ..... 20 .....
in favour of
Cession: .....

Protocol No. 931E

DEPARTMENT: MINERALS AND ENERGY

REPUBLIC OF SOUTH AFRICA

MINING RIGHT

[CONVERTED OLD ORDER MINING RIGHT]

[Converted in terms of item 7(3) of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)]

LET IT HEREBY BE MADE KNOWN:

THAT on this the 21 day of November in the year 2005, before me, a notary public, duly sworn and admitted, residing and practising at Kimberley, in the Northern Cape Province of South Africa, and in the presence of the subscribing competent witnesses, personally came and appeared:

(1) MALEKA JERRY Mndaweni Regional Manager, Northern Cape Region of the Department of Minerals and Energy, and as such in his capacity as the duly authorised representative of:

THE MINISTER OF MINERALS AND ENERGY

(Hereafter together with his or her successors in title and assigns referred to as "the Minister")

He, the said Regional Manager, being duly authorised thereto under and by virtue of a power of attorney granted to him or her by Jacinto Ferreira dos Santos Rocha in his capacity as Acting Director-General : Mineral Regulation of the Department of Minerals and Energy of the Republic of South Africa

On the 6th day of, October 2005 acting under and by virtue of the powers conferred upon him in terms of section 103 of the of the Mineral and Petroleum Resources Development Act, 2002(Act no.28 of 2002), by the Minister of Minerals and Energy;

AND

(2) Quintus Roux, an authorised representative of :

SAMANCOR LIMITED
(Registration no. 1926/008883/06)

(Hereinafter together with its successors in title and assigns referred to as" the Holder"), he, the said Appearer, being duly authorised thereto under and by virtue of a resolution of directors of the Holder, passed at Johannesburg on the 11th day November of 2004

which power of attorney and a certified copy of which resolution have this day been exhibited to me, the notary, remain filed of record in my protocol with the minute hereof.

AND THE MINISTER AND HOLDER DECLARED THAT:

WHEREAS	the State is the custodian of the National Mineral and Petroleum Resources;
AND WHEREAS	the Holder has lodged its old order mining right for conversion in terms of item 7(2) of Schedule II of the Act and it has conducted mining operations in respect of the area which is the subject of the old order mining right conversion;
AND WHEREAS	the Minister has converted the old order mining right in terms of item 7(3) of Schedule II of the Act;

NOW THEREFORE THE MINISTER HAS CONVERTED THE OLD ORDER MINING RIGHT SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS:

1. Definitions

In this mining right the following words and expressions shall have the meanings assigned to them:

1.1. "*Act*" means the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) and includes the regulations made in terms of this Act;

1.2. "*Mineral*" means manganese ores;

1.3. "*Mining Work Programme*" as indicated in Annexure "A" to this mining right;

1.4. "*Social and Labour Plan*", as indicated in Annexure "B" to this mining right;

1.5. "*environmental management programme*" see definition in section 1 of the Act;

1.6. "*Minister*" means the Minister of Minerals and Energy in her capacity as the representative of the State, in its capacity as the custodian of the nation's mineral resources shall include the successors in title and assigns of the Minister, and wherever appropriate (in particular where the provisions of this mining right require the prior consent of the Minister) the references in this mining right to the Minister shall be as meaning the Minister or any person duly authorised by the Minister to act in the Minister's place and stead;

1.7. "*Holder*" means Samancor Limited, Registration No 1926/008883/06 and shall include the assigns or successors in title of the Holder or any syndicate or juristic or natural person which in any manner takes over or otherwise acquires the rights of the Holder under this Mining Right;

1.8. "*mining operations*" as defined in section 1 of the Act;

1.9. "*Mining Right Area*" means the portion or portions of the land referred to in clause 2;

1.10. "*Manager*" shall mean the Regional Manager for the Northern Cape Region of the Department of Minerals and Energy;

1.11. "*Effective date*" means 6 October 2005.

2. Description of the Mining Right Area

The mining right area shall comprise the following:

Certain: portions of the farm WESSELS NO. 227, portions 1 and 2 of the farm DIBIAGHOMO NO. 226 and portion 1 of the farm DIKGATHLONG 268

Situate: in the Region and Province of the Northern Cape

Measuring: 596,9036 (FIVE HUNDRED AND NINETY SIX comma NINE NOUGHT THREE SIX) hectares in extent.

TB

Which Mining Right Area is depicted by the figure ABCDEFGH on the attached Diagram MPT No. 63/2006 (SG 1052/2005) marked Annexure "C" and registered in the Mineral and Petroleum Titles Registration Office on 16-01- 2006

3. Conversion to Mining Right

Without detracting from the provisions of section 5 of the Act, the Minister grants to the Holder the sole and exclusive right to continue mining, and recover the Mineral in, on and under the Mining Right Area for the Holder's own benefit and account, and to deal with, remove and sell or otherwise dispose of the Mineral, subject to the terms and conditions of this mining right, the provisions of the Act and any other relevant law in force for the time being.

4. Commencement, duration and renewal

4.1 This mining right shall commence on 6 October 2005 and, unless cancelled or suspended in terms of section 47 of the Acts will continue in force for a period of 30 years ending on 5 October 2035.

4.2 Any application for renewal shall be submitted to the Minister not later than 90 days prior to the date of expiry of the initial period.

5. Amendment, variation

5.1. The provisions of section 102 of the Act applies to this mining right.

5.2. With effect from the date the Holder has so abandoned or relinquished a portion or portions of the Mining Right Area, the Minister shall be entitled to grant any prospecting rights or mining rights or any right or permit referred to in the Act in, on, or under the portion or portions, so abandoned or relinquished, to any person or persons.

5.3. Upon abandonment or relinquishment of the Mining Right Area or any portion thereof, the Holder will furnish the Minister with all mining results and/or information, as well as its general evaluation of, the geological, geophysical and borehole data in respect of such abandoned area in so far as it applies to the Mineral or any other mineral or minerals referred to in clause 10 such results and/or information may be made available to third parties.

TB

6. Mining fees and royalties

6.1. The provisions of section 71 of Schedule 3 of the Taxation Laws Amendment Act, 2004 (Act 16 of 2004) apply to this Mining Right.]

6.2. The Holder shall pay to the Minister throughout the duration of this mining right any levy, fee, royalty or consideration payable in terms of any relevant Act of Parliament. All payments required in terms of this Act shall be made by the Holder to the South African Revenue Services (SARS) at the relevant time-periods determined by the said Act.

7. Restrictions and Obligations imposed on the Holder

7.1 The Holder is entitled to the rights referred to in section 5(2) and (3) or any other relevant provisions of the Act, such other rights as may be contained in this mining right or such other right as may be granted to, acquired by or conferred upon it by any other applicable law.

7.2 Mining operations in the Mining Right Area must be conducted in accordance with the Mining Work Programme.

7.3 The Holder shall not trespass or enter into any homestead, house or its curtilage nor interfere with or prejudice the interests of the occupiers and/or owners of the surface of the Mining Right Area except to the extent to which such interference or prejudice is necessary for the purposes of enabling the Holder to properly exercise the Holder's rights under this mining right.

8. Mortgage, Cession, Transfer, Alienation

The provisions of section 11 of the Act apply to any cession, letting, subletting, assignment alienation or disposal of this right or an interest therein.

9. Protection of Boreholes, Shafts, etc.

No boreholes sunk by the Holder during the currency of this mining right shall be sealed or closed up by the Holder without the prior written approval of the Minister, but the Holder shall fence and render safe all boreholes, shafts, openings and excavations in accordance with the provisions of the Act, the Mine Health and Safety Act, 1996 and any other applicable laws and regulations.

TB

10. Indemnity and Insurance

10.1 The Holder, its successors and/or assigns, during the tenure of this mining right will take all such necessary and reasonable steps while carrying out their mining operations in such a manner as will adequately safeguard and protect the environment, the Mining Right Area and any person or persons using or entitled to use the surface of the Mining Right Area from any damage caused by or through or in consequence of the exercise by the Holder of its aforesaid right to conduct mining operations under this mining right, of any activity or activities associated with the Holder's operations in the Mining Right Area, and will in so far as there is a legal liability, compensate such person or persons for any damage or losses, including but not limited to damage to the surface, to any crops or improvements, which such person or persons may suffer as a result of, arising from or in connection with the exercise of his/her rights under this mining right or of any act or omission in connection therewith.

10.2. The Minister is not or will not be deemed to be a partner in any mining operations carried out in terms of this mining right.

11. Inspection of Mining Right Area

The Minister and any person duly authorised thereto in writing by the Minister shall be entitled to inspect the Mining Right Area, the Holder's mining operations and the execution of the approved EMP on the Mining Right Area at any time, and any instruction conveyed in writing by the Minister to the Holder requiring the proper performance by the Holder of the Holder's obligations under this mining right shall be put into effect by the Holder in terms of the Act.

12. Cancellation or suspension [section 47 of the Act]

12.1 Subject to section 47 of the Act, this mining right may be cancelled or suspended if:

12.1.1 the Holder conducts mining operations in contravention of the provisions of the Act;

12.1.2 the Holder breaches any material terms and condition of this mining right;

12.1.3 the Holder contravenes the requirements of the approved Environmental Management Programme; or

12.1.4 the Holder submits inaccurate, incorrect or misleading information with any matter which is required to be submitted under the Act.

12.2 Before the Minister acts under section 47(1) of the Act, the Minister shall:

12.2.1. Give written notice to the Holder indicating the intention to suspend or cancel this mining right;

12.2.2 Give reason why the Minister is considering the suspension or cancellation of this mining right;

12.2.3 Give the Holder 30 days to show why the mining right should not be suspended;

12.2.4 Notify, the mortgagor, if any, of this mining right of the Minister's intention to suspend or cancel this mining right; and

12.2.5 Direct the Holder to take specified measures to remedy any contravention, breach or failure to comply.

12.3 If the Holder does not comply with the directions referred to in sub-clause 12.2.5, the Minister may act under section 47(1), after:

12.3.1 giving the Holder a reasonable opportunity to make representations; and

12.3.2 having considered such representation.

13. Records and Returns

13.1. The Holder shall maintain all such books, plans and records in regard to mining on the Mining Right Area as may be required by the Act and shall furnish to the Minister such reports and documents as may be relevant to the rights of the Minister under this mining right.

13.2. The Holder shall furnish to the Regional Manager all such returns as may from time to time be required under the Act.

13.3. The Holder shall on a quarterly basis, calculated from the commencement of this mining right, furnish the Regional Manager or his or her nominee with a return reflecting the particulars of any geological exploration undertaken by the Holder on the Mining Right Area.

13.4. The Holder shall furthermore at the end of each year following commencement of this mining right, inform the Manager in writing of any new developments and of the future prospecting and mining activities planned in connection with the exploitation/mining of the Mineral on the Mining Right Area.

TB

14. Payment of Compensation

The Minister shall not at any time be liable or responsible for the payment of compensation of whatsoever nature to the Holder, the Holder's successors-in-title or assigns, except for compensation for which the Minister is liable in consequence of the breach by the Minister of any of the provisions of this mining right or on account of any wrongful act or omission by or attributable to the Minister, without derogating from the provisions of item 12 of Schedule II to the Act or section 25 of the Constitution of the Republic of South Africa 1996.

15. Comply with laws of the Republic

The Holder and its successors and/or assigns must comply with all the provisions of the Mine Health and Safety Act, (Act no.29 of 1996) and any other law in force in the republic

16. Preserved terms and conditions of the old order mining right

Notwithstanding the cessation of the old order mining right in terms of item 7 of Schedule II of the Act, the following terms and conditions of the said old order mining right have been preserved, namely :

16.1 the provisions of the Minerals Act, 1991, applicable thereto, including but not limited to :

16.1.1 the provisions of section 5(3) of the Minerals Act, 1991 whereby the Holder may, while mining Minerals, also mine and dispose of any other minerals in respect whereof the Holder is not the holder of the right thereto, but which must of necessity be mined together with Minerals, subject to the proviso to the said section 5(3);

16.1.2 the provisions thereof read with the common law whereby Temporary Mining Authorisation T52/93 also extends to Minerals mined by virtue of the said Temporary Mining Authorisation T52/93 and stockpiled or otherwise retained by the Holder;

16.2 the provisions of Mining Leases No. 1/1975, 6/1980 and 7/1983;

provided that no terms and conditions remain in force if they are contrary to the provisions of the Constitution of the Republic of South Africa, 1996 or the Act.

TB

17. Provisions relating to section 2(d) and (f) of the Act

The Holder is required by the provisions of Section 2(d) and (f) of the Act, and has made the undertakings as detailed in Attachment L of its application for the conversion of an Old Order Mining Right dated 3rd December 2004 :

17.1 to substantially and meaningfully expand opportunities for historically disadvantaged persons, including women, to enter the mineral industries and to benefit from the exploitation of the nation's mineral resources available to the Holder through :

17.1.1 the transfer of at least 26% ownership to a historically disadvantaged South African owned or controlled entity;

17.1.2 implementation of employee participation schemes;

17.1.3 implementation of community participation schemes;

17.1.4 compliance with the commitments contained in the Mining Charter contemplated in Section 100 of the Act;

17.1.5 providing historically disadvantaged South Africans with preferred supplied status where possible, in all three levels of procurement namely, capital goods, services and consumables. In order to provide historically disadvantaged South Africans with preferred supplier status, the Holder is required to identify levels of procurement and to progress procurement, in accordance with the commitments provided in the Social and Labour Plan;

17.2 to promote employment and advance the social and economic welfare of all South Africans by:

17.2.1 complying with the requirements and principles contained in the Holder's human resource development policy, employment equity policy and plan, skills development plan, mentorship plan, and career progression plan;

17.2.2 complying with the commitments set out in its Housing and Living Conditions Policy and through continued corporate social investment.

18. Severability

Notwithstanding anything to the contrary, any provision of this mining right which is contrary to any provision of the Act or which is otherwise ultra vires, void, voidable, or unenforceable, shall be severable from the rest of this Right, such rest thus being and remaining of full force, effect and enforceability.

TB

19. Domicilia citandi et executandi

19.1. The parties hereto choose the under mentioned addresses as their *domicilia citandi et executandi* and for all purposes arising from this mining right, in particular for the purposes of serving of any notice in terms of this mining right, and any notice properly addressed to the under mentioned postal addresses of the parties shall be deemed to have been received by the addressee within 5 days if given in writing and posted by prepaid registered post addressed to the addressee at the relevant postal address:

19.1.1. In the case of the ***Minister***:

Business Address:	29 Currie Street KIMBERLEY 8301
Postal Address:	Private Bag X6093 KIMBERLEY 8300
Tel:	(053) 830-0800
Fax:	(053) 832-5631

19.1.2. In the case of the ***Holder***:

Business Address:	6 Hollard Street JOHANNESBURG 2001
Postal Address:	P O Box 61075 MARSHALLTOWN 2107
Tel:	(011) 376-3504
Fax:	(011) 376-2160

19.2. Notwithstanding anything to the contrary herein contained, a written notice or communication actually received by a party at any place other than the chosen *domicilium citandi et executandi* shall constitute adequate notice or communication to the party notwithstanding that it was not sent to or delivered at such party's chosen *domicilium citandi et executandi.*

19.3 Either party shall be entitled from time to time to change the *domicilium citandi et* executandi or postal address furnished above after giving at least 14 days prior written

TB

notice of such change to the other party, failing which the above mentioned addresses shall remain in force.

19.4. Any written notice or communication contemplated in this clause which is forwarded by one party to the other by registered post will be rebuttably presumed to have been received by the addressee on the fourteenth day following the date of posting from an address within the Republic of South Africa to the addressee at the postal address of the addressee for the time being as determined in accordance with the provisions of this clause.

20. Costs

The Holder shall pay all costs and charges incurred by the Holder in connection with the negotiation, preparation, execution and registration of this mining right.

Thus done and signed at Kimberley on the 21 day of November 2005 in the presence of the undersigned witnesses:

AS WITNESSES:

1. _____

2. _____

_____

For and on behalf of the **Minister**

Thus done and signed at Kimberley on the 21 day of November 2005 in the presence of the undersigned witnesses:

AS WITNESSES:

1. _____

2. _____

_____

For and on behalf of the **Holder**

IZAK CORNELIUS POTGIETER
NOTARIS PUBLIEK
NOTARY PUBLIC
Provinsie Noordkaap/Northern Cape Province

TB

Framed by: Nel, Cross & Partners

MINING RIGHT DIAGRAM

SIDES Metres		ANGLES OF DIRECTION		CO-ORDINATES Y System : WG.23° X	
		Konstante		+0, 00	+2900 000, 00
AB	2 594, 56	256 10 13	A	+16 051, 45	+ 98 619, 32
BC	874, 16	256 10 13	B	+13 532, 11	+ 97 999, 12
CD	1 395, 54	355 28 02	C	+12 683, 29	+ 97 790, 16
DE	950, 74	358 15 51	D	+12 573, 00	+ 99 181, 34
EF	1 298, 68	358 13 04	E	+12 544, 20	+ 100 131, 64
FG	1 442, 14	100 44 06	F	+12 503, 81	+ 101 429, 69
GH	2 457, 79	94 43 13	G	+13 920, 71	+ 101 161, 07
HA	2 361, 11	187 45 27	H	+16 370, 16	+ 100 958, 82
Excluded Figure					
JK	60, 23	291 05 10	J	+14 449, 43	+ 100 408, 95
KL	83, 29	16 28 28	K	+14 393, 23	+ 100 430, 62
LM	60, 02	106 24 54	L	+14 416, 85	+ 100 510, 49
ML	88, 19	196 27 37	M	+14 474, 42	+ 100 493, 53
(43) Black Rock			△	+16 474, 78	+ 101 712, 22
(83) Abbatoir			△	+12 343, 06	+ 105 265, 46

Mining Region : Northern-Cape

Issued by
The Regional Director
Department of
Minerals and Energy
Northern-Cape

....
Signature Date

Approved by Regional Manager [signature] Date: 21/11/2011 X please sign

For and on behalf of the holder [signature] Date: X please sign

The figure A B C D E F G H excluding the figure J K L M
represents 1068, 5876 hectares, being
a Mining Right to be issued in favour of
HOTAZEL MANGANESE MINES (Pty.) Ltd. No.2007/004878/07, situate on

1) The farm WESSELS No.227 vide Diagram SG No.F1313/1914 annexed to Crown Grant 6/47
2) Portion 1 of the farm DIBIAGHOMO No.226 vide Diagram No.F3767/1948 annexed to D/T No.1133/1948
3) Portion 2 of the farm DIBIAGHOMO No.226 vide Diagram No.F4372/1956 annexed to D/T No.261/1957
4) Portion 1 of the farm DIKGATHLONG No.268 vide Diagram No.F8159/1955 annexed to D/T No.416/1956

Administrative District Kuruman Mining Region Northern-Cape
Province Northern-Cape
Surveyed by me in February and July 2009

G.O.L. Cross
PLS 0124
Pr.Land Surveyor

This diagram is annexed to No. dated t.g.v Registrateur van Aktes	The Original Diagrams are as quoted	File No. KURM 226 S.R. No. 480/2009 Comp.HL-2 (5725) M 4040 (HLNK-1)

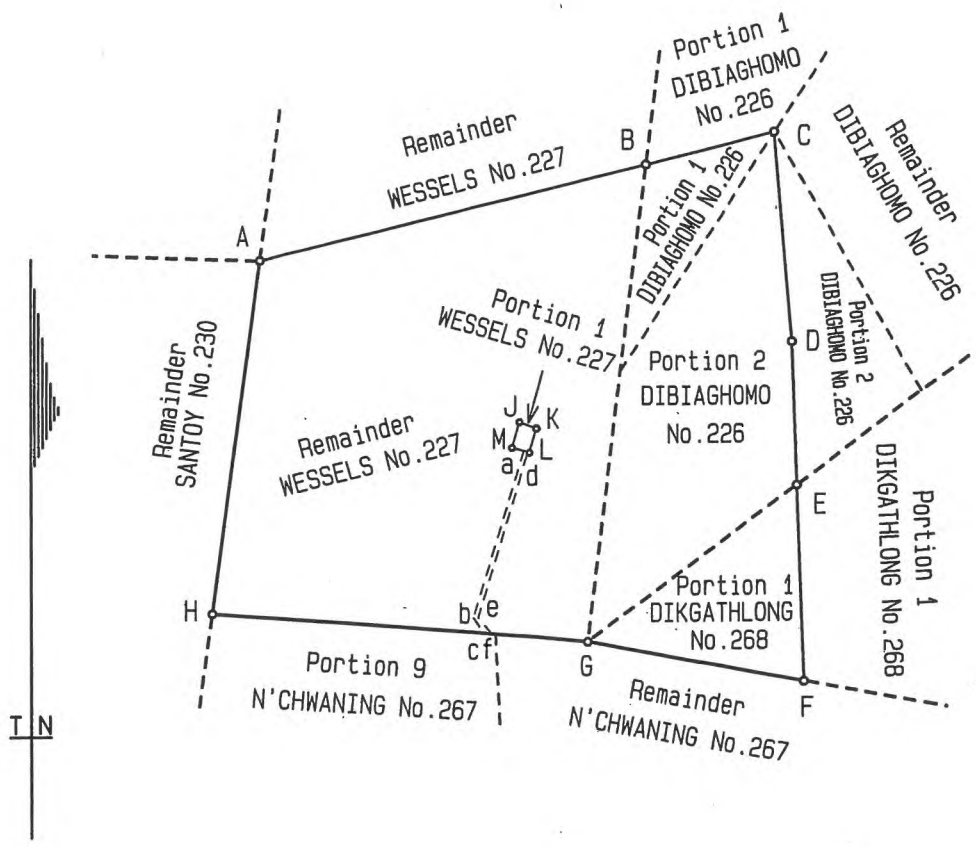
Beacon Description

A	Planted stone
B	Not beaconed
C, J, M	20mm Iron peg
K, L	16mm Iron peg
D, E, F, G, H	750mm Concrete beacon with centre pipe

Servitude Notes

(a) The line abc represents the centre line of an Electric Power Line Servitude 31m wide and the line def represents the centre line of an Electric Power Line Servitude 22m wide over the Remainder of the farm Wessels No.227, vide Diagram SG No.F5520/1979 annexed to D/T No.1627/1982

S.G. No.
1235/2009
Approved
[signature]
for
Surveyor General
2009.08.18.



Scale 1 : 50 000

Knight Piésold CONSULTING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT REPORT

Amendment of Environmental Management Programme for Hotazel Manganese Mines: Wessels Mine

Environmental Impact Assessment Report

Annexures A - J

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

AMENDMENT OF ENVIRONMENTAL MANAGEMENT PROGRAMME FOR HOTAZEL MANGANESE MINES: WESSELS MINE

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: Hotazel Manganese Mines (Pty) Ltd: Wessels

TEL NO: 0113762705

FAX NO: N/A

POSTAL ADDRESS: P O Box 61820, Marshalltown

PHYSICAL ADDRESS: 39 Melrose Boulevard, Melrose Arch

FILE REFERENCE NUMBER SAMRAD:

Consultant:

Project Name: Amendment of Environmental Management Programme for Hotazel Manganese Mines: Wessels Mine

Project Number: 301-00462/06

Name	Signature	Date	Responsibility
Mavisha Nariansamy Cand.Sci.Nat. Environmental Scientist		05/07/2017	**Report Compiler**
Neal Neervoort Pr.Sci.Nat Senior Environmental Scientist		05/07/2017	**Report Reviewer**
Amelia Briel (Project EAP) Pr.Sci.Nat.; EAPSA Section Manager : Environmental		07/07/2017	**Senior Reviewer**
Revised			
Mavisha Nariansamy Cand.Sci.Nat. Environmental Scientist		16/03/2018	**Report Compiler**

Tania Oosthuizen Pr.Sci.Nat.; EAPSA Senior Environmental Scientist		23/03/2018	**Senior Reviewer**
Revised V 2			
Mavisha Nariansamy Cand.Sci.Nat. Environmental Scientist		18/10/2018	**Report Compiler**
Tania Oosthuizen Pr.Sci.Nat.; EAPSA Senior Environmental Scientist		18/10/2018	**Senior Reviewer**
CLIENT APPROVAL RECORD			
Sylvia Makoele Lead Business Partner HSE, Wessels Mine			**Approved**

1. IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

2. OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—-

  (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

  (ii) degree to which these impacts—

    (aa) can be reversed;

    (bb) may cause irreplaceable loss of resources, and

    (cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to manage, avoid or mitigate identified impacts; and

(h) identify residual risks that need to be managed and monitored.

ACRONYMS	
°C	Degrees Celsius
ABA	Acid/Base Accounting Study
ABACUS	Acid Base Accounting Cumulative Screening
AMD	Acid mine Drainage
ARS	Above the Recommended Standard
B	Boron
BID	Background Information Document
BIFs	Banded Iron Formations
CO_2	Carbon dioxide
CRR	Comment and Response Report
CSMI	Centre for Sustainability in Mining and Industry
dBA	A-weighted Decibels
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DoE	Department of Education
DRPW	Department of Roads and Public Works
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPSA	Environmental Assessment Practitioners Association of South Africa
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GG	Government Gazette
GN	Government Notice
GNR	Government Notice Regulation
H_2SO_4	Hydrogen Sulphate / Sulphuric Acid
ha	Hectares
HMM	Hotazel Manganese Mines
HSE	Health, Safety and Environment
HSEC	Health, Safety, Environment and Community
ISO	International Organization for Standardization
I&APs	Interested and Affected Parties
IWULA	Integrated Water Use License Application
km	Kilometres
km^2	square kilometres
L/s	Litres per second
LB	Lower Body
LoM	Life of Mine
m	Meters
m^2	square meters

m^3	cubic meters
MB	Middle Body
mbgl	Meters Below Ground Level
MHSA	Mine Health and Safety Act
mm	Millimetre
Mn	Manganese
MPRDA	Mineral and Petroleum Resources Development Act (No. 28 of 2002)
NAAQS	National Ambient Air Quality Standards
NEM: WA	National Environmental Management: Waste Act (Act 59 of 2008)
NEM: AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NHRA	National Heritage Resources Act (No. 25 of 1999)
NNP	Net Neutralising Potential
NPR	Neutralising Potential Ratios
NWA	National Water Act (No. 36 of 1998)
O_2	Oxygen
OHSA	Occupational Health and Safety Act
PP	Public participation
PPE	Personal Protection Equipment
PPP	Public participation Process
SANS	South African National Standards
SLP	Social and Labour Plan
SOP	Standard Operating Procedures
SWL	Static Water Level
SWMP	Stormwater Management Plan
RAU	Rand Afrikaans University
TSF	Tailings Storage Facility
U/G	Under Ground
UB	Upper Body
UJ	University of Johannesburg
VGP	Vaal Ga- Mogara Pipeline
WRD	Waste Rock Dump
WUL	Water Use Licence

EXECUTIVE SUMMARY

This project is primarily involved with the updating of the approved Environmental Management Programme (EMPr) now referred to as the Environmental Authorisation (EA) for Hotazel Manganese Mines (HMM) (Pty) Ltd Wessels Mine in Hotazel. The HMM Wessels Mine has an existing (approved as per reference NC/30/5/1/2/3/2/1/ (253) MR) Environmental Authorisation which was compiled in 2005 by Jones and Wagener (Pty) Ltd. The EA update process was initiated in 2016 and documents used to inform this report were the most recent at the time.

A pre-application meeting was held on the 13th of February 2017 at the Department of Water and Sanitation (DWS) Kimberley Regional Offices and was attended by case officer from the Department of Mineral Resources (DMR) (refer to Annexure A for attendance register and meeting minutes). Based on the outcome of the meeting, it was confirmed by the DMR case officer that only an amendment process should be followed to undertake the EA update, because this update does not consist of any material changes. A separate pre-application meeting was undertaken with the DWS and project team. The meeting minutes and attendance register is also included in Annexure A. This report contains the relevant information required for the amendment process.

Project applicant

Project applicant:	Hotazel Manganese Mines (Pty) Ltd: Wessels
Registration no (if any):	2007/004878/07
Responsible Person:	Mr Xolani Qamata: General Manager – Hotazel Manganese Mines-Wessels
Contact person:	Mr Thembani Mashamba
Physical address:	39 Melrose Boulevard, Melrose Arch
Telephone:	013 376 2705
E-mail:	Thembani.Mashamba@south32.net

Project background

The HMM Wessels Mine is an underground manganese mine near Hotazel in the Northern Cape (coordinates East 22.85566 and South: -27.11425 (WGS84)). The nearest town is Hotazel which lies 18 km towards south east. The Blackrock mining settlements is also situated adjacent to Wessels Mine site. No significant environmental features exist on the HMM Wessels Mine, because the majority of the mine concession is utilised for mining. The closest attributes to the HMM Wessels Mine are two non-perennial rivers; namely the Kuruman (13 km) and Ga-Mogara River (4.7 km) (Knight Piésold, 2017). The significant infrastructure on site is detailed in Part A, Section (d) (ii) of this document.

The significant surface infrastructure is also listed as follows:

- Stockpile areas
- Waste Rock Dumps
- Explosives Magazine
- Duck Pond/ Return Water Dam
- Tailings Storage Facility (TSF)

- Surface Wash and Screen Plant
- Ventilation Shaft
- Decline Shaft
- Sewage Plant
- Administration Blocks (training centres, laboratory, security and administration offices, hostel area, workshops, mine store etc.)
- Diesel Bay
- Oil Separator
- Load-out Station
- Eskom Sub-station
- Waste Yard.

GHT Consulting investigated the potential risk for Acid Mine Drainage (AMD); and reported their findings in a Geohydrology Report for Wessels Mine (GHT, 2017). The investigation showed that there is a low potential for Acid Mine Drainage (AMD) from leaching of the waste rock dump discards and TSF. This result was also confirmed by the kinetic geochemical modelling undertaken in the same study for the HMM Wessels Mine. The specialist investigation incorporated over 13 years of monitoring data into the kinetic model.

The risk of manganese leaching in concentrations exceeding regulatory guidelines were negligible, whilst risk of nitrate leaching exceeding regulatory guidelines is likely. The origin of nitrate enrichment within the system is suspected to be from the use of ammonium nitrate-based explosive. The use of which is restricted to the operational phase and the risk of nitrate leaching into the post-operational phase is low.

The leaching of Boron from waste rock and tailings was shown to be likely in operational and post-operational phase. The specialist investigation includes a contaminant plume model which showed that the pollution plume is localised on-site. In addition, the dewatering effects were also proven to be localised, with the aquifer regaining its natural states at 30 - 50 years post closure. Mitigation measures were proposed by the specialist's consultants and are included in this document.

The surface water specialist study (Knight Piésold, 2017) confirmed that the mining operations are of little risk to the natural aquatic eco-system due to the site's geographical distance from the nearest watercourse. The study also stated that water from the unlined TSF and Duck Pond are of poor quality but following a risk-based approach based on results from the geohydrology report (contamination plume model and Acid/Base Accounting (ABA) study results), the facility posed limited risk to the environment.

Project alternatives

The consideration of alternatives with respect to the developmental footprint and mine operations were not applicable to this update. This is due to the fact that the updating of the HMM Wessels Mine EMPr will not result in material changes to mine operation and processes.

Significant impacts

As a part of this amendment process, the impacts of the current mining activities and operations were re-assessed and ranked (according to the Knight Piésold impact rating system). Impacts, which were rated as high significance, are detailed below:

High Negative Impacts:

Extraction of ore for mining operations (during Operation, Closure and Post closure)

- The extraction of ore will cause a permanent alteration in local geology (however the bord and pillar structures will remain unchanged),
- Ore area will become highly permeable compared to original rock mass.

Site rehabilitation and reclamation (closure):

- During the closure stage, there will be a change of land use from mining activity to grazing.

Mine Closure (Closure):

- The closure of the mine (Life of Mine (LoM) is 2035) will result in a negative economic impact due to retrenchment and increase in unemployment. There will also be a negative impact on secondary economic activities (business, goods and services),
- Reduction of institutional capacity to manage social infrastructure.

High Positive Impacts:

Economic impact of job creation (Operation):

- Direct employment of workers for surface and underground mining, disposal of waste rock and tailings, mineral processing and associated support services.

Mining operations (Operation):

- Employment of workers - The operation of the mine facilitates employment, and the indirect positive impact of the generation of secondary markets. The secondary markets include service providers, contractors and other informal job creation.

Table 1: Positive and negative impacts from HMM Wessels Mine operation

Activity	Potential impact	Phase	Significance Before Mitigation	Mitigation type	Significance After Mitigation
			SP		SP
GEOLOGY					
Extraction of ore for mining operations	• Permanent alteration in local geology (the bord and pillar structures will remain unchanged) • Ore area will become highly permeable	Operation, Closure and Post closure	High (Negative)	No mitigation possible	High (Negative)

Activity	Potential impact	Phase	Significance Before Mitigation	Mitigation type	Significance After Mitigation
			SP		SP
	compared to original rock mass				
SOIL, LAND USE AND LAND CAPABILITY					
Site rehabilitation and reclamation	Change of land use from mining activity to grazing.	Closure	High (Positive)	No mitigation applicable aside from ensuring rehabilitation objectives are met.	High (Positive)
SOCIO-ECONOMIC					
Economic impact of job creation	Employment of workers for surface and underground mining, disposal of waste rock and tailings, mineral processing and associated support services	Operation	High (Positive)	Enhance positive impact by implementing Social Labour Plan (SLP)	High (Positive)
Mining operations	Employment of workers, generation of secondary economic benefits.	Operation	High (Positive)	No mitigation required, enhance through SLP	High (Positive)
Mine closure	Economic impact of retrenchment and increase in unemployment, impact on secondary economic activities (business, goods and services).	Closure	High (Negative)	Modify through alternative method: Closure Plan	High (Negative)
	Reduction of institutional capacity to manage social infrastructure.	Closure	High (Negative)	Mitigation through capacity training: Closure Plan	Moderate (Negative)

Public participation

The Public participation Process (PPP) is a requirement in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), supplemented by the Environmental Impact Assessment Regulations (2014).

The objectives of the PPP for the HMM Wessels EA updates were as follows:

- Providing information on the proposed update
- Answering questions or concerns regarding HMM Wessels Mine

- Recording the concerns of stakeholders in an objective way for inclusion in the Environmental Impact Assessment Report (EIAR).

The Public participation (PP) for the EA update consists of formal project announcement, public meeting and announcement of the Environmental Authorisation. A public meeting was held on the 07 August 2018. No external stakeholders were in attendance. No comments or concerns were received during the public meeting. Only comments from the Department of Water and Sanitation (DWS) were received during the public review period. These comments are integrated within this report.

Conclusion

An amendment process was followed due to the lack of material changes to the mining operation for the update (as per advice during the pre-application meeting). All listed activities concerned with the mining operations have already been authorised as part of the original EMPr (approved as per reference NC/30/5/1/2/3/2/1/ (253) MR). Unauthorised water uses (described in Part A (k) (ii) of this document) require authorisation in terms of the National Water Act (1998), the process of which is being undertaken in parallel with this amendment process.

Mitigation measures for mining related impacts have also been revised to improve their specificity. The mitigation measures proposed with this EA/ EMPr update is aimed at being achievable whilst still ensuring that all environmental impacts are minimised and managed. Continued implementation of monitoring programmes will also assist in reducing significant environmental impacts at HMM Wessels Mine.

Contents

Table of Figures

List of Tables

List of Annexures

ANNEXURE D	**Surface Water Study: Knight Piésold 2017**
ANNEXURE E	**Waste Classification Report: Solution H + 2017**
ANNEXURE F	**Public participation Material**
ANNEXURE G	**South 32 Wessel Closure Plan**
ANNEXURE H	**South 32 Wessels Rehabilitation Plan**
ANNEXURE I	**South 32 Wessels Service Level Agreements**
ANNEXURE J	**Draft Water Use License Technical Report**

PART A

SCOPE OF ASSSSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

This project is primarily involved with the updating of the approved Environmental Management Programme (EMPr) now referred to as the Environmental Authorisation (EA) for the Hotazel Manganese Mines (HMM) Wessels Mine in Hotazel. The HMM Wessels Mine has an existing (approved as per reference NC/30/5/1/2/3/2/1/ (253) MR) environmental authorisation which was compiled in 2005 by Jones and Wagener (Pty) Ltd.

A pre-application meeting was held on the 13th of February 2017 at the DWS Kimberley Regional Offices and was attended by the case officer from the Department of Mineral Resources (DMR) (refer to Annexure A for attendance register and meeting minutes). Based on the outcome of the meeting, it was confirmed by the DMR case officer that only an amendment process should be followed to undertake an EA update, because this update does not consist of any material changes. This report contains the relevant information required for the amendment process.

The EA process was initiated in 2016, with the report compilation beginning in late 2017. The documentation used to inform this report was the most recent at the time. However, key documents which have since been revised by HMM Wessels, were reviewed to ensure that there was no material deviation from that presented in this report.

3. Contact Person and correspondence address

a) **Details of**

i) **Details of the EAP**

Name of The Practitioner: Amelia Briel

Tel No.: 011 806 7045

Fax No. : 011 806 7111

e-mail address: abriel@knightpiesold.com

ii) **Expertise of the EAP**

(1) The qualifications of the EAP

- Environmental Assessment Practitioner SA (EAPSA)
- SACNASP Registered Professional Natural Scientist (Pr.Sci.Nat.) Reg. No.: 114335
- 2011, ISO 14001 Environmental Management Systems
- 2008, Certificate of Competence: Environmental Awareness and Legal Liability for Managers
- 2005, Certificate of Competence: Environmental Impacts and Management on Mine Sites, CSMI, Wits
- 1997: BSc (Biological Science), RAU (now the University of Johannesburg (UJ)), South Africa
- 1998, BSc (Hons) (Zoology), RAU, South Africa
- 2001, MSc (Environmental Toxicology), RAU, South Africa

The full Curricula Vita of Mrs Amelia Briel is included as Annexure B.

(2) Summary of the EAP's past experience

Amelia Briel has 15 years of experience in Environmental Management, especially within the mining and water infrastructure field. She is a certified Environmental Assessment Practitioner and a registered Professional Natural Scientist. She joined Knight Piésold after four years in the service of the Gauteng Department of Agriculture, Conservation and Environment. During this period, she dealt extensively with all aspects of environmental management, especially relating to the mining industry.

Amelia specialises in large-scale Environmental and Social Impact Assessments in various African countries and is proficient in stakeholder consultation. Project management experience at Knight Piésold includes the Neckartal Dam Project, Ethemba Dam Project, various assignments for the Kinsevere Copper Mine, Sedibelo Platinum Project, Kusile Power Station, Banro Hydroelectric Power Project, Mongbwalu Gold Project and Siguiri Gold Mine Combination Plant Project.

RELEVANT PROJECT EXPERIENCE:

Kinsevere Copper Mine, DRC: Project manager of the Environmental and Social Impact Assessment (ESIA) for Stage 2 of the Copper Mine and various follow-up assignments, including a Biodiversity Action Plan, Mine Closure Plan and closure cost model, update of the Environmental Impact Study. Project manager for the ESIA for the Primary Copper Project.

Siguiri Gold Mine, Guinea: Project manager for the environmental feasibility study and Environmental Impact Notice for the Combination Plant Project.

Ethemba Dam, Swaziland: Project manager for the remaining aspects of the feasibility study: ESIA, geotechnical investigation and Resettlement Action Plan.

Neckartal Dam, Namibia: Project manager for the Scoping process and a full Environmental and Social Impact Assessment process, including public consultation, Relocation Action Plan and Environmental Specifications.

Mutoshi Gold Project, DRC: Artisanal Mining Survey and an Environmental and Social Baseline Survey to inform the way forward for the mining company. Tasks included water quality assessment, environmental baseline, management of in-country specialists and stakeholder consultation.

Mongbwalu Gold Project, DRC: Compilation of various management plans to integrate with the mine's ISO 14001 Environmental Management System, including inter alia management plans for waste, biodiversity, heritage, soil and land use, noise, air quality and an emergency and contingency response plan. These documents comply with the DRC Mining Legislation, the Code Minier.

Sedibelo Platinum Project, South Africa: Environmental project manager for the finalisation of the EIA and EMP process and compilation of the Water Use License application. Presentations for the public participation process as well as authority liaison.

Kusile Power Station, Mpumalanga Province, South Africa: Client and authority liaison, public consultation, project management and review for the Integrated Water Use License Application.

b) Description of the property

Farm Name:	The remaining extent and Portion 1 of the farm Wessels No. 227, Portions 1 and 2 and 4 of the farm Dibiaghomo No. 226, and Portion 1 of the farm Dikgatlong 268
Application area (Ha)	149.1 ha (surface area)
Magisterial district:	John Taolo Gaetsewe District Municipality
Distance and direction from nearest town	The nearest town is Hotazel which lies 18 km towards the south east. The Blackrock mining settlement is also situated adjacent to Wessels Mine site.
21 digit Surveyor General Code for each farm portion	C04100000000022700000 - Wessels 227 -RE/227 C04100000000022700001 - Wessels 227 -1/227 C04100000000022600001- Dibiaghomo 226 -1/226 C04100000000022600002 - Dibiaghomo 226 -2/226 C04100000000022600004 - Dibiaghomo 226 -4/226 C04100000000026800001 - Dikgatlong 268 -1/268

c) Locality map

Locality map is shown in Figure 1 below.

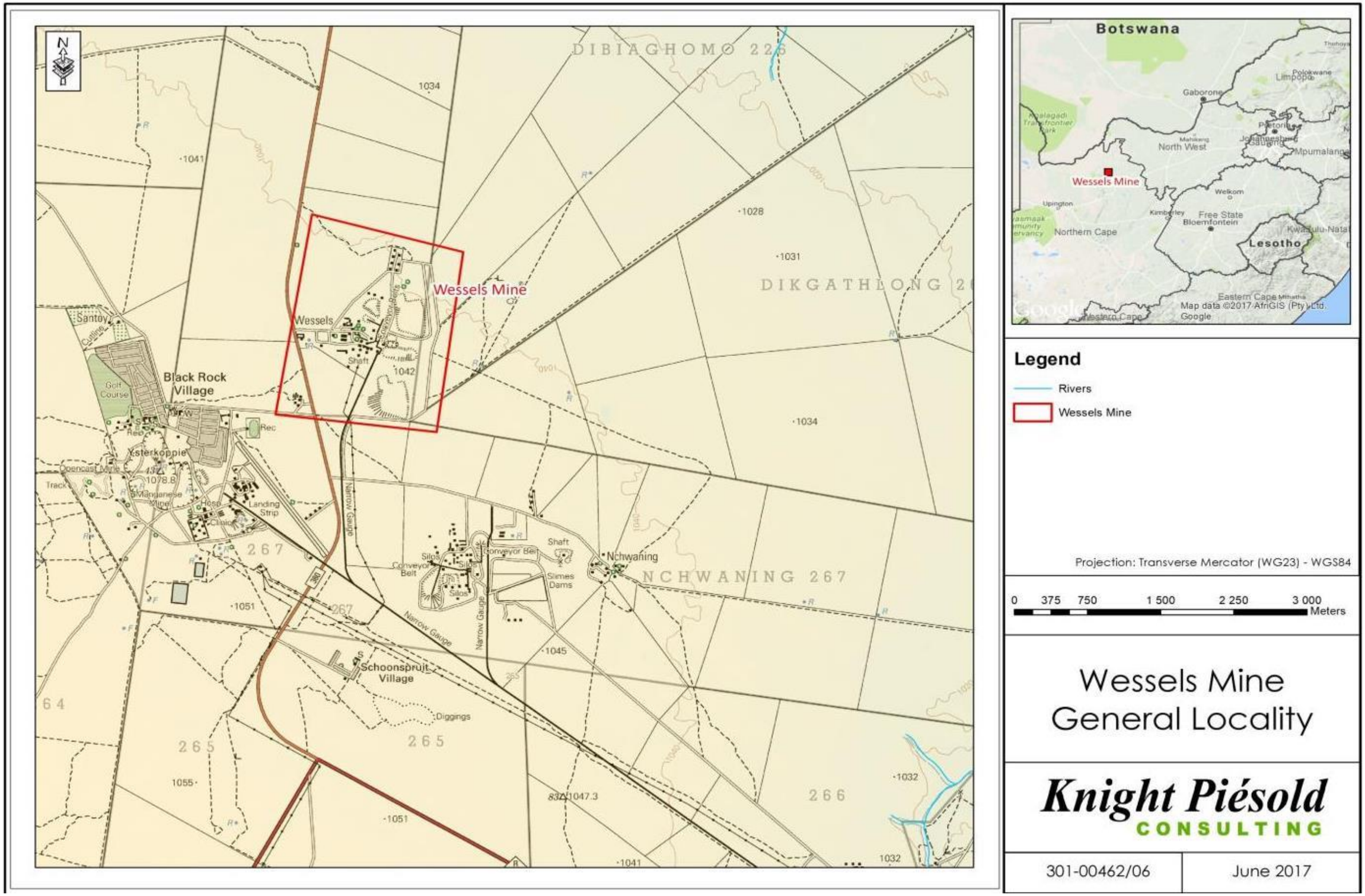


Figure 1: General locality of HMM Wessels Mine

d) Description of the scope of the proposed overall activity

This project activity is primarily involved with the updating of the approved Environmental Management Programme now referred to as EA for the HMM Wessels Mine in Hotazel. This was necessitated by the recommendations made in the performance assessment audit conducted for Wessels Environmental Management Programme in 2016. The HMM Wessels Mine has an existing (approved as per reference NC/30/5/1/2/3/2/1/ (253) MR) environmental authorisation which was compiled in 2005 by Jones and Wagener (Pty) Ltd. In addition, waste-related activities concerned with HMM Wessels mining operation has been authorised under Section 20 of the Environmental Conservation Act 1989.

The following authorised activities are undertaken at Wessels Mine (equivalent activities in the latest EIA Regulations Listing Notices):

- Listing Notice 2, Activity 17 (GN R 984): Mining activity at Wessels Mine, this includes the operation of vertical and decline shafts
- Listing Notice 2, Activity 21 (GN R 984): Operation of primary and secondary crushers
- Listing Notice 2, Activity 4 (GN R 984) and 16 (GN R 325): The development and operation of tailings dam
- Listing Notice 1, Activity 66 (GN R 983): Tailings Storage Facility footprint
- Listing Notice 1, Activity 14 (GN 983): Storage and handling of dangerous goods with container capacity of 80 m^3 but less than 500 m^3. (A diesel storage tank was authorised under NEMA EIA Regulations of 2006. The record of decision reference number is NNO 25/19).

Investigation into the project description for the Wessels Mine operations showed that some water uses were included in the approved EMPr; but have not been authorised in terms of the National Water Act (No 36 of 1998, NWA). To obtain complete compliance; it was decided that an Integrated Water Use License Applications (IWULA) under the NWA be submitted for the unauthorised water uses. The outstanding water uses which are stipulated and mentioned in the EMPr are as follows:

Section 21 (g) for the following facilities:

- Product stockpiles (North, South and Central)
- Waste Rock dump (North and South)
- Waste Rock dumped underground
- Dust suppression with water from undergrounds workings
- Oil separation facility, including evaporation ponds.

Section 21 (e) for

- Sewage plant treated effluent used for irrigation of veld, distributed by means of sprinklers

The findings of the Surface Water Study (Knight Piésold, 2017) recommended the construction of the following infrastructure as an improvement to the site's stormwater management:

- A total of 8 597 m of unlined water diversion channels will be required

- A total of 461 m of lined water diversion channels will be required
- 1 lined Sump and 3 unlined sumps will be required

As a result, the following water new water uses will be also be applied for:

Section 21 (g):

- Sump 1 collecting dirty water on site (unlined)
- Sump 2 collecting dirty water on site (lined)
- Sump 3 collecting dirty water on site (unlined)
- Sump 4 collecting dirty water on site (unlined)
- Lined diversion channels

The authorisation of these water uses will however trigger Activity 6 of Listing Notice 2 (GN 984) of the NEMA EIA Regulations of 2017. During the pre-application it was confirmed by the DMR, that only an amendment process should be followed to undertake an EA update. This is because this update does not consist of any material changes. DMR Case Officer also indicated that because no formal process has been established regarding the EA (EMPr update under the DMR); no application fee is required at this stage.

The project comprised of public participation (as stipulated in by Regulation 41(2) of GN R 982) and included the following specialist studies:

- Waste Classification and geochemistry study
- Surface water study
- Groundwater study.

During the pre-application meeting, it was confirmed by the DMR representative that no further specialist studies will be required due to the fact that no changes to the mine operation and activity has occurred, and that all activities have been included in the original authorisation for the mine. An application for the outstanding water uses will be undertaken in conjunction with the EA amendment process and will be lodged to the DWS Kimberley offices. A pre-application meeting for the outstanding water uses was undertaken on the 01 October 2018 where further recommendations regarding the WUL process was given (See Annexure A for meeting minutes and attendance register). The final EIAR will contain impacts and mitigation measures, as well as an updated EMPr.

i) **Listed and specified activities**

NAME OF ACTIVITY (All activities including activities not listed)	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE (GNR 544, GNR 545 or GNR 546)/NOT LISTED
Mining activity at Wessels Mine (including the construction and operation of vertical and decline shafts)	149.1 ha	x	Listing Notice 2, Activity 17 (GN R 984)
Operation of primary and secondary crushers	Included within the mining footprint area (i.e. 149.1ha)	x	Listing Notice 2, Activity 21 (GN R 984)
The development and operation of TSF	15.49 ha	x	Listing Notice 2, Activity 4 and 16 (GN R 984)
A diesel storage tank	0.0606 ha	x	Authorised under NEMA EIA Regulations of 2006 (Listing Notice 1, Activity 7)
Water storage dam (duck pond)	0.58 ha	x	Listing Notice 1, Activity 13 (GN R 983)
Storage of water underground	Various individual areas, overall mining right area (underground) is 1 068.59 ha	N/A	N/A
Stockpile construction and operation (North, West and Central)	North - 4.85ha West - 1.63 ha South - 40.99 ha	x	Listing Notice 2, Activity 19 (GN R 984)
Sewage Treatment Works	0.16 ha	x	Listing Notice 1, Activity 25 (GN R 983)
Blasting (Explosives Magazine)	2.84 ha	N/A	N/A
Boreholes	Included within the mining footprint area (i.e. 149.1ha)	N/A	N/A
Loading, hauling and transport	Included within the mining footprint area (i.e. 149.1ha)	N/A	N/A
Administration offices	Included within the mining footprint area (i.e.149.1ha)	N/A	N/A
Workshops	Included within the mining footprint area (i.e. 149.1ha)	N/A	N/A
Waste Rock Dumps	7.2 ha	x	Listing Notice 2, Activity 19 (GN R 984)
Evaporation Ponds	0.15 ha	x	Listing Notice 2, Activity 6 (GN R 984)

(Sewage and Oil separation)			
The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or license, in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent	Various areas around the mine concession	X	Listing Notice 2, Activity 6 (GN R 984)

ii) Description of the activities to be undertaken

Wessels Mine is situated approximately 15 kilometres northwest of Hotazel and 80 kilometres from the town of Kuruman in the Northern Cape Province of South Africa. Nchwaning Mine borders the Wessels Mine lease area to the south.

- Life of Mine

The mine was officially opened on 2 May 1973 and has been operational ever since. The life of mine for HMM Wessels Mine is anticipated to last through to 2035.

- Infrastructure
    - Surface Infrastructure

Existing structures are mainly mining related and include residential building, industrial buildings, dumps, power lines and roads. All surface disturbances due to Wessels mining activities extend over an area of 149.1 ha, with the TSF disturbance being 15.49 ha. The mine infrastructure already exists and is close to the vertical shaft. The figure below (Figure 2) indicates the surface infrastructure associated with the mining operation.

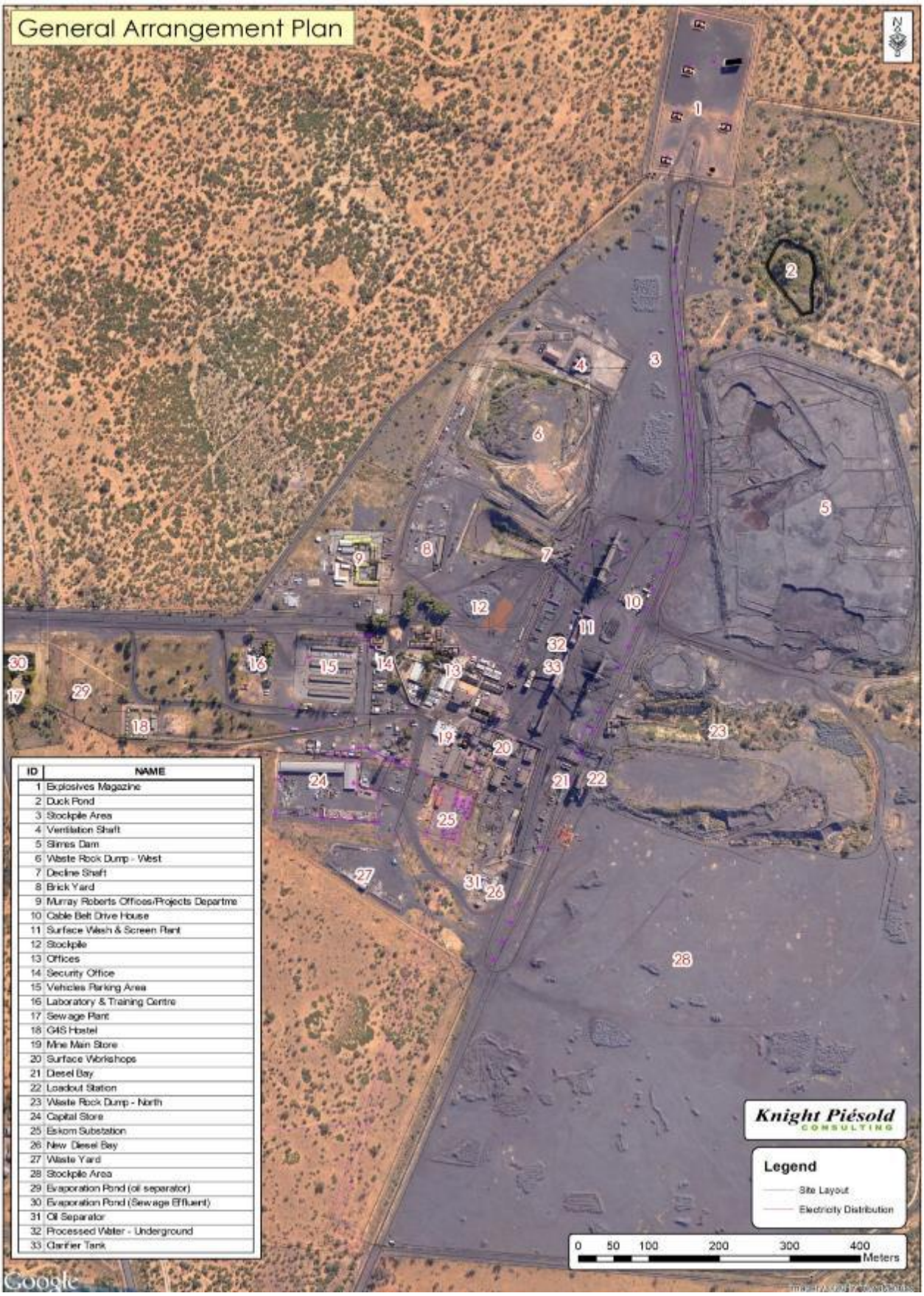


Figure 2: General arrangement map of HMM Wessels Mine showing surface infrastructure

- Mining method

Wessels Mine is a trackless bord and pillar underground mine operating at a depth of approximately 300 m below surface. Currently two areas of mineralisation are being mined. One vertical and two decline shafts access the mineralisation. Hydraulic twin boom drilling machines undertakes drilling. Blasting takes place at the end of shift, using a mixture of emulsion and sensitizer, with electronic detonators to obtain a face advance of approximately 2, 65 meters for each blast. The cleaning crew uses rubber wheeled loaders to load 25-ton haulers with ore. The haulers transport the ore to tipping points where the ore passes through a primary crusher and after some conveyor transportation is stored in silos underground until it is hoisted to surface by means of a continuous cable belt conveyor.

Once on surface, the ore passes through a screening and washing plant. The washing plant produces material from 150 micron down. The material is then stockpiled for loading on to the railing system. Orders are generally received for specific ore, which is then selectively loaded on to Transnet trucks. The market tends to be both inland and for export.

- Tailings Storage Facility (TSF)

The tailings is pumped from the surface plant to the TSF with pumps and pipes. The footprint area of the TSF is 154 990 m^2 or 15.49 ha with a height of 4.5 m. On the TSF, a single pipe feeds an identified deposition area on a specific day or time. This also controls pool position. The movement of the pool area is controlled by the deposition point, which means the deposition point will be placed according to the pool area. The current maximum tailings deposition rate is 10 658 tonnes / month.

The hand-packed walls form the outer perimeter of the two compartments and are packed and raised by the use of general hand tools and equipment (e.g. shovels, rakes and picks). The wall is built by using dry sludge from within the facility itself from where deposition of sludge takes place. The hand-packed wall is built in a manner to always ensure a freeboard of 0.8 m, for the containment of sludge within the facility and one-meter wide walkway surface for safe access. The penstock is used for the decanting of storm- and excess process water from the facility by making use of the platform, lift-master and concrete rings neatly stacked on top of one another. Decanted water flows from the penstock, by means of gravity, within a system of outfall piping and manholes to the duck pond area. Paddocks have been constructed on the TSF to prevent runoff and erosion from the TSF from encroaching into the surrounding bush. The penstock is not currently being utilised, as excess water is being pumped directly to the duck pond. The TSF has no provision for under drainage. The settled tailings are removed from the TSF and stockpiled to dry. They are then loaded onto vehicles for transport to various markets as a product.

The tailing facility has been operational since the establishment of the Wessels Mine in 1973. There are currently no records available for the initial design of the deposits. However, the design below was created and adopted by site to manage the facility in the future (BHP Billiton - Mandatory Code of Practice for Mine Residue Deposits, 2011).

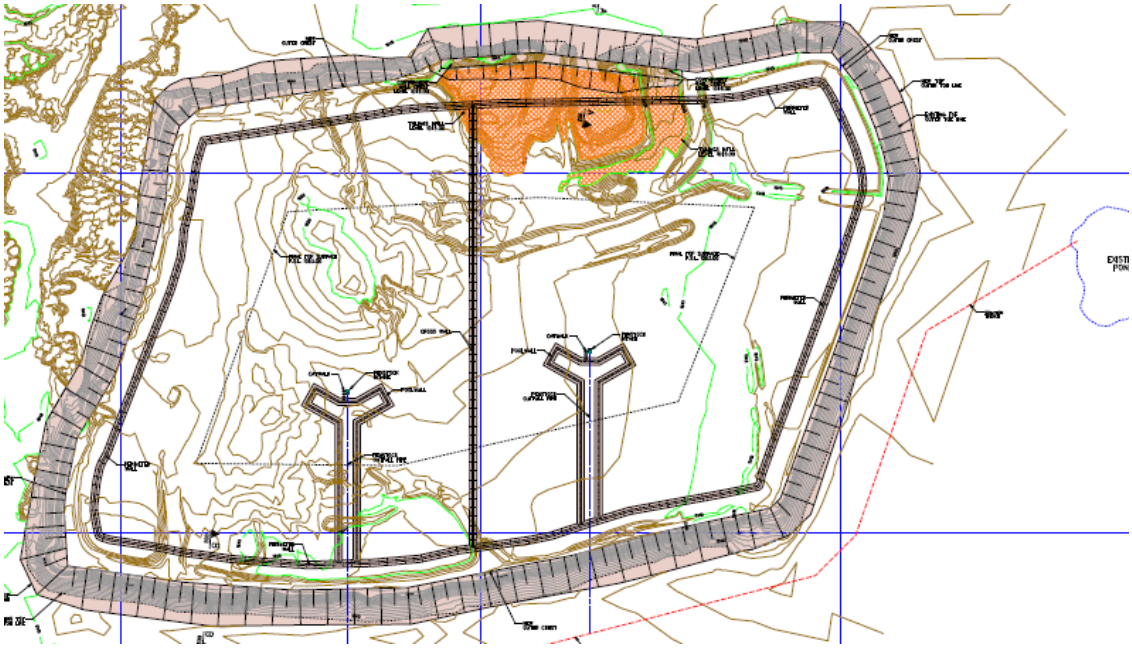


Figure 3: Wessels Mines TSF design (BHP Billiton: Mandatory Code of Practice for Mine Residue Deposits, 2011)

- Waste Rock Dumps (WRDs)

Two waste dumps (North and South dump) are employed for the disposal of waste rock brought to the surface. These two waste dumps were mainly used during the construction of the decline shaft and underground crusher chambers. However, the quantity of rock brought to surface is limited to a large extent by the dumping of waste rock in mined out areas underground. The current average height of these dumps is 10 m and covers an area of 7.2 ha. The composition of the two waste rock dumps consists of limestone, calcrete, gravel, tillite, Mapedi shale (largest component), low grade manganese ore, banded ironstone and limited lava's from the Ongeluk Formation. The stockpiles of Aeolian sand are considered to be largely inert and the dolomitic calcrete represents a low risk to water quality. The WRDs also contain low and economic grade manganese ore.

- Acid Mine Drainage (AMD)

GHT Consulting (2017) investigated the potential for AMD from the TSF and waste rock discards. The methodology and key findings of the assessment are detailed in **Part A (k) (i)** and **Part B (1) (d) (iii – v)**. Please refer to Annexure C for the full geohydrological study.

- Stockpiles

The following product stockpile areas are being used by the mine:

- Main stockpile area (South Stockpile area 42.23 ha)

- North product stockpile (4.11 ha)
- Central Stockpile area (9.95 ha).

- Duck Pond

The duck pond is an unlined earth dam located to the north east of the site adjacent to the TSF. The duck pond is used as a dirty water management system with excess water and stormwater from the TSF being pumped directly to the duck pond. The duck pond also receives contaminated water from the underground workings.

- Water management infrastructure

Potable Water: The Vaal Ga- Mogara Pipeline (VGP) supplies Wessels Mine with potable water for domestic use and consumption purposes. The potable water is pumped from the VGP through a diversion pipeline to Wessels Mine. At Wessels Mine, the diversion pipeline splits into two pipelines. One pipeline diverts potable water to the Hostel Reservoir and the other pipeline diverts the water to the Main Reservoir. Wessels Mine utilises on average 6 930 m^3/month of potable water.

From the Hostel Reservoir the potable water is pumped to the Softener plant at the Hostel. The softener plant at the Hostel is defunct and will (likely) never be used again; therefore, the water is just bypassed at the plant. Thereafter, the water is pumped to the change house at the Hostel where it is used for washing purposes. From the change house, the water is pumped to the Main Sewage Plant near the tar road (R31). The treated sewage effluent is evaporated.

From the Main Reservoir the potable water is pumped to the softener plant next to the Main Reservoir. The softener is not functioning at the current time. From the softener plant, the water is pumped to the Softener Reservoir. The Softener Reservoir is the main dispensing point from which the following water usage sites are supplied:

- Hoist Cooler
- Compressor Cooler
- Cable Belt
- Surface Plant. From the Surface Plant of Wessels Mine the water is pumped to the Thickener. From the Thickener the water is pumped to the TSF and then water flows into the duck pond
- Surface Workshop. From the Surface Workshop the water that has been used for washing is drained to the surface oil skimmer. The treated oil skimmer effluent is pumped to the Wessels Main Sewage Plant

From the Change House the water is pumped to the Sewage Plant near the Surface Plant. From there the sewage water is pumped to the Main Sewage Plant near the tar road (R31). Potable water from the VGP is also used for dust suppression and drinking water to Wessels Underground Sections.

Recycling of Process Water: Raw water derived from the underground workings (U/G) is pumped to the surface and utilised as process water for the plant, dust suppression, and TSF operations. Wessels Mine pumps on average 23 915 m^3/month of raw water from the underground workings. The process water is thereafter pumped to the TSF as a slurry with the fines.

At the vent shafts, groundwater seepage from the TSF is being pumped to the surface reservoir for the U/G water storage. The seepage water is also partly captured by the mine decline. Therefore, the seepage from the aquifer, TSF, decline, vent shafts and underground workings is circulated through pumping of seepage water from the U/G workings to the surface. This raw water is used as process water at the plant and is thereafter disposed of at the TSF. Dewatering is only experienced locally at the vent shafts in the receiving aquifer.

- Services

Roads, railways and electricity: The R31 from Kuruman to Hotazel is tarred. At Wessels Mine, this road becomes a drift road to Van Sylsrus some 116 km north-west of Hotazel. The R380 from Hotazel to Wessels is tarred although the tarred section ends at the entrance to Wessels Mine. This road continues northwards to McCathysrus as a gravel road. All other roads around Wessels mine are classified as secondary roads or farm tracks. These roads all fall under the jurisdiction of the provincial administration.

The nearest official railway station is located at Hotazel. This is used mainly for the shunting and storing of manganese ore railway trucks. From Hotazel to Wessels mine, the railway line is privately owned as a joint venture.

Eskom supplies electrical power to the mine at 22 kv. These power lines traverse the mine property as an overhead system. One system brings power to the mine substation while another continues through the mine property to the north.

Sanitation: There is a sewage works at Wessels Mine at the corner of the main road (Route 31) and the entrance to the mine. The works are permitted in terms of the National Water Act, Act 36 of 1998 for water usage and treatment. The sewage works receives effluent from the ablution facilities as well as the effluent from the surface, oil skimmer plant. The wastewater is aerated and finally chlorinated prior to evaporation in dedicated lined evaporation ponds. The treated effluent is irrigated into the adjacent veld by means of sprinklers. The capacity of the sewage treatment works is 350 m^3 per day and handles an average of 250m^3 per day. There is 6 m^3 of dried sludge generated per annum, buried on site, next to the sewer.

- Waste Management
    - Waste Classification Study

Solution H undertook the waste type assessment and waste classification study [+], the results are presented in this section.

A total of nine waste streams emanating from the Wessels Mine was analysed in terms of the National Environmental Management: Waste Amendment Act (26 of 2014) (NEMWAA) and regulations. The objective was to determine the requirements for safe and environmentally responsible placement and stockpiling, particularly to safeguard local water resources.

The approach to the waste type assessment and classification included; obtaining samples, laboratory analysis of the samples according to methods and procedures specified in the NEMWAA regulations, and interpretation of the results. Composite samples for the following 9 waste streams were analysed:

- Rock dump West: not homogenous
- Rock dump North: not homogenous
- Tailing Storage Facility (TSF) (material referred to as slimes in specialist waste classification study)
- Note that the fine fractions are removed from the TSF and dried. This material is considered product and sold as such.
- Product stockpiles
- Sewage sludge
- Hazardous waste that is taken to Holfontein:
    - Sludge from workshops
    - Sludge from oil separators
    - Hydrocarbon contaminated soil
    - Hydrocarbon contaminated water

Waste classification: The waste streams were classified in accordance with SANS 10234 South African National Standard Globally Harmonized System of Classification and Labelling of Chemicals (GHS) as required in terms of GNR 634 of the NEMWAA. Analysis of the waste streams for the purpose of waste classification has been limited to that required for the waste type assessment. The results of the waste classification are shown below.

Table 2: Results of Waste classification of nine waste streams at Wessels Mine (Solution H [+], 2017)

No	Sample	Classification (SANS 10234)
1	Workshop sludge	Not hazardous
2	Contaminated soil	Not hazardous
3	Product	Not hazardous
4	Waste rock dump North	Not hazardous
5	Waste rock dump West	Not hazardous
6	Tailings	Not hazardous
7	SOP spill kit	Not hazardous

No	Sample	Classification (SANS 10234)
8	Sewage plant sludge	Hazardous unless proven otherwise (potential toxicity to aquatic life will require further testing)
9	Hydrocarbon contaminated water from the oil separator at the workshop	Not hazardous

Waste type assessment: NEMWAA Regulation 635 requires that the waste type be assessed as follows:

- Identify chemical substances present in the waste
- Analyse the waste to determine total concentrations (TCs) and leachable concentrations (LCs) of elements and chemical substances in the waste
- Compare the TCs and LCs to threshold limits specified in R635 to determine the waste type.

Table 3: Results of Waste Type Assessment of nine waste streams at HMM Wessels Mine (Solution H [+], 2017)

No	Sample	Waste type (Regulation 635 of NEMWAA)	Parameter(s) exceeding TCT or LCT
1	Workshop sludge	Type 1A	Total Mn and Se
2	Contaminated soil	Type 1A	Total Mn and Se
3	Product	Type 1A	Total Mn and Se
4	Waste rock dump North	Type 1A	Total Mn
5	Waste rock dump West	Type 1A	Total Mn
6	Tailings	Type 1A	Total Mn and Se
7	SOP spill kit	Type 0	Diesel range organics (C10-C36)
8	Sewage plant sludge	Type 1	Total Mn and Hg
9	Water sample from the oil separator at the workshop	not applicable	

Notes:
[A] In terms of Section 7(4) of Regulation 635, a Type 0 waste is Type 1 if leachable concentrations are lower than LCT3

The findings of the waste classification and waste type assessment are based on analyses of single samples that are assumed representative of the material. For heterogeneous material, it may be difficult to obtain a representative sample. In such cases, it may be necessary to conduct analysis on several samples to clarify the potential variation in concentration.

Based on the assessment conducted by Solution H [+], the following conclusions are stated:

- All samples except Sample 8 (sewage plant sludge) are classified as non-hazardous in terms of SANS 10234. This applies to potential environmental, human health, and safety issues associated with transport, handling, and storage of waste. It does not change the NEMWAA classification of mining waste as "hazardous".

- All samples except Sample 7 (SOP spill kit) and Sample 9 (water from the workshop oil separator) are waste Type 1. Sample 7 is waste Type 0 and Sample 9 is not applicable for classification under Regulation 635.
- Regulation 632 makes provision for a risk analysis to determine appropriate management and mitigation measures to prevent water quality impacts from stockpiled mine residue material. Considering that leachable Mn and Se are low (Samples 1, 2 and 5) or non-detectable (Samples 3, 4, 5, and 6), the potential risk to water resources from these mineral residues is likely to be low and suggests that even the Type 1 category for these materials may overstate their environmental risk. The Wessels area is characterised by elevated background Mn and the generally arid climate reduces the potential for seepage from tailings and waste rock. The Environmental Assessment Practitioner (EAP) may wish to evaluate the potential impact of waste facilities represented by Samples 3, 4, 5 and 6 in this context.
- Similarly, Samples 1, 2 and 7 contain hydrocarbon contamination, which is readily treatable through land farming. The leachable Mn and Se are low or non-detect, which suggests that, once the hydrocarbon contamination is reduced to acceptable levels, the waste facilities represented by Samples 1, 2 and 7 are likely to pose a low risk to water resources. Therefore, the EAP may wish to evaluate the potential impact of these materials in this context.
- According to Regulation 636, Sample 8 (sewage plant sludge) must be disposed of in a facility that complies with Class A landfill requirements (Figure 4).

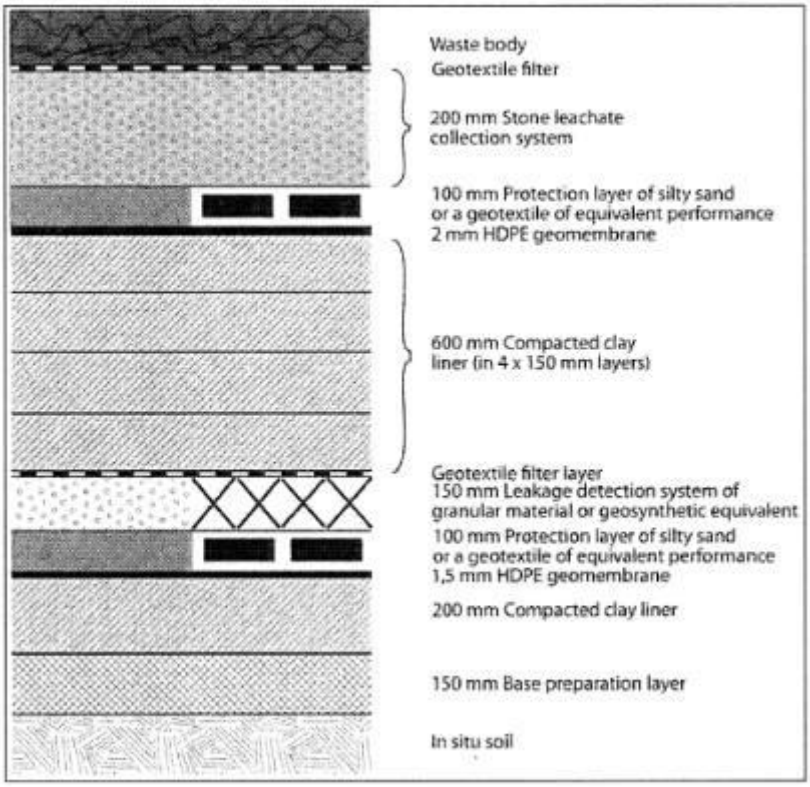


Figure 4: Class A containment barrier (from Regulation 636 of NEMWAA)

Based on the waste classification and waste type assessment, Solution H [+] made the following recommendations:

- South32 Wessels Mine (or appointed Environmental Assessment Practitioner) should engage with the environmental authorities to point out the low risk to water resources presented by tailings, waste rock, and product stockpiles. This may support alternative waste management strategies to the liner systems described in Regulation 636.
- South32 Wessels Mine should consider treating the workshop sludge, contaminated soil, and SOP spill kit material through land farming. The material waste type will need to be reassessed after the treatment.
- Sewage plant sludge should be disposed of in a Class A landfill. Alternatively, the sludge should be treated to reduce total Mn and Hg concentrations. The material waste type will need to be reassessed after the treatment.

- Industrial Waste

All industrial and hazardous waste is disposed of according to the South32 waste management procedure. The various wastes are discarded as follows:

- Rubber waste such as conveyor belts are collected by a contractor. Old tyres are stored on site and require a permit if it exceeds 500 m^2
- Scrap metal is collected by Gamagara Scrap Metal and recycled off site
- Medical waste is taken off site by Compass Waste and incinerated
- Hazardous waste, such as used oil, is taken off site by a contractor and disposed of at Holfontein Landfill, a hazardous landfill site. An average of 2.31 tonnes of hazardous waste is discarded monthly.

- Domestic Waste

Domestic waste generated on site is collected in waste bins operated by Interwaste. The waste is taken to a registered landfill in Hotazel. A mean monthly average of 9.83 tonnes of general waste is removed from site.

HMM Wessels Mine has procured the services of sub-contractors to manage and collect different types of waste. These include general and industrial waste, oil removal and scrap metals; copies of the service level agreement are included in Annexure I.

e) Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
The Constitution of South Africa (No. 108 of 1996) Section 24 of the Constitution provides that everyone has the right to an	To give effect to Section 24 of the Constitution, an application for environmental	The environmental management objective of the Wessels Mine is to

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – i. Prevent pollution and ecological degradation i. Promote conservation i. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.	authorisation is being made in terms of legislative requirements. The EA update process. Chapter 2 relates to the Bill of Rights.	ensure that the impacts of mining activities and associated infrastructure are avoided or minimised.
Minerals and Petroleum Resources Development Act, (No. 28 of 2002) In terms of Section 43 of the MPRDA, the holder of a prospecting right, mining right, retention permit or mining permit remains responsible for any environmental liability, pollution or ecological degradation, and the management thereof, until the Minister has issued a closure certificate to the holder concerned.	This application is in line with an existing mining right. All matters relating to any amendment or change to the facilities on this property must be authorised in accordance with the requirements of this Act.	The EA update has been compiled in accordance to the NEMA regulations.
National Environmental Management Act (No. 107 of 1998) The NEMA, as amended was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.*	NEMA principles were considered during the environmental application process.	This EA has been compiled in accordance with the requirements of the NEMA EIA Regulations (2014).

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
Environmental Impact Assessment Regulations as Amended, GN No. 326 of April 2017	The EIA regulations were applied in Part A (i).	This document is an application for amendment of the Environmental Authorisation in terms of Regulation.
GNR 1147 (November 2015) of NEMA (Act No. 107 Of 1998): Regulations Pertaining to The Financial Provision For Prospecting, Exploration, Mining or Production Operations. *"The purpose of these Regulations is to regulate the determine and making of financial provision as contemplated in the Act for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual Environmental impacts that may become known in the future"*	The mine has complied with the requirements of GNR 1147 and submitted their financial provisioning to the relevant authority.	Mitigation and management measures recommended as part of the rehabilitation plan. Determination of financial provisioning for annual rehabilitation, rehabilitation upon closure and costs associated with latent and residual impacts post closure.
National Water Act (No. 36 of 1998) The NWA provides for fundamental reform of the law relating to water resources, where the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users. Specific water use of concern includes disposing of waste in a manner which may detrimentally impact on a water resource. The purpose of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account - (i) meeting the basic human needs of present and future generations; (ii) promoting equitable access to water; (iii) redressing the results of past racial and gender discrimination;	A groundwater study was undertaken to determine the groundwater conditions and possible impacts. Specialist input incorporated into EA and specialist report attached as annexure.	Wessels Mine has an existing Water Use Licence (WUL), however is in the process of applying for the following new water uses: • S 21 (g) – disposing of waste in a manner which may detrimentally impact on a water resources • S 21 (e) – engaging in a controlled activity identified as such in section 37 (1) or declared under section 38 (1)

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
(iv) promoting the efficient, sustainable and beneficial use of water in the public interest; (v) facilitating social and economic development; (vi) providing for growing demand for water use; (vii) protecting aquatic and associated ecosystems and their biological diversity; (viii) reducing and preventing pollution and degradation of water resources; (ix) meeting international obligations; (x) promoting dam safety; (xi) managing floods and droughts, and (xii) for achieving this purpose, to establish suitable institutions and to ensure that they have appropriate community, racial and gender representation. Chapter 4 of the NWA requires the licensing of a variety of activities concerning water uses which is captured in Section 21 and includes; (a) taking water from a water resource; (b) storing water; (c) impeding or diverting the flow of water in a watercourse; (d) engaging in a stream flow reduction activity contemplated in section 36; (e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1); (f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; (g) disposing of waste in a manner which may detrimentally impact on a water resource; (h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process; (i) altering the bed, banks, course or characteristics of a watercourse; (j) removing, discharging or disposing of water found underground if it is	A Water Use Licence (WUL) application process for the outstanding water uses not authorised has been commissioned. An update of the IWWMP is in process. The guidelines and regulations were utilised in the development of a Stormwater Management Plan (SWMP), and to ensure the separation of clean and dirty water. Specialist study impact and findings were incorporated into the EA and attached as Annexure D.	

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
necessary for the efficient continuation of an activity or for the safety of people; and (k) using water for recreational purposes. **Government Notice No 704 (Government Gazette 20119 of February 2010) : Regulation on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources**		
The National Heritage Resources Act (No. 25 of 1999) The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources Agency's in this case the South African Heritage Resources Agency (SAHRA), be notified as early as possible of any developments that may exceed certain minimum thresholds.	No cultural significant sites or graves were located within the project area. A specialist study was undertaken previously.	Not Applicable.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA) According to the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA) the Department of Environmental Affairs (DEA), the provincial environmental departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM: AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM: AQA is the establishment of National Ambient Air Quality Standards (NAAQS). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.	The proposed construction, operation and closure of the facility may result in activities that may cause atmospheric emissions, which could impact on the receiving environment	The mitigation and management measures to be implemented as part of the project aim to manage and prevent potential impacts on air quality.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. This Act works in accordance to the framework set under NEMA. The following regulations which have been promulgated in terms of the NEM: BA are also of relevance: • Alien and Invasive Species Lists, 2014 published (GN R.599 in GG 37886 of 1 August 2014) ; • National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations (GN 388); • National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN R.1002, 9 December 2011).	As the mine is operational the mine has established management plans to minimise the impact of any activities on biodiversity.	The EIAR has been compiled in accordance with the requirements of the NEMA EIA Regulations (2014) and the Amendments to the EIA Regulations (GN No 326 of April 2017). The mitigation and management measures to be implemented as part of the project aim to manage and conserve biological diversity, as well as to minimise alien invasive species.
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHSA) To provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith.	The OHSA has been taken into consideration during the development of the project (all phases).	Wessels internal Safety, Health, Environment and Quality guidelines and standards have been considered as part of the EA.
Mine Health and Safety Act, 1996 (MHSA).	The MHSA has been taken into consideration	Wessels internal Safety, Health,

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
To provide for protection of the health and safety of employees and other persons at the mines.	during the development of the project.	Environment and Quality guidelines and standards have been considered as part of the EA.
National Environmental Management: Waste Act, Act 59 of 2008 (NEM: WA) The NEMA and the EIA Regulations and associated Listed Activities identified under Regulations 982, 983, 984 and 985 (as amended by, GN 326, GN 327, GN 325 and GN 324 of April 2017), are the key national legislation underpinning Environmental Authorisations in South Africa. The Department of Mineral Resources (DMR) is the Competent Authority for mining-related applications in terms of NEMA. The DMR, along with the Department of Environmental Affairs (DEA), will consider the National Environmental Management: Waste Act (NEM: WA), including GN R632 (July 2015) pertaining to the regulations regarding the planning and management of residue stockpiles and residue deposits as well as applicable norms and standards.	NEMA, NEM: WA and associated activities are directly relevant to this authorisation application. Waste classification report was completed by a specialist in accordance to the regulations. Specialist study in Annexure E.	The mitigation and management measures to be implemented aim to manage and prevent potential impacts associated with waste management and disposal.

f) **Need and desirability of the proposed activities.**

South African manganese (Mn) operations are situated at Hotazel in the Northern Cape, which has the world's largest known deposits of manganese ore (over 70 % of the world's Mn supply originates from the Kalahari Desert), according to Montabert (2017). Approximately 90% of all manganese consumed annually goes into steel as an alloying element. The balance is consumed in other applications such as chemical production, batteries and alloys such as aluminium alloys), according to Montabert (2017). The main uses are in industrial and metallurgical applications such as batteries and chemicals, according to Montabert (2017). The mining of Mn ore contributes significantly to the GDP of the country by exports and workforce employment. Due to the fixed location of the ore body, mining operations are required to continue at the current site until 2035 (expected Life of Mine (LoM)).

The Hotazel Manganese Mine (HMM) Wessels Mine is an existing facility which has been operational since 1973 within the Hotazel area. The mine provides support to the surrounding community by providing employment to a total number of 913 people and 1 304 contractors (as of 27/10/2016). The mine also contributes to the economic development of the community by the implementation of various community projects. The Social and Labour Plan (SLP) for Hotazel Manganese Mines (FY 16) showed that the Mine Community Development Fund reached 41 303 beneficiaries and created 201 job opportunities. The mining operations are currently desirable because they provide a platform for community enrichment.

This proposed project is concerned with the administrative update of the HMM Wessels EMPr, to improve the applicability of the EMPr to suit the current mining operations. The update is also focussed on updating impacts and mitigation measures to ensure that all environmental and social impacts are minimised as far as possible. In addition, the proposed update of the EMPr will also aim to improve the readability of the document. The proposed update will not involve any material changes to the current mining operations and no changes are envisioned in the future. An updated EMPr will provide the mine with a user-friendly document, which is easily implementable and satisfies the requirements of Appendix 4 of the 2014 EIA Regulations (GN 982, as amended by GN 326).

g) **Motivation for the preferred development footprint within the approved site including a full description of the process followed to reach the proposed development footprint within the approved site.**

The HMM Wessels Mine is an existing facility, acquired during the period of 1959 to 1987. All operations and mining processes at the mine has remained the same since the conversion of the original mining lease to a Mining Right in 2005. This proposed update of the HMM Wessels Environmental Management Programme (EMPr) (referred to as EA update hereon) is concerned with administrative changes only.

The project does not include any material changes to the mining operations and therefore no changes in the development footprint will occur. In addition, new infrastructure development is not envisioned at HMM Wessels Mine in the near future. Please refer to Figure 2, which depicts the surface layout map for the site.

i) Details of the development footprint alternatives considered

The consideration of alternatives with respect to the developmental footprint was not applicable to this EA update. This is because no changes in the foot print will occur because of updating the HMM Wessels Mine EA.

ii) Details of the Public participation Process Followed

The Public participation Process (PPP) is a requirement in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), supplemented by the Amendments to the Environmental Impact Assessment Regulations (2017). The PPP plays an integral role in informing Interested and Affected Parties (I&APs) as well as the organs of state; of a proposed project/activity. This entails the disclosure of all pertinent information to I&APs to aid in the decision-making process. In addition, the PPP allows for I&APs to contribute local knowledge and raise comments that may be related to project planning and design. Knight Piésold was appointed to conduct the PPP for the HMM Wessels Mine EA update in accordance to the PPP as stipulated by Regulation 41(2) of GNR 982 (2014).

The objectives of the PPP for the HMM Wessels EA updates were as follows:

- Providing information on the proposed update of the HMM Wessels Mine EA
- Answering questions or concerns regarding HMM Wessels Mine
- Recording the concerns of stakeholders in an objective way for inclusion in the Environmental Impact Assessment Report (EIAR).

The Public participation (PP) for the EA update consists of three phases, namely:

1. Formal project announcement
2. Public review of the application documentation and Public meeting
3. Announcement of the Environmental Authorisation.

The activities undertaken during each phase are detailed below. All comments received from I&APs during the PPP were included in this EIAR document.

1. Public announcement

- Identification of stakeholders

The stakeholders interested in or affected by the proposed EA update for HMM Wessels Mine were identified by the methods indicated below:

- Use of an existing stakeholder database compiled by HMM
- Responses on the distribution of the BID, site notices or newspaper advertisement placed
- Attendance at public meeting.

Stakeholders for the proposed project includes neighbouring landowners; district and local municipality personnel; senior traditional leaders; national departments; non-governmental organisations; schools; Northern Cape Mining Sector Forum and community forums. The database has been continuously updated throughout the project lifecycle.

- *Public participation Material*: All public participation material is contained in Annexure F.

Site Notices: Site notices contained information on the nature of the activity, the application process, as well as details of the EAP. It provided details on how to provide comment and be registered as an I&AP. The site notices were placed in areas where the public had full accessibility. An example of the site notices is shown in Annexure F.

Background Information Document (BID): A BID was prepared for I&APs to provide a brief description of the proposed project activity, information regarding the applicable legislation and process which will be followed, as well as the details of the EAP. The BID was accompanied by an I&AP Registration and Comment Form for stakeholders to use for formal registration or to submit comments. Examples of the BID documents which were distributed are given in Annexure F.

Newspaper advertisement: A single advertisement was placed in the Kathu Gazette and the Kalahari Bulletin on the 07 July 2018 and 05 July 2018 respectively, in line with Regulation 41(2) of GNR 982 (Environmental Impact Assessment Regulations as Amended, GN No. 326 of April 2017). The advertisements were placed in English. During the above-mentioned pre-application meeting held at Kimberley on the 13th February 2017, DMR representative indicated that the placing of one round of advertisement placement would suffice. The newspaper advertisement contained information on the nature of the activity, the application process, as well as details of the EAP. It provided details on how to provide comment and be registered as an I&AP. The details date and location of the public meeting were also included (see Annexure F).

Maps: Maps illustrating the location of the mine and proposed activities were displayed at the public meeting to provide context to I&APs.

The comment period for the HMM Wessels EIAR was 30 days from 1 June 2018 – 5 July 2018. The EIAR was available for review during this time at the Hotazel Library and the Hotazel Recreation Club in Hotazel, Northern Cape. The draft EIAR was also accessible on www.knightpiesold.com/Wessels. During the 30-day comment period, engagement with I&APs was undertaken by means of telephonic consultations and e-mail communication. After the 30-day comment period lapsed, all comments and concerns were collated into this EIAR document. Photographic proof taken of the Draft EIAR document on display at the Hotazel Rec Club and Hotazel Library is shown in Annexure F.

2. Public Meeting

Because there is a lack of material changes in terms of mine operations and processes, it was envisioned that only one public meeting would suffice for this project. It was confirmed by authorities during the pre-application meeting (held on 13th February 2017) that one public meeting would be adequate for the purposes of this application.

The public meeting took place at the Hotazel Recreation Club on the 07 August 2018 at 11:00 am. The meeting was attended by South32 employees, GHT geohydrology Consultants and Knight Piésold. No external parties were in attendance (community members, adjacent landowners, governmental organization or Non-profit organizations). As such no comments or concerns were

received during the public meeting. The only correspondence received during the public review period was from the Department of Water and Sanitation (DWS) on the 01 August 2018 via e-mail. All concerns raised by the DWS is addressed in detail in Section iii (Summary of issues raised by I&APs) of this document. The attendance registers for the public meeting as well as photographic evidence of the public meeting is included in Annexure F.

3. Announcement of Environmental Authorisation

The decision from DMR will also be communicated via an announcement phase to allow for appeals. The procedure for appeals in terms of NEMA will be communicated to all stakeholders. Notification to stakeholders will be done by means of a letter via email and placement of an advertisement in the relevant local newspaper.

iii) **Summary of issues raised by I&APs**

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
AFFECTED PARTIES					
Landowner/s	x	N/A	No Comments received		
Lawful occupier/s of the land	x	N/A	No Comments received		
Landowners or lawful occupiers on adjacent properties	x	N/A	No Comments received		
Municipal councillor	x	N/A	No Comments received		
Municipality	x	N/A	No Comments received		
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA e	x	N/A	No Comments received		
Communities	x	N/A	No Comments received		
Dept. Land Affairs	x	N/A	No Comments received		
Traditional Leaders	x	N/A	No Comments received		
Dept. Environmental Affairs	x	N/A	No Comments received		
Other Competent Authorities Affected Department of Water and Sanitation (DWS) Comments received from Mr P. Msimango (msimangop@dws.gov.za)		01 August 2018	No application for water use licence has been submitted as part of this project. There also has never been a pre-application engagement with the Department.	Pre-application meeting held with DWS on the 01 October 2018. Minutes of the meeting will be included are included in Annexure A.	Annexure A
	x		No development or mining activity should occur within 100 m of a watercourse or within 1:100-year flood lines of a watercourse (whichever is the greatest).	Comment was noted. The Wessels Mine is an existing authorised mining facility, there is no further developmental activity scheduled to occur. No development or mining occurs within 100 m of a watercourse or within 1:100-year flood lines of a watercourse (whichever is the greatest).	
	x		Water courses should be delineated in accordance with the appropriate DWS delineation document.	As part of the Surface Water Study (Knight Piésold, 2017) commissioned by South32 for this project, watercourses close to the mining site was delineated. The mining activity occurs within an allowable distance away from any watercourses.	

	x		The construction camp shall not be located within the 1: 100-year flood line or within 100 meters whatever is the greatest from any watercourse. Operation and storage of equipment within the riparian zone must be limited as far as possible.	The HMM Wessels Mine is an existing mining facility. No future developments requiring construction camp and the storage and operation of equipment is envisioned. Pre-consultation with the Department of Water and Sanitation will occur, should the requirement for new developments arise.	
	x		Vehicles and other machinery must be serviced well above the 1: 100-year flood line or within a horizontal distance of 100 meters from any watercourse or estuary. Oils and other potential pollutants must be disposed of at an appropriate licensed site, with the necessary agreement from the owner of such a site.	Comment noted. The revised EMPr makes provisions for the disposal of oils and other potential pollutants during the operational and closure phases (please see 1)d)viii)).	Section 1)d)viii)
	x	01 August 2018	**Storm Water management:** • Any storm water must be diverted from the construction works and roads and must be managed in such a manner as to disperse runoff and to prevent the concentration of storm water flow. Where necessary, works must be constructed to attenuate the velocity of the storm water discharge and to protect the banks of the watercourse. • Storm water control works must be constructed, operated and maintained in a sustainable manner throughout the project. • Increased runoff due to vegetation clearance and/or soil compaction must be managed, and steps must be taken to ensure that storm water does not lead to bank instability and excessive levels of silt entering the watercourse. Storm water leaving the construction site must in no way be contaminated by any substance, whether such substance is a solid, liquid, vapour or gas or a combination thereof which is produced, used, stored, dumped or spilled on the premises.	• HMM Wessels Mine is an existing mining facility with established roads, as such no additional construction activities are envisioned for this operation. • A Surface Water Study (Knight Piésold, 2017) was undertaken for the HMM Wessels Mine, the study produced additional designs for storm water management facilities on the site. Knight Piésold has already begun with the Water Use License applications required for these facilities. A pre-application meeting was undertaken with DWS on the 01 October 2018. The meeting minutes of this meeting is included as part of Annexure F. • HMM Wessels Mine is an existing mining facility, as such no additional construction activities are envisioned for this operation. However, the comment has been noted. Pre-consultation with the Department of Water and Sanitation will occur, should the requirement for new developments and construction activities arise.	
	x		**Invasive alien vegetation**:	HMM Wessels Mine is an existing mining facility, as such no additional construction activities are envisioned for this	Section 1)d)viii)

			Vegetation must be monitored and managed on an on-going basis during construction and operation. Alien vegetation must not be allowed to further colonise the area, and all new alien vegetation recruitment must be eradicated or controlled, using standard methods approved by the Department.	operation. The EMPr produced for this project (Wessels EMPr Update EIAR) addresses the management measures in place regarding invasive alien vegetation.	
Department of Water and Sanitation (DWS) Comments received from Mr P. Masimango (msimangop@dws.gov.za)	**X**	01 August 2018	**Design and layout of mining:** A detailed layout plan needs to be submitted to our Department showing all the facilities in the proposed development, distance from the any watercourses and bathroom facilities. Details of the final design must also be supplied as soon as a decision has been made, as the details of this factor may influence the environmental impact both during the construction and operational phases of the project.	Comment was noted. The Wessels Mine is an existing authorised mining facility. There is no further developmental activity scheduled to occur and will therefore not result in any construction activities. The HMM Wessels Mine is currently in its operational phase. However, no development occurs within proximity of any watercourses.	
	X		**Construction**: Material with pollution generating potential must be limited in any construction activities. Any hazardous substances must be handled according to the relevant legislation relating to transport, storage and use of the substance. Any spillage of any hazardous materials including diesel that may occur during construction and operation must be reported immediately to our Department.	Comment was noted. The Wessels Mine is an existing authorised mining facility. There is no further developmental activity scheduled to occur and will therefore not result in any construction activities. The EMPr produced for this project (Wessels EMPr Update EIAR) addresses the management measures in place regarding hazardous materials including diesel.	Section d)ii) and Section 1)d)viii)
	X		**Waste Management:** Rubbish bins and Enviro loose/mobile toilets must be there and enough for the people on site during construction. A letter of consent from a registered waste facility to allow contractor to empty the toilet facility at their sewer system should be submitted to our department. All sewage, grey and wash water, as well as any waste generated during the construction phase of the facilities will be collected, contained and disposed of at the permitted and / or licensed facilities of the Local Authority and this must please be confirmed in writing by the local authority.	Comment was noted. The Wessels Mine is an existing authorised mining facility. There is no further developmental activity scheduled to occur and will therefore not result in any construction activities. Currently, HMM Wessels procures the services of various waste management sub-contractors. The copies of the service level agreements can be found in Annexure I.	Section 1)d)viii) and Annexure I
	X		**Rehabilitation:** Soils that have become compacted through the activities of the development must be loosened to an appropriate depth to allow seed germination. The necessary erosion prevention mechanisms must be employed to ensure the sustainability of all structures and activities and to prevent in-stream sedimentation. Rehabilitation remains the sole responsibility of the applicant and the Department.	Comment was noted. The EMPr produced for this project (Wessels EMPr Update EIAR) addresses the management measures in place regarding soils, erosion thereof and rehabilitation.	Section 1)d)viii)

	x		**Water use entitlement:** The Department notes that the applicant has not submitted a request for a water use authorisation from our Department. Please be informed that engaging in water use activities is unlawful without necessary authorisation from our Department. Please note that an application can lodged electronically via the Electronic Water Use Licence Application and Authorisation (EWULAA) system (www.dws.qov.za/ewulaas).	Comment was noted. The water uses employed on the mine have been included in the approved EA but have not been authorised in terms of the National Water Act (No 36 of 1998, NWA). HMM Wessels Mine has an existing water use license (Licence No.: 10/D41M/AGJ/1536), however some water uses were omitted as per the previous authorisation. To obtain complete compliance, an Integrated Water Use License Application (IWULA) under the National Water Act (No 36 of 1998, NWA) was undertaken in parallel to the HMM Wessels EA Amendment. The completed documentation pertaining to the IWULA application may be found in Annexure J of this report. A pre-application meeting with the DWS was undertaken on the 01 October 2018 (see Annexure F).	
	x	01 August 2018	**Issues to take into consideration:** The applicant is to submit an Environmental Management Programme (EMP)/Environmental Impact Assessment (EIA) and it should take the following issues into consideration: a) Should the project continue; a site visit and pre-consultation meeting must be conducted by a DWS official with the applicant, which will be followed by an application for Water Use Authorisation (proof of consultation and submission of an application). This must be submitted to DWS in terms of the National Water Act, 1998 (Act 36 of 1998) before any mining activities take place. The following should be included in the application: I. Fully completed application forms. The water uses that will possibly be triggered are section 21 (a), (e) and (g) in terms of the National Water Act (Act 36 of 1998). These forms for the various water uses are available on the Department of water and Sanitation's website (https://www.dws.qov.za/Proiect5WARMS/Licensinq/licensinq1.aspx) or upon request; II. Registration fee (RI15) and proof of payment; III. Certified copy of the representative's id or company registration certificate; IV. Copy of the property title deed; V. Copy of the property zoning document;	HMM Wessels is an existing mining operation with an approved environmental authorisation and a Water Use License (Licence No.: 10/D41M/AGJ/1536). Additional water uses for which authorisation was omitted in the past, are now being applied for in parallel to this Environmental Amendment process. A pre-application meeting with DWS was undertaken on the 01 October 2018, to discuss the authorisation of the omitted water uses. Pending the outcome of the pre-application, a site visit will be undertaken if mandated by the DWS.	

			VI. Letter of consent from land owner if the applicant is not the land owner; VII. A copy of 1:50 000 topographic map / 1:10 000 indicating map VIII. name number of farm boundaries including subdivision; IX. Approved EMP, Water Quality Management Report, Geohydrological Report; Integrated Water and Waste Management Plan with Overall Water Balance; X. Signed Design Drawings and Engineer Report (pollution control dam, storm water trenches, evaporation dams, onsite sanitation etc), designed by ECSA registered Engineer; XI. Environmental Impact Assessment Report and Environmental Authorisation/RoD from Environmental Affairs; XII. Public Participation Correspondence (notice proof and minutes from meeting); xii. Section 27 (1) of NWA of 1998 No. 36 and proof of BBBEE status; XIII. Service level agreement with waste collector (sewage, domestic and oil) and water services provider during construction and for the remainder of the mining development; XIV. Water Supply and water demand analysis; and XV. Clearance Letter from Land Claim		
	x	01 August 2018	b) The EMP must clearly show all water courses as defined in the National Water Act, 1998 (Act 36 of 1998) as well as the delineated 1: 100-year flood lines. No activity may occur within the 1: 100-year flood line of a river/drainage lines without authorisation. No activity may occur within the 500 metres radius of a pan/wetland (perennial/non-perennial) without authorisation.	HMM Wessels is an existing mining operation, no activity occurs within the delineated 1:100-year flood line of a river/drainage line. The EIAR illustrates the site layout in Figure 1. No watercourses occur in the1 :100-year flood line of the mine site.	Figure 1 Annexure D - Surface Water Study (Knight Piésold, 2017)
	x		c) The EMP must clearly show the methods for collecting, storing, transporting and finally disposing of all waste products produced as well as the responsible and accountable persons. This includes written consent from the relevant accredited waste disposal site/ sewage disposal/ oil disposal in handling the waste. All applicable sections of the National Environmental Management: Waste Act 59 of 2008 should be strictly adhered to.	Comment noted. The EMPr includes waste management measures for the operation.	Section 1)d)viii)

			d) The EMP must clearly identify all risks that are associated with the project that can affect the water resources in and around the project area and state all implementable measures to prevent and respond to accidents and abnormal events that may occur.	Comment noted. The Surface Water Study (Knight Piésold, 2017) and Draft EIAR includes assessment of all the risks associated with water resources in mine operations.	Annexure D- Surface Water Study (Knight Piésold, 2017) Table 10 and Summary of specialist reports.
	x		e) The EMP must clearly identify all risks that are associated with the project that can affect the water resources in and around the project area and state all corresponding measures to prevent and respond to accidents and abnormal events that may occur.	Comment noted. The Surface Water Study (Knight Piésold, 2017) and Draft EIAR includes assessment of all the risks associated with water resources in mine operations.	Annexure D - Surface Water Study (Knight Piésold, 2017) Table 10 and Summary of specialist reports.
	x		f) The EMP must clearly show through a responsibility matrix and organogram the responsible persons for implementing the mitigation measures and reporting lines, in the event of an accident.	Comment noted. The responsibility matrix depicting the responsible person for implementing mitigation measures are shown in Table 23, page 154.	Table 23, page 154. Organogram is provided in Annexure F
	x	01 August 2018	g) The EMP must show in written form that the developer has made a legally binding commitment to implement the proposed mitigation measures and that these measures are not only suggestions and recommendations.	Comment noted. The approval of this EMPr update by HMM Wessels Mine and South32 Holdings is legally binding upon approval from the relevant authorities.	
	x		h) The EMP must clearly show the process followed if the developer does not comply with the legal requirements of the EMP and National Water Act, 1998 (Act No 36 of 1998).	Comment noted. No further development is expected on the Mine as Wessels is an existing operational facility. The EMP clearly stipulates mitigation measures for various impacts which are likely to occur during the operational and closure phase. Roles and responsibilities are given to specific teams at Wessels to ensure that there is implementation of mitigation measures as stipulated. The EMP is legally binding to the NWA and NEMA. The mine is committed to carrying out all mitigation measures proposed in this EMP.	
	x		The regulations on the use of water for mining and related activities aimed at the protection of the Water Resources as published in the Government Notice No.704 on 4 June (Government Gazette No. 20119) must be complied with. Every person in control of a mine or activity must take reasonable measures to comply with the following requirements;	Comment noted.	

			a) prevent water containing waste or any substance which causes or is likely to cause pollution of a water resource from entering any water resource, either by natural flow or by seepage, and must retain or collect such substance or water containing waste for use, re-use, evaporation or for purification and disposal in terms of the Act;		
	x		a) design, modify, locate, construct and maintain all water systems, including residue deposits, in any area to prevent the pollution of any water resource through the operation or use thereof and to restrict the possibility of damage to the riparian or instream habitat through erosion or sedimentation, or the disturbance of vegetation, or the alteration of flow characteristics;	Comment noted.	
	x		b) cause effective measures to be taken to minimise the flow of any surface water or floodwater into mine workings, opencast workings, other workings or subterranean caverns, through cracked or fissured formations, subsided ground, sinkholes, outcrop excavations, audits, entrances or any other openings;	Comment noted.	
	x	01 August 2018	c) design, modify, construct, maintain and use any dam or any residue deposit or stockpile used for the disposal or storage of mineral tailings, ash or other hydraulic transported substances, so that the water or waste therein, or falling therein, will not result in the failure thereof or impair the stability thereof.	Comment noted.	
	x		d) prevent the erosion or leaching of materials from any residue deposit or stockpile from any area and contain material or substances so eroded or leached in such area by providing suitable barrier dams, evaporation dams or any other effective measures to prevent this material or substance from entering and polluting any water resources;	Comment noted.	
	x		e) ensure that water used in any process at a mine or activity is recycled as far as practicable, and any facility, sump, pumping installation, catchments dam or other impoundment used for recycling water, is of adequate	Comment noted.	

			design and capacity to prevent the spillage, seepage or release of water containing waste at any time;		
	x		f) at all times keep any water system free from any matter or obstruction which may affect the efficiency thereof; and	Comment noted.	
	x		g) cause all domestic waste, including wash-water, which cannot be disposed of in a municipal sewage system, to be disposed of in terms of an authorisation under the Act.	Comment noted.	
	x		The Department therefore has no objections to this activity provided proof of adherence to the above-mentioned recommendations has been obtained. This reply does not grant any exemption from the requirements of any applicable Act, Ordinance, Regulation or By-law	Comments noted.	
OTHER AFFECTED PARTIES		**None**			
INTERESTED PARTIES		**None**			

iv) **The Environmental attributes associated with the development footprint alternatives.**

(1) Baseline Environment

The following section provides a description of the baseline environment of the proposed project area. The HMM Wessels Mine is an underground manganese mine near Hotazel in the Northern Cape (coordinates East 22.85566 and South: -27.11425 (WGS84)). The nearest town is Hotazel which lies 18 km towards south east. The Blackrock mining settlements is also situated adjacent to Wessels Mine site. This section aims to provide details on the baseline environment of the project area.

a) **Type of environment affected by the proposed activity.**

Climate

Climate data for this section was sourced for the Surface Water Study compiled by Knight Piésold (2017). The mine is located in an area typical of the central Kalahari Desert. Average daily maximum temperatures for January (the hottest month) in the order of 30 degrees Celsius (°C) are expected, but temperatures as high as 45°C are not uncommon during hotter periods. Average minimum temperatures of 1°C are expected in the mid-winter months, but low humidity will preclude the possibility of frost. Humidity is expected to normally be less than 30 percent (%) (www.waterresourceswr2012.co.za, accessed 2017). This lack of humidity, frequent high winds and hot conditions, especially during summer, will give rise to high evaporation rates from any surface water area.

Rainfall and Design Rainfall Depths

Rainfall records for this dry region seem to vary with 250 millimetres per annum (mm/a) being reported for the town of Hotazel, 375 mm/a reported for a local game ranch, whilst rainfall maps, weather service data and other sources of rainfall data all suggest rainfall for the site that varies between 250 - 380 mm/a.

A long record of rainfall is required to reliably assess statistical characteristics of the local rainfall. The rainfall depths were extracted from the closest weather station to the Wessels site, obtained from the Design Rainfall Estimation Programme (Smithers, 2002); this daily rainfall record covers the period from July 1912 - July 2000 (87 years). Additional data was obtained from the South African Weather Service (SAWS), this covered the period from July 2000 to June 2017. The selection of the Mukulu Station (0392640_W) is because this is the closest station to the study area with a reliable record.

Name of rainfall station	Rainfall station number	Distance (km)	Latitude (°)(‘)	Longitude (°)(‘)	Record (years)	Map (mm)
Mukulu	0392640_W	5.91	27° 10’	22° 51’	106	289

The Mean Annual Precipitation (MAP) near the site was adopted as 289 millimetres (mm); the average monthly rainfall depths are shown in Figure 5. About 81% of the annual rain falls in summer (October - March), in the form of showers, with the maximum amount of precipitation falling in February. Figure 6 shows the calculated storm duration (days of consecutive rainfall) and their statistical frequencies. This indicates that the rainfall events are short, with most rainfall events occurring in one day. Figure 7 shows the storm distributions (days between rainfall events) and their statistical frequencies.

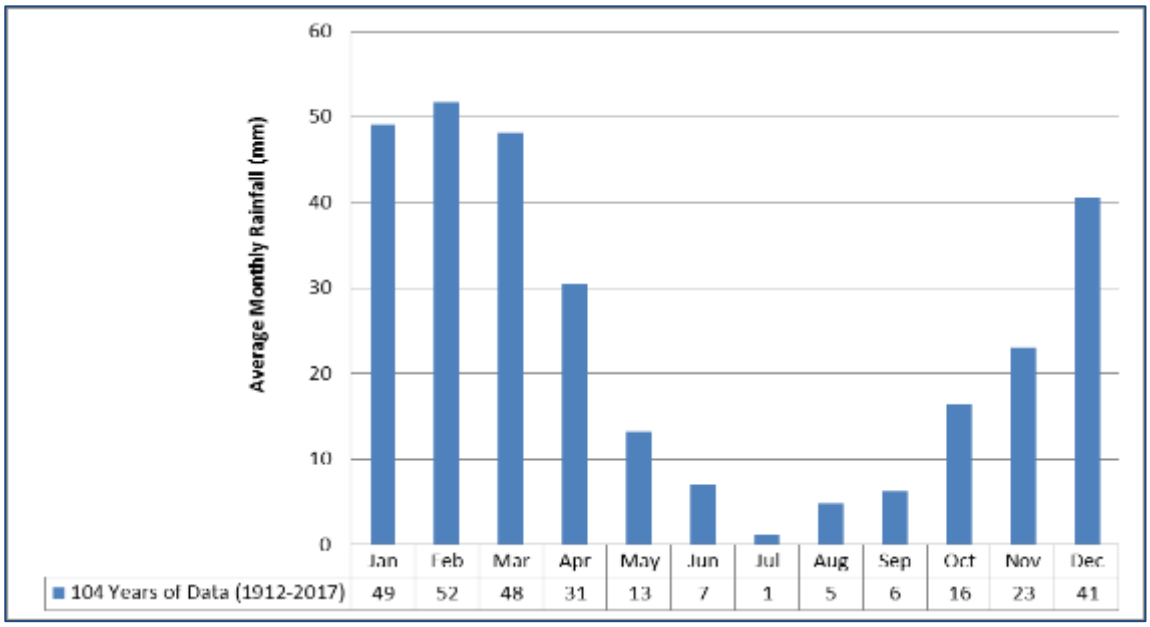


Figure 5: Calculated monthly average rainfall (mm) for rainfall station Mukulu (0392640_W)

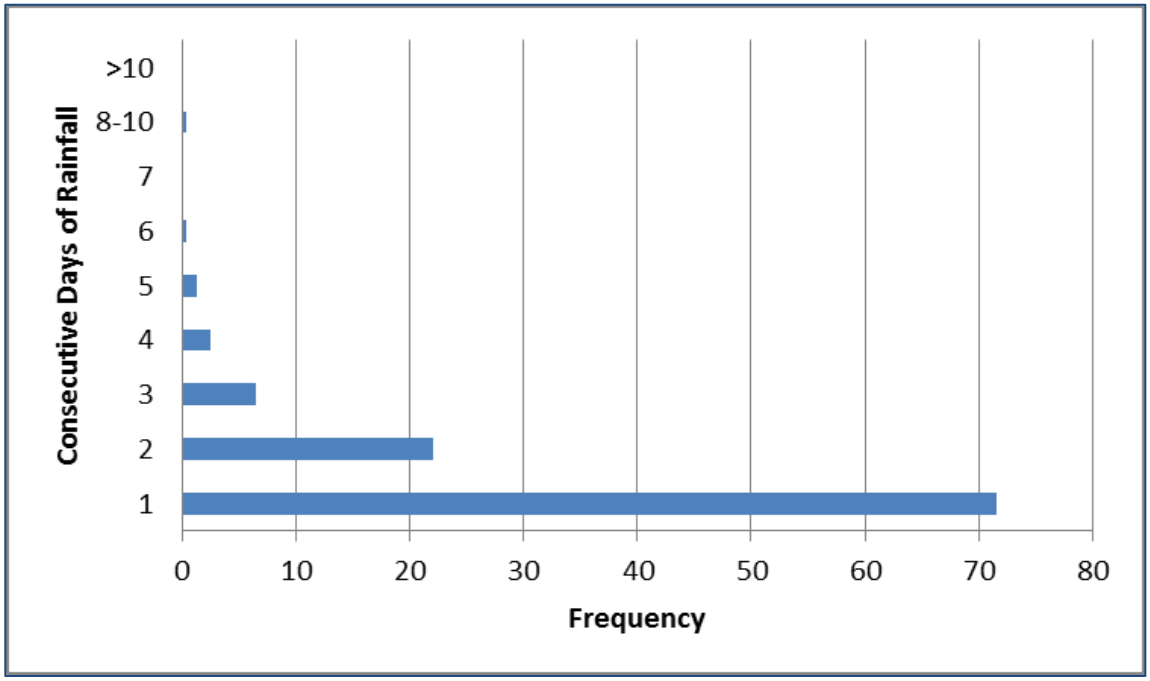


Figure 6: Storm durations for rainfall station Mukulu (0392640_W)

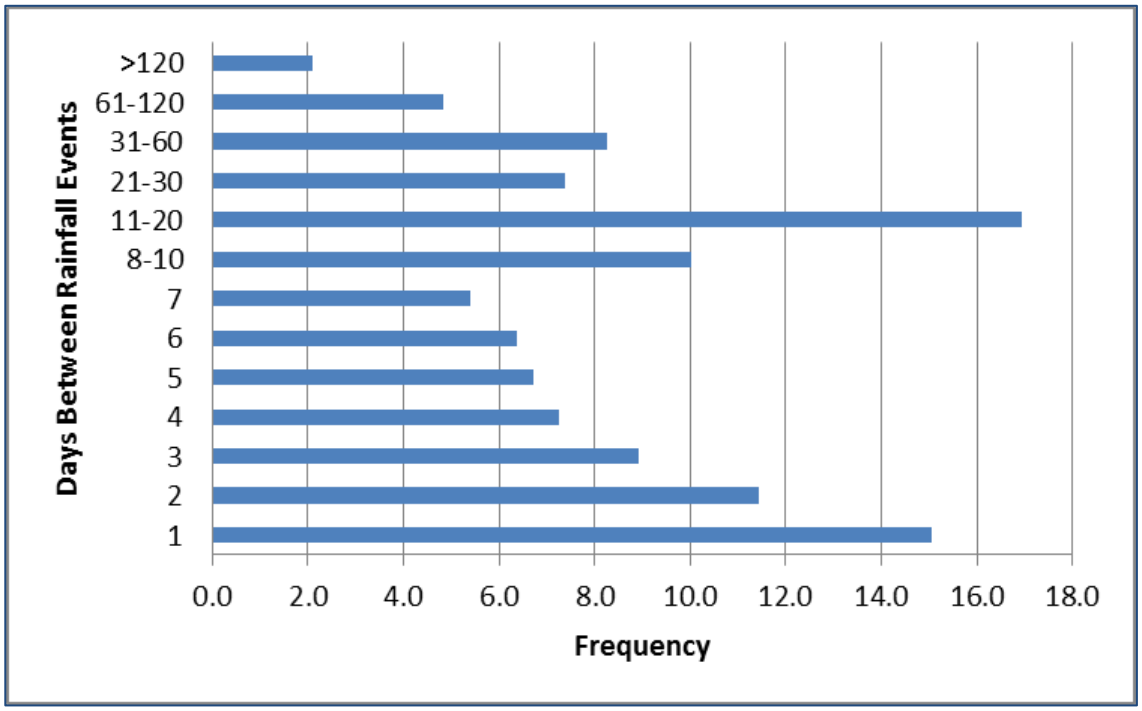


Figure 7: Storm distributions for rainfall station Mukulu (0392640_W)

The 24-hour storm rainfall depths for the 2-year, 10-year, 20-year, 50-year and 100-year recurrence interval events, at the SAWS Mukulu Station (0392640_W) were abstracted from the database. The depths are presented in Table 4.

Table 4: 24 Hour Storm Design Rainfall Depths (mm)

Recurrence interval (years)	1 in 2	1 in 10	1 in 20	1 in 50	1 in 100
24 hour Rainfall depth (mm)	33	72	92	121	135

Evaporation

The WR 2012 data shows a range in annual evaporation for the site of greater than 2 600 mm (A-Pan estimate). Figure 8 presents the evaporation data sourced from the nearest Department of Water and Sanitation (DWS) station (Kuruman).

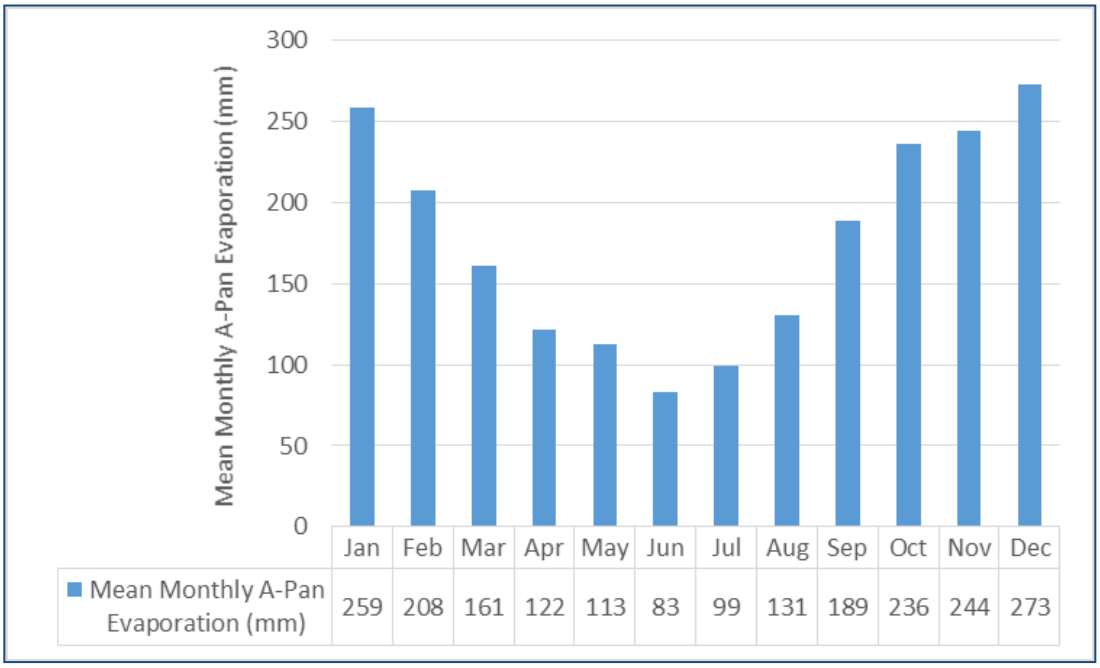


Figure 8: Mean monthly pan evaporation

Runoff

The surrounding area is an endoreic area (runoff only occurs with extreme, flood producing rainfall events). A characteristic of this area is that, with 253 mm/a rainfall, less than 1 mm/a runoff (on average) reaches local river systems (Water Research Commission WR2005 Database). Local point runoff does, however, occur.

With individual storms, where precipitation exceeds approximately 70 mm over a relatively short period, water does run off and pond in local depressions that typically will have a basal layer of exposed calcrete. With extreme flood events this water can break out of these ponds to flow over-land in a general northerly to north-easterly direction. No regular runoff is expected, and small volumes of runoff captured will rapidly be lost to evaporation. The total mine area accounts for less than 1% of the entire quaternary catchment. This will result in an insignificant reduction in runoff to the river approximately 5 km north-east of the site.

Topography

Much of the Northern Cape is covered with a thick layer of Kalahari sand and calcrete. The terrain is predominantly flat. There are two ranges of high ground running through the region from south to north. The eastern range contains the Asbestos Mountain and Kuruman Hills. To the west are the Langeberg and Koranna mountains. The Wessels mining area is predominantly flat with the only significant topographical features being the TSF, stockpiles and WRDs.

Air Quality

Dust Fallout

The data utilised for the dust fallout section originates from the monthly dust monitoring reports compiled by SGS for the time period of September 2015 – November 2016. Dust monitoring at Wessels Mine is conducted on a monthly basis at three locations within the area of the mine. The monitoring is conducted based on the ASTM International standard method for collection and analysis (ASTM D1739 – 1970) with certain modifications and in accordance with SANS 1137:2012. The monitoring of dust fallout began in January 2010, and the most recent dataset is presented in Figure 9 below. Neither the residential nor the non-residential dust fallout rates have been exceeded at Wessels Mine.

A biodegradable and non-toxic dust suppressant is applied to the haul, secondary and underground roads as a dust palliative. This further reduces the amount of fallout dust around the mine surface.

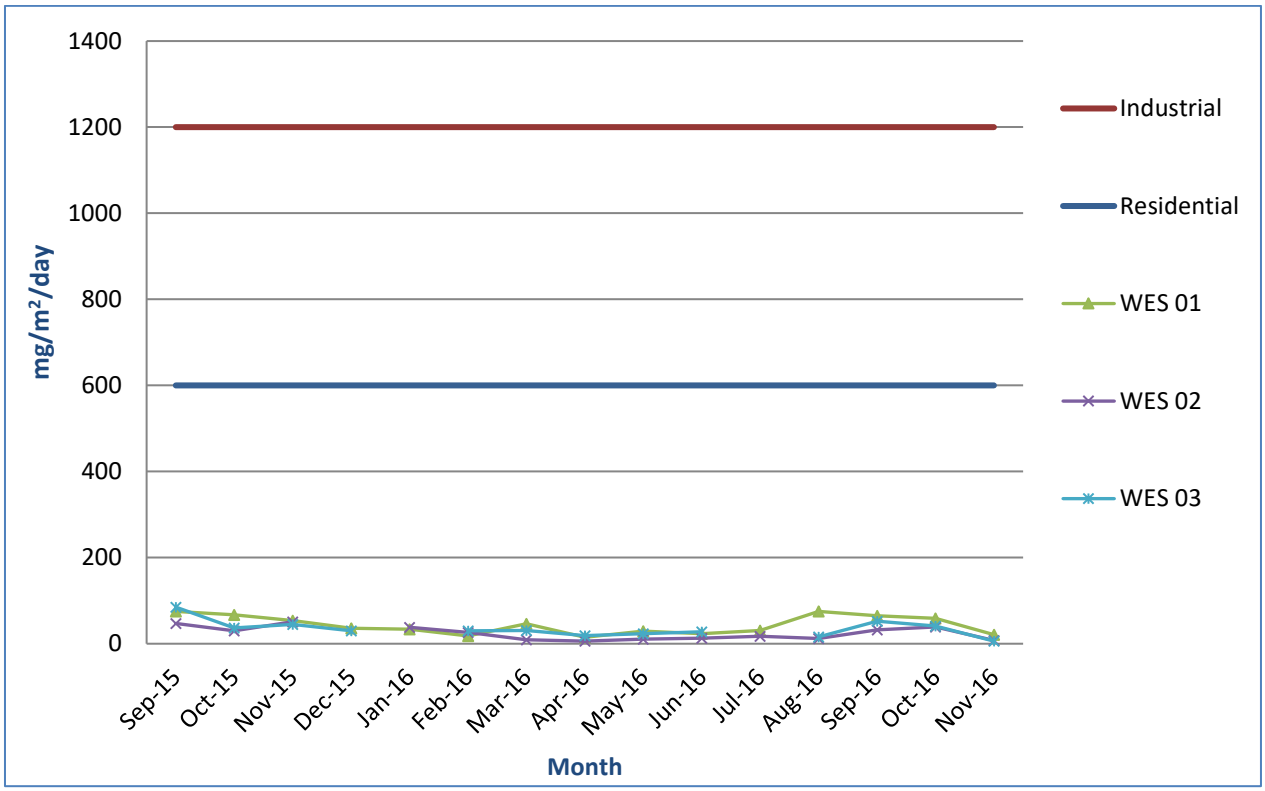


Figure 9: Dust Fallout Rates at Wessels Mine for September 2015 - November 2016

Noise

An ambient noise study was conducted in September 2011 by Acoustic Consulting, to establish the extent of the impact that noise emissions from the Wessels Mine operation has on ambient noise levels in its environment. Malherbe undertook an update to this study in November 2017 in order to re-evaluate and determine ambient noise levels in the environment, to determine noise emissions and the impact of the noise emissions from the operations on ambient noise levels and to recommend noise management and monitoring measures. The following section provides a brief overview of the findings of the study undertaken by Malherbe (2018).

The assessment of ambient noise was performed in accordance to the Air Quality Act (2005). The field survey was undertaken on the 23 and 24 November 2017, and noise measurements were taken at the monitoring points indicated below.

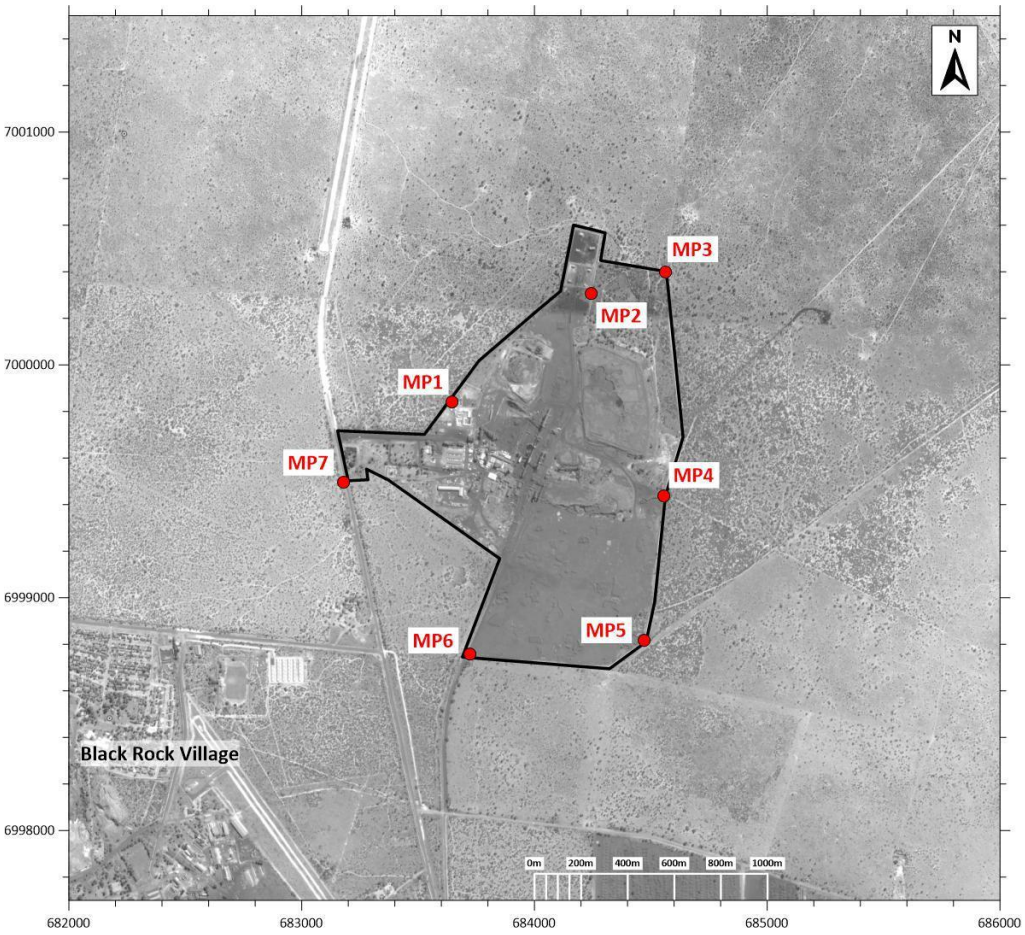


Figure 10: Noise monitoring points (Malherbe, 2018)

Ambient noise levels along the boundary of Wessels Mine were studied in accordance with the procedures stipulated in SANS 10103. The measurement results were processed in order to remove the noise contributions of noise emissions not originating from the Wessels mining operation, such as traffic on the main road and noisy insects close to the measuring instrument. The noise emissions from Wessels Mine were determined utilising the Concawe prediction method described in SANS

10357 for day and night- time conditions. A three-dimensional model was developed for calculating the noise emissions and propagation from Wessels, which took account of:

- the sound power emission levels of the dominant equipment and processes;
- the attenuation of noise with increasing distance due to geometric spreading;
- the additional attenuation of noise caused by the absorption of noise energy by the ground and air between the noise source and receiver.

The local topography surrounding Wessels Mine is considerably flat, and therefore no screening against the noise generated by the mine is provided. The local vegetation does however provide some of attenuation through the absorption of sound by the interspersed shrubs and medium-sized trees of the Kalahari Bushveld (Acoustic Consulting, 2011 & Malherbe, 2018). Although the local environment is characterised as being rural, several other mining operations are present within the area, which contribute to existing ambient noise levels within the local region. An additional source contributing to the ambient noise levels is road traffic from the nearby main road to Kuruman and Kathu (Acoustic Consulting, 2011 & Malherbe, 2018). The noise contours obtained are shown in the figures below.

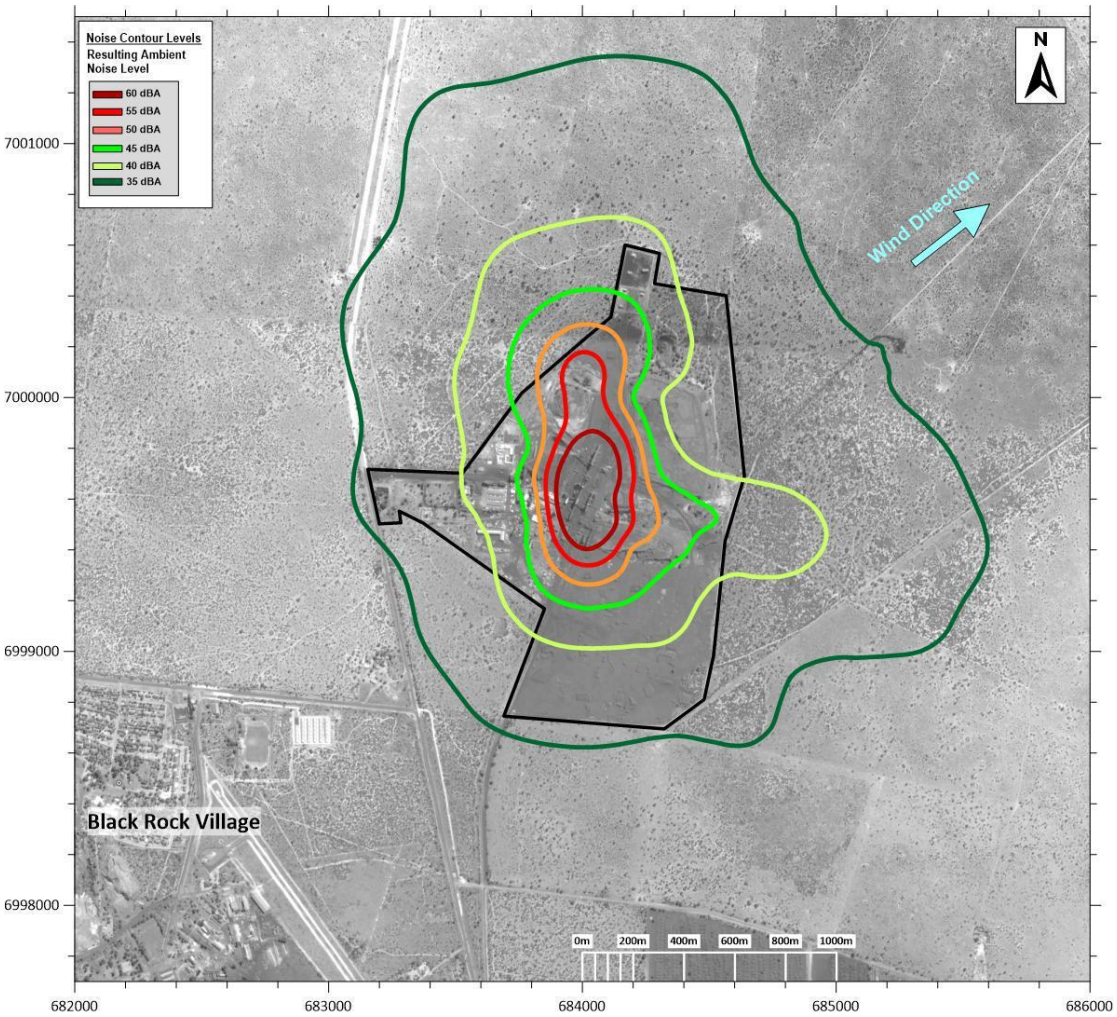


Figure 11: Noise contours for day-time conditions with an on average 1.7 m/s SW wind, assuming a base noise level of 32 dBA.

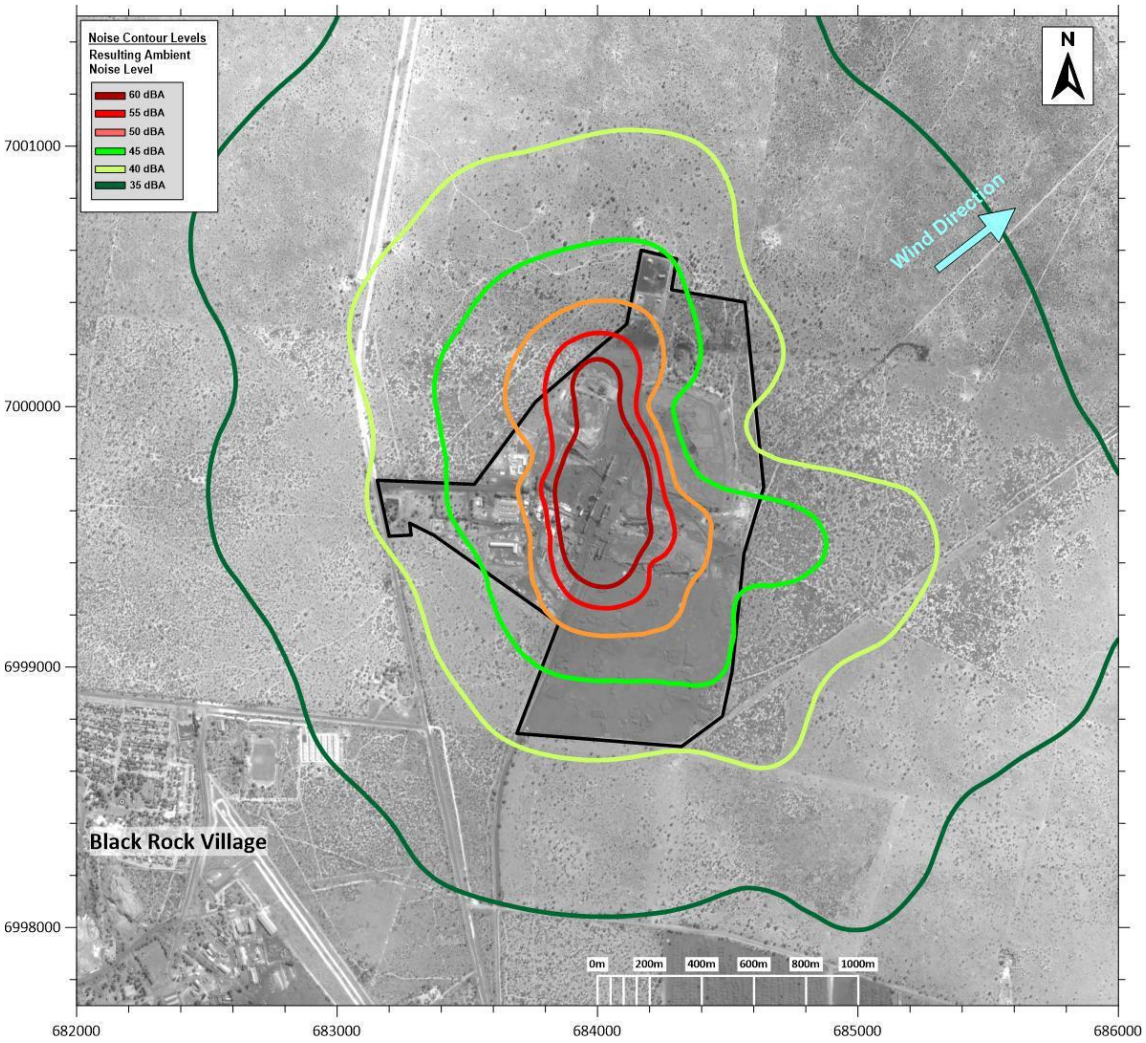


Figure 12: Noise contours for night-time conditions with an on average 1.7 m/s SW wind, assuming a base noise level of 32 dBA.

The following conclusions were drawn from the measurement results (Malherbe, 2018):

Noise emissions from Wessels are audible to clearly audible at each of the measurement points during the day- and night-time. Therefore, Wessels provided a significant contribution to the ambient noise levels at most of the measurement points. However, at night the noise emissions from the other mines operating in the area were also audible. This is due to meteorological and other atmospheric conditions favouring the propagation of noise over longer distances, particularly at low frequencies. Therefore, the noise caused by mining activities is a general characteristic of this environment.

The following conclusions were made from the modelling results (Malherbe, 2018). Both during day- and night-time the noise levels at the boundary of Wessels are well below the 70 dBA (listed in Table 2 of SANS 10103) as typical for 'industrial districts. This is also true for both the investigated directions (i.e. SW and N). Although the wind direction has a marked influence on the extent of the noise contours in any particular direction, no residential areas or farmsteads are negatively affected. Therefore, the severity of the noise impact caused by Wessel in its immediate environment is

considered as **low**. Malherbe also indicated that since the significance of noise emissions were rated a **low**, then no specific additional noise mitigations are required.

Soils types and soil capability

The following information describes the soil types and soil capability on site as given in the Biodiversity Management and Action Plan (Advisian, 2017). The soils occurring in the Wessels area were described and classified using the South African Classification system (Soil Classification Working Group, 1991). The soils all belong to the Hutton from, with two series being identified, namely Hayfield (moderately leached) and Stella (lightly leached).

The parent and underlying materials are Quaternary aeolian sand over dolomitic limestone. The surface sands are of an average depth of 22m and overly a deep layer of calcrete, which varies in thickness from 13 to 24m. These soils are identified as two horizons, namely A (generally red to light red, sandy soils varying in depth, occurring no deeper than 2m) and B horizons (similar colour to that of the A horizon, but is more sandy and drains easily). Chemical data suggests a fairly low nutrient status and cation exchange capacity although these sands are usually regarded as base-rich. The soils also show low phosphorous values varying between 3.77 and 4.54 for the topsoil. The soils have very low cations (Na, K, Ca and Mg) values. Carbon content of the soils is very low. Due to the fine sandy nature of the topsoil with a low clay content and limited organic matter, the soils are highly erodible, particularly where vegetation is removed.

The site was identified as a Class VII: Non-arable; Grazing, Woodland or Wildlife land capability (in accordance with the Department of Agriculture databases). The current mining area was formerly utilised for grazing. The mine area falls in the veld type known as the Kathu Bushveld. The sparse tuftness of the grass and the looseness of the deep soils, make this veld extremely vulnerable to grazing pressure and overgrazing. The pre-mining land capability is un-impacted over the underground mining areas, and the impact on land capability is confined to the plant and associated stockpile area. During the operational phase the dewatering of the area will limit the land capability, although the vegetation will start to re-establish. Post closure, the vegetation will re-establish, although concerns remain that the water table will take generations to re-establish, and the livestock carrying capability of the mined-out areas will be limited by the vulnerability of the areas to drought.

Geology

The following section was informed by the geohydrology specialist report compiled by GHT Consulting (2017), as well as by the, “HMM Mandatory Code of Practice to Combat Rock Fall and Rock Burst Accidents in the Underground Working of Wessels Mine” compiled by HMM Wessels Mine (2016).

Ongeluk Formation

The oldest rocks in the immediate vicinity of the proposed development forms part of the Transvaal Super Group, a Proterozoic aged marine sequence deposited in an intra-continental (Kaapvaal Craton) back arc basin environment approximately 2 600 million years ago. Of these, the generally jasper-Fe-Mg rich lavas of the Ongeluk Formation are the oldest, the presence pillow lava structures elsewhere in the region suggesting deposition in a shallow sea. The material is often un-weathered, hard and relatively massive. Any fractures are usually in filled with epidote and calcite.

Hotazel Formation

In terms of economic exploitation potential, the Hotazel Formation is the most important lithological unit in the area due to the presence of manganese bearing beds. Deposited between 2 200 and 2 300 million years ago, the formation is structurally confined within the Dimoten Syncline, a north westerly plunging basin containing more than 80% of global land-based manganese reserves within an area of approximately 525 km^2. This basin defines the extent of the Kalahari Manganese Field.

Three manganese-bearing sequences are of importance throughout the basin, the lower, middle, and upper bodies. The lowermost of the three units, the Lower Body (LB) is the only unit presently mined at Wessels Mine.

Local Geology

Wessels Mine exploits the northernmost portion of the Kalahari Manganese Field, which is an orebody preserved in a 40 kilometre long (N – S) by 15 kilometre wide (E - W) basin. It occupies a gently folded structure, the Dimothen syncline, which plunges at a shallow angle (3º to 8º) to the north-northwest. The Hotazel Formation (Voëlwater Subgroup, Postmasburg Group) of the Transvaal Sequence hosts the manganese mineralisation at Wessels Mine.

The volcanogenic – sedimentary manganese enriched horizons are erosional or structurally preserved relicts of the Proterozoic aged Hotazel Formation. The latter is characterised by three manganese rich horizons separated by Banded Ironstone Formations (BIF). The lowermost of the three units, the Lower Body (LB) is the only unit presently being mined. High grade (on average 48%) Wessels type manganese mineralisation occurs at Wessels Mine. The ore is typically coarse grained, shiny, massive or vuggy with the principal ore minerals being Hausmannite and Braunite II.

The Hotazel Formation is underlain by the Ongeluk Formation lava and, unconformably overlain by inter-bedded red shales of the Proterozoic Mapedi Formation (Olifantshoek Group). The unconformity is known as the Olifantshoek Unconformity. The Mapedi lithologies are in turn overlain by remnants of Lucknow Formation quartzite and Karoo age Dwyka Formation tillite (preserved in the north-eastern portion of Wessels Mine) and finally a cover of Kalahari Quaternary age alluvial/ fluvial sediments. The tillite also truncates unconformably into the underlying sediments. The local geological formations are illustrated in Figure 13.

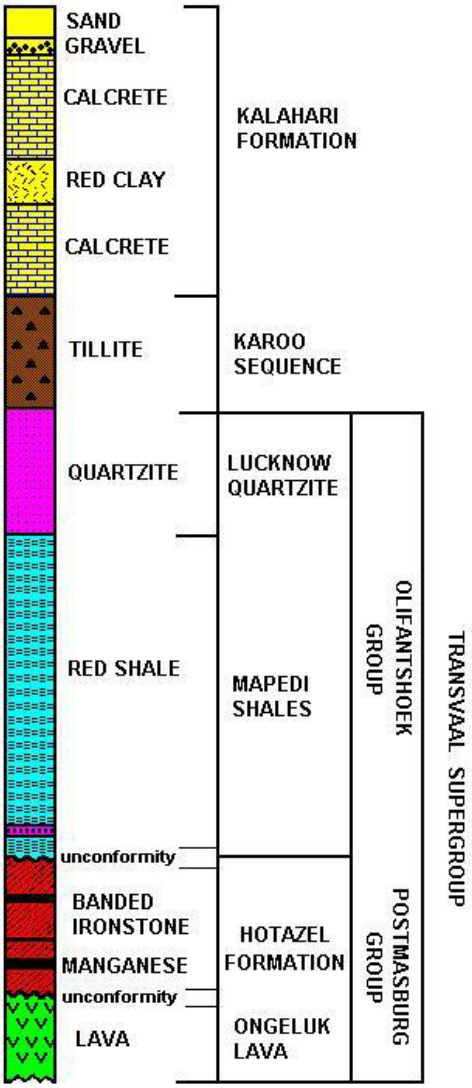


Figure 13: Geological formations at Wessels Mine (GHT, 2017)

Structural Geology

The following information was abstracted from the "Mandatory Code of Practice to Combat Rock Fall and Rock Burst Accidents in the Underground Working of Wessels Mine" (HMM, 2016b).

Structural deformation near Wessels Mine is significantly more complex than further south within the basin. Faulting is dominated by North–South and ENE–WSW trending systems. Fault displacements vary in scale from centimetres to metres. Sub-vertical displacements of up to 200 metres have been recorded. Differential movement parallel or sub-parallel to bedding planes also occurs. These are commonly defined at Wessels Mine as shear planes.

Dykes occurring at Wessels Mine are primarily orientated in a NE - SW direction, often following older fault surfaces. Thicknesses vary from 10's of centimetres to several metres (up to 70 metres have been recorded). Normal thicknesses are, however, in the order of 20 to 30 metres.

Ore bodies mined

The three manganese horizons occurring in the Hotazel Formation are called the Upper Body (UB), Middle Body (MB) and Lower Body (LB) respectively. The UB and MB are separated by

approximately ten metres of banded ironstone and the MB and LB by approximately two metres of hematite lutite ironstone and banded ironstone. The manganese horizon extracted at Wessels Mine is the Lower Body. The dip of the LB manganese horizon varies from flat to a maximum of 18º.

Reserve Block			Floor Depth	Average Thickness
	Min (m)	Max (m)	Avg (m)	(m)
West Block	300	390	340	5.0
Graben Block	420	520	470	4.0
Central Block	300	380	350	5.5
East Block	240	320	280	5.0

Seismological Setting

Wessels Mine is a shallow mine (mining depths ranging from 240 m to 520 m depth below surface), with no history of natural or mining induced seismic activity. Hotazel is situated in a very stable part of the country regarding seismic events. Further caution is taken on Wessels Mine by the installation of a ground monitoring device detecting ground motion waves. No activity has been recorded, stating the absence of seismicity on Wessels Mine.

Water

Water Quality

Geohydrology specialist report compiled by GHT Consulting (2017) and the Stormwater Management Plan undertaken by Knight Piésold (2017) informed information regarding the baseline water quality. Please refer to Annexure C and Annexure D for the full texts.

GHT Consulting, an independent consultant, conducts ground- and surface water quality monitoring on a quarterly basis at Wessels Mine. No natural watercourses are present on site, with surface water samples therefore collected from the TSF and the unlined duck pond, with a total of 6 surface water monitoring points. Groundwater samples are collected from 13 monitoring boreholes spread across the Wessels Mine site. The water quality monitoring points are listed in Table 5 below.

Table 5: Water Quality Monitoring Points for Wessels Mine (GHT, 2017)

Area	Site	Description / Potential source of contamination
Waste Site Area	JB (DGO) 31	Seepage from old waste site
	JB (WES) 32	Seepage from the decommissioned tyre/scrap metal dump
	JB (WES) 46	Water quality of old waste site and TSF
Process Waste Disposal Area	JB (DGO) 29	Seepage from the duck pond Dam
	JB (DGO) 30	Seepage from the TSF
	JB (DGO) 47	Seepage from the TSF

	P (WES) 01	Quality of water from the underground workings
	P (WES) 02	Quality of water in TSF
	P (WES) 03	Quality of water in duck pond Dam
Sewage Treatment Area	JB (WES) 37	Seepage from the Sewage Treatment Works
	K (WES) 01	Quality of sewage effluent
Oil Skimmers	JB (WES) 34	Seepage from the oil skimmers
	Z (WES) 02	Visual inspection of oil skimmer
	Z (WES) 03	Oil skimmer in the Wessels underground section
Explosive Magazine Area	JB (WES) 28	Seepage from the explosive magazine
Kraal Area	JB (WES) 36	Impact on groundwater quality
Softener Area	JB (WES) 35	Impact on groundwater quality
Stockpile Area	JB (DIK) 33	Background borehole

* Groundwater monitoring points

*Surface water monitoring points

The water quality of both surface- and groundwater at Wessels Mine is considered unsuitable for lifetime human consumption, as described by the South African National Standards, SANS241:2015. The ground / surface water monitoring assessment report (GHT, 2017) describes the inorganic water quality as being above the recommended standard limit, or above the recommended standard (ARS), due to elevated levels of various parameters such as electrical conductivity, boron, calcium, chloride, manganese, nitrate, nitrite, total hardness and turbidity. The surface water analysed from the duck pond, TSF and the treated sewage treatment effluent is categorised as ARS water, as the SANS241:2015 limits are exceeded for parameters such as boron, calcium, chloride, electrical conductivity, magnesium and nitrate. The elevated nitrate concentrations within groundwater is of natural origin, as can be expected within most semi-arid regions and described within the ground / surface water monitoring assessment report (GHT, 2017).

A localised pollution plume was identified by GHT, emanating from the TSF and duck pond areas, presenting a potential risk to groundwater through filtration of pollutants through the Kalahari Formation sediments into the underlying aquifers. The existing unlined dams that have recharged the local aquifers contain salts which degrade groundwater quality. The groundwater beneath the sewage treatment plant is similarly classified as ARS water, due to elevated nitrates, manganese and total hardness impacting the inorganic water quality. The organic water quality, based on the bacteriological analysis of this water, also classifies it as ARS water, as the plate counts exceed the SANS241:2011 recommended limits, indicating the impact on the local aquifer (GHT, 2017).

Surface Water

Because of the low rainfall, flat topography and sandy soils occur over much of the water management area, little usable surface runoff is generated in the water management area. The

runoff, which does occur, is highly variable and intermittent. Although occasional runoff occurs in the upper reaches of the Molopo River, no record exists of flow having reached the Orange River. Previous recordings of flow in the lower reaches of the Molopo and/or Kuruman Rivers were in 1933 and again in the 1974/5 and 1975/76 seasons. The mine falls within the Lower Vaal water management area, which is located in the quaternary drainage region D41M of the DWS (Advisian, 2017). Flow in the Vaal River, which is the main source of water in the water management area, virtually all originates from the Upper Vaal and Middle Vaal water management areas (DWAF, 2003).

No other watercourses or drainage lines are present in the study area. No natural watercourses traverse the Wessels Mine mining area. Knight Piésold (Pty) Ltd (Knight Piésold, 2017) undertook an investigation into the clean and dirty water management at Wessels Mine. Surface water in the region flows to Duck Pond to the north of the TSF. The report proposed a conceptual Stormwater Management Plan, which comprises three unlined sumps and one lined sump. The proposed structures will contain dirty water runoff from the plant, waste rock dump, stockpile area, TSF, waste yard and fuel storage and vehicle workshop area.

Aquatic Ecosystems

Two non-perennial rivers were identified within the Wessels Mine proximity, namely the Kuruman and Ga-mogara rivers (Knight Piésold, 2017). Visual observations of the soil and sub soil layer within the river beds of the two water bodies indicated that no surface water flow has been experienced in recent times. River beds were found to be overgrown with vegetation, with no evidence of any surface water present during the survey in April 2017 (Knight Piésold, 2017). It was determined that no aquatic bio-monitoring is required within these two systems in the location of the Wessels Mine project area. For further information regarding the aquatic ecosystems, refer to the Surface Water Study (Knight Piésold, 2017).

Groundwater

Information regarding the baseline groundwater conditions was informed by geohydrology specialist report compiled by GHT Consulting (2017). Please refer to Annexure C for the full texts.

Regional Hydrogeology: The main artesian water trap in the region is the relatively permeable Kalahari red clay, allowing groundwater to accumulate between its upper contacts with the calcrete-pebble bed. Recently (2009) the East Block Raw decline collapsed in the area where the red clay was intersected, mainly due to the swelling of the clay when being exposed to water. Degrading of the clay to a mud mass will also occur when exposed to continuous water.

Groundwater also accumulates along dykes and faults. The water accumulations are usually in a reservoir form (not pressurised). The limited amount of water that accumulates on a daily basis underground is controlled by a drainage system, which safeguards the mine against flooding. Local inflow of ground water can be expected near dykes and faults, however, inflows are not significant.

Local volume of water underground has a negative impact on hanging wall stability in isolated areas. Surface drilling operations have intersected minor to moderate volumes of water within the Kalahari Formation alluvial / fluvial sediments. These sediments generally attain a maximum thickness of approximately 130 metres.

Aquifer Classification and Aquifer Vulnerability Classification: The aquifer classification and vulnerability information discussed below are detailed within the Geohydrological Report compiled by GHT consulting (GHT, 2017). Please refer to Annexure C for the full texts.

The Aquifer Classification Map of South Africa (DWS, 1999) indicated that the local aquifer of Wessels Mine is classified as “poor”. The aquifer vulnerability of Wessels Mine is rated as “least” by the Aquifer Vulnerability Classification Map of South Africa (DWS, 2013).

Regional Recharge Characteristics: The site’s semi-arid climate and a relatively thick unsaturated zone (>25 m deep on average) are not conducive to active recharge, which has been calculated to be between 1 and 4% of average annual rainfall. Groundwater is up to 25 000 years old in deeper, confined aquifers, although surficial unconfined/semi-confined aquifers have been recharged in relatively recent time. Site aquifers are recharged directly from rainfall, though stable isotope results suggest that infiltration of standing surface water contained in topographical depressions may be of importance regionally. Recharge occurs via the relatively permeable Kalahari Formation, the recharge front mobilising soil nitrates, particularly at sites that have been overgrazed or stripped of vegetation. This has resulted in dangerously high nitrate concentrations (i.e. Class 4) in groundwater throughout the investigation area.

Groundwater is derived from aquifers within the Ongeluk, Hotazel, Mooidraai, and Kalahari in the region, although sediments of the Olifantshoek Group may also be of significance in the vicinity of Wessels Mine. In terms of potential groundwater use, the aquifer is of significance locally due to its high yielding characteristics (>10 L/s). There is no evidence to suggest that these aquifers have been recharged in recent time.

Presence of Boreholes and Springs: No springs or permanent surface water bodies are known to occur within the study area, while the main drainage features, the Kuruman and Ga- Mogara Rivers, flow rarely and only after periods of prolonged wet weather during wetter than average years. Therefore, groundwater and surface water interaction is negligible. The nearest non-perennial spring is located 5.15 km to the north of Wessels Mine.

Groundwater Elevations and Hydrocensus

The groundwater levels at Wessels Mine have been monitored through various boreholes since September 2002 to present. The data from the most recent surveys of September 2016 and November 2016 have been utilised to generate contour maps for Wessels Mine. The static water level data indicates that the hydraulic gradient is towards the southwest (GHT, 2017).

The water table appears locally elevated towards the unlined duck pond and the TSF. A calcrete-hosted pebble bed, which varies in thickness, appears to entirely overlie the red clays at Wessels Mine. Groundwater is present within this horizon, although yields were found to vary significantly, generally increasing with pebble bed thickness (GHT, 2017). Refer to Figure 14 for a map illustrating the groundwater elevations at Wessels Mine in November 2016.

Static water level data indicates that a groundwater mound has developed in the water table beneath the unlined TSF and duck pond at Wessels Mine. This may be in response to the leakage into permeable Aeolian sands and calcretes that occur at the Wessels Mine, where groundwater levels have increases between 10 – 20 m (GHT, 2017). The groundwater mound increases the hydraulic gradient of the mine, which increases the migration rates of potential contaminants. The groundwater mound at Wessels Mine has increased in size underneath the tailings and duck pond dams, due to seepage and artificial recharge; although recent data suggests that, the mound is decreasing, with artificial recharge stabilising (GHT, 2017).

Seepage and leakage from the Wessels sewage plant resulted in groundwater levels fluctuating in the past, indicating that the seepage and leakage of the plant has assisted in artificial recharge of the underlying aquifer. Recent data from monitoring boreholes indicates that the rate of groundwater elevation is decreasing near the sewage treatment plant. Decreasing water levels around the Wessels vent shaft were indicative of the formation of a dewatering cone during the construction; however, the water levels are recovering from the localised dewatering impacts of the construction of the vent shaft (GHT, 2017).

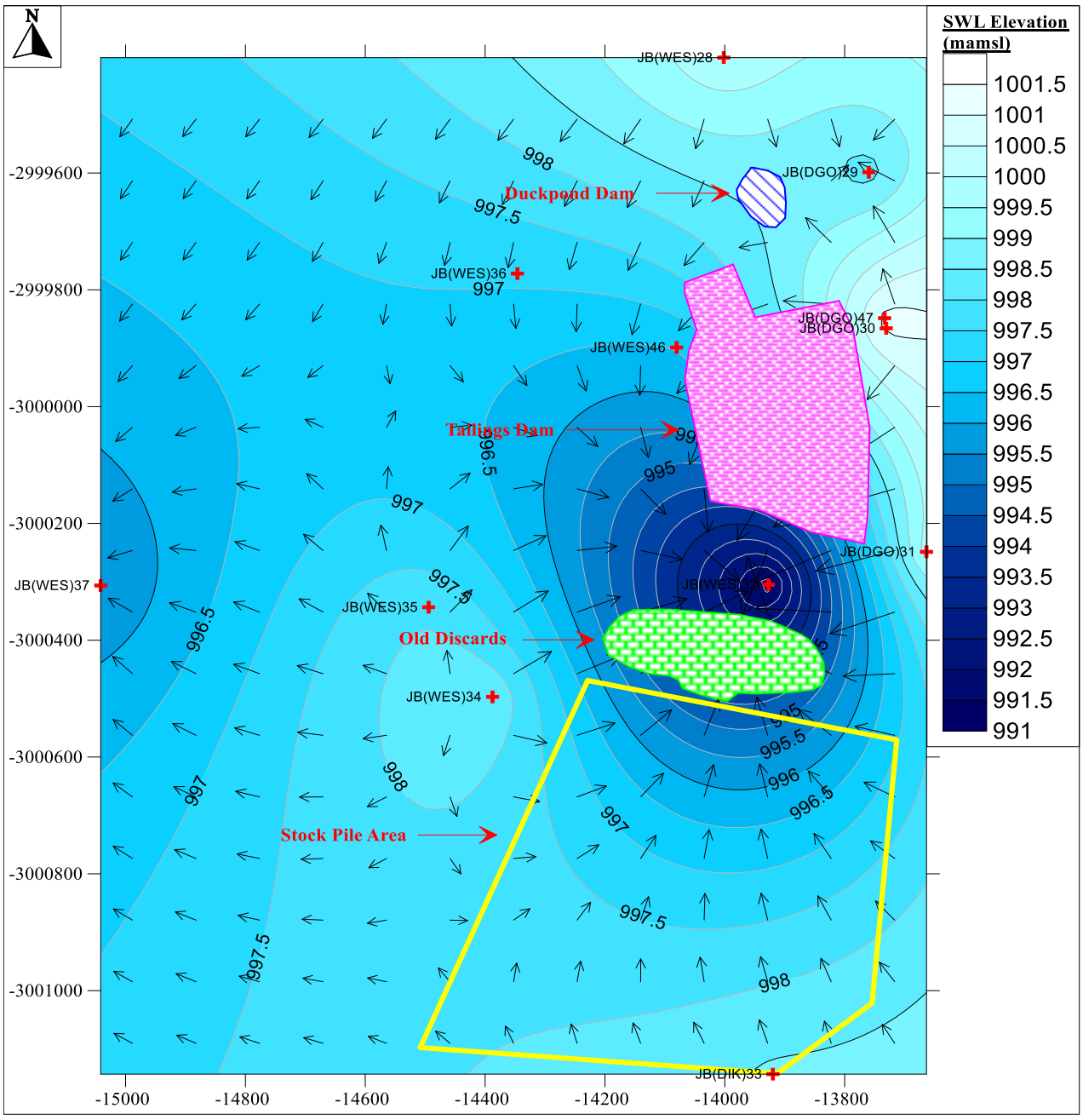


Figure 14: Groundwater elevations in November 2016 for Wessels Mine (GHT, 2017)

The average groundwater elevation on-site on the Wessels Mine is 998.3 mamsl (meters above mean sea level) and the average groundwater elevation of the farm hydrocensus boreholes 996.7 mamsl, which is of similar elevation. The average depth of the groundwater table at Wessels Mine is 40.90 mbgl (meters below ground level) and for the farm boreholes the average is 39.30 mbgl.

Numerical modelling conducted by GHT Consulting (2017) indicated that the regional groundwater table of the unconfined / semi-confined aquifer is mimicking the topographical elevations. No dewatering impacts are evident regionally. The regional groundwater flow direction is towards north east towards the Ga-Mogara non-perennial river, which is also the regional drainage direction. This means that the dewatering is only occurring locally on the mine concession due to seepage at the shaft, vents shafts and pumping at the new north vent shaft. Currently the radius of influence is

about 1 km and the depth of the dewatering cone is 8 metres deep relative to the background groundwater level of the area.

Biodiversity: Flora

Advisian (2017) compiled a biodiversity assessment and Biodiversity Management and Action Plan for Wessels Mine. A description of the major findings was extracted from the Biodiversity Action and Management Plan (Advisian, 2017).

Regional Context

The vegetation of the Wessels Mine site falls within the north-eastern range of the Griqualand West Centre of Endemism (Van Wyk & Smith 2001). The Griqualand West Centre (GWC) is one of the 84 African centres of endemism and one of 14 centres in southern Africa, and these centres are of global conservation significance. Endemics and near-endemics include Searsia tridactyla, Aloinopsis orpenii, Euphorbia planiceps, Euphorbia bergii, Lebeckia macrantha, Lithops aucampiae subsp. aucampiae and Tarchonanthus obovatus.

Local Context

An overview study of the plant communities within the Wessels Mine properties revealed the following vegetation units. Which may be considered as representative of the mining site in general (Advisian, 2017).

Vachellia erioloba – Vachellia haematoxylon woodland: This vegetation unit occurs throughout large sections of the Mining Right Area, although only two small pockets occur inside the Mining Area of the Wessels Mine to the south of the entrance road and to the North-east of the Duck Pond area in the Northeast of the mining area. The woody structure is open woodland dominated by the protected tree species Vachellia erioloba and Vachellia haematoxylon. The herbaceous layer is medium dense and dominated by species such as Stipagrostis uniplumis, Eragrostis pallens and Schmidtia kalaharense.

Mixed Senegalia mellifera –Vachellia erioloba – Vachellia haematoxylon woodland:
Isolated areas of the mine is characterised by mixed microphyllous woodland. These areas form an undulating landscape with calcrete outcrops overlain by Aeolian sand (dunes). The vegetation are characterised by equal density of Vachellia erioloba and Vachellia haematoxylon on the deeper sandy areas, while Senegalia mellifera dominate where the calcrete bedrock are closer to the surface. The shrub species Grewia flava occur on low-lying areas where higher clay content occurs in the soil. Typical grass species associated with the area include Stipagrostis species, Enneapogon scabra and Schmidtia kalahariense.

Senegalia mellifera thickets / bushclumps: This vegetation unit occurs in pockets where the calcrete bedrock is closer to the surface, although still overlayed by kalahari sands. The bushclumps are almost completely dominated by Senegalia mellifera (black thorn). A poor grass layer occurs in and around the bushclumps as a result of overgrazing. The habitat type can be considered degraded. No red data species occurs; probably as a result of the habitat being different compared to the potential red data species that could occur.

Degraded Grassland**:** This vegetation unit occurs throughout the mining areas and represent degraded grassland in a secondary state of succession. Most of the areas were previously degraded for mining related activities. Secondary grasslands are those that have undergone extensive modification and a fundamental shift from their original state, but have then been allowed to return to a 'grassland' state. Although secondary grasslands may superficially look like primary grasslands, they differ with respect to species composition, vegetation structure, ecological functioning and the ecosystem services they deliver. These grasslands are still in an early successional state, although somewhat older (older than 5 years) with several grass species like Enneapogon cenchroides, Aristida junciformis, Aristida congesta s. congesta and Eragrostis echinchloidea. The herbaceous layer is characterised by dense stands (density 60-70%) of climax grasses of medium height (0.6-1.2m).

Drainage Features: One specific drainage feature was clearly distinguished on the Wessels Mine property, namely the depression (Duck Pond) and associated riparian woodland dominated completely by Prosopis glandulosa. The Duck Pond is classified as an artificial wetland system according to the classification by SANBI and specifically a man-made endorheic depression. The vegetation associated with depressions is mostly sedges and bulrushes depending on the depth of the water and the substrate. Species such as Phragmites australis (reeds) almost completely dominated the inside of the dam on a muddy substrate, while the alien invasive Prosopis and other aliens such as Tamarisk and Lantana dominate the outside of the pond.

The only species of conservation concern that was found on the Wessels Mining area is the tree species Vachellia erioloba, although this species is also listed as protected under the National Forest Act. Other RED DATA species such as Harpagophytum procumbens (Devil's claw) or Nerine laticoma were not documented on site, although these species are geophytes and might have been dormant during the surveys. Tree species; Vachellia erioloba; Vachellia haematoxylon and Boscia albitrunca are located in the area, and are protected in terms of the National Forest Act (1998). Obtaining relevant permits are required prior to any impact on these individuals.

Biodiversity: Fauna

Mammals: Large mammals that occurred historically at the site, are absent from the area, owing to anthropogenic impacts in recent centuries. The mammals are mostly represented by generalised species such as rodents, scrub hares and smaller antelope (steenbok, common duiker) that will move through the area while foraging. The close proximity of the informal settlements does however place constant pressure on these mammal populations and many of these populations will eventually disappear from the area completely.

Birds (avifauna): Three major bird habitat systems were identified within the borders of the study site namely microphyllous woodland, degraded grasslands and the Duck Pond wetland area. Microphyllous woodland usually supports much higher bird numbers compared to the broadleaved woodlands. The area represents microphyllous woodland and supports many smaller bird species such as Ashy Tit, Pied Babbler, Kalahari Robin, Burntnecked Eremomela, Desert Barred Warbler,

Marico Flycatcher, PiritBatis, Crimsonbreasted Shrike, Longtailed Shrike, Threestreaked Tchagra, Great Sparrow, Whitebrowed Sparrowweaver, Scalyfeathered Finch, Violeteared Waxbill and Blackcheeked Waxbill. The broadleaved woodland occurring in the study area has quite a higher diversity of birds as a result of the crossover of habitats. Typical examples of broad-leaved-woodland birds are Pallid Flycatcher, Greencapped Eremomela, White-bellied Korhaan and Meyer's Parrot.

Degraded grasslands represents a significant feeding area for many bird species in any landscape. The Duck Pond is an extremely important source of water for most bird species and will be regularly utilised not only as a source of drinking water and food, but also for bathing.

Herpetofauna (Reptiles and Amphibians): Typical species associated with arid and semi-arid habitat types occur in the study area. Venomous species such as the puff adder and cape cobra is expected to occur in the study area, although the presence of these snakes is dependent on the presence of their prey species (rodents, frogs etc.). The general habitat type for reptiles consists of open shrubveld and grassland with limited available habitat for diurnally active and sit-and-wait predators, such as terrestrial skinks and other reptiles. The amphibians appear to be poorly represented on site and the artificial dam represent the only suitable habitat for the few amphibian species that could occur in the area. No threatened species occur in the area.

No traps were set for the scope of this study, but Advisian (2017) gives a list of potentially occurring fauna in the area in the full text of the Biodiversity Action and Management Plan.

Archaeology

Matakoma Heritage Consultants undertook a heritage assessment in September 2005, as a requirement from the South African Heritage Resources Association (SAHRA) for the EMPr. The purpose of the survey was to identify all heritage sites, document and assess the importance thereof within local, provincial, and national context, in order to preserve, protect and develop the heritage resources within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (Matakoma Heritage Consultants, 2005).

The utilisation of archived data stored in both the National and Transvaal Archives assisted in the compilation of a data list of potential archaeological sites, historical sites, graves, architecture, oral history and ethnographical information on the inhabitants of the area (Matakoma Heritage Consultants, 2005). Physical surveys were performed due to the nature of cultural remains that occur below surface. Aerial photographs and 1:50 000 maps of the area were consulted and literature of the area were studied prior to the survey, in order to identify areas of possible historic and prehistoric activity. During the survey numerous local inhabitants were consulted on the presence of graves and old settlements in the survey area. However no indications of the presence of these were given (Matakoma Heritage Consultants, 2005).

The significance of various potential cultural sites was evaluated utilising the specific criteria, namely, site integrity, amount of deposit, range of features, uniqueness and potential to provide answers to present research questions (Matakoma Heritage Consultants, 2005). Following the survey, no sites

of cultural significance were identified within the mining lease area of Wessels Mine. However, it is incumbent upon the developer to inform the relevant heritage agency should further cultural remains be unearthed or laid open during the process of development. The Heritage Assessment Report provides broad management guidelines for the discovery of cultural heritage sites or objects for inclusion into the Management Program (Matakoma Heritage Consultants, 2005).

Socio-economic

Wessels Mine is located within the Joe Morolong Local Municipality (NC451), situated within the John Taolo Gaetsewe District Municipality (DC45) of the Northern Cape, South Africa (Stats SA, 2016). The Northern Cape Province is considered one of the largest provinces within the country; however, it hosts the smallest population, with a density of approximately one person per square kilometre. Mining activities are considered as the key economic drivers within the Northern Cape, contributing nearly 7% of South Africa's total mining value and contributes 23.4% to the province's total economy (Stats SA, 2016). The John Taolo Gaetsewe District Municipality (DC45) is comprised of three local municipalities, namely Joe Morolong, Gamagara and Ga-Segonyana local municipalities. This district is comprised of 186 towns and settlements, of which 80% are villages. A mixture of land uses occurs within this district, of which agriculture and mining are dominant (Taolo Gaetsewe Municipal Website, 2017).

The Joe Morolong Local Municipality (NC451) comprises an area of approximately 6 million hectares and faces expansive service delivery challenges. The area is considered as predominantly rural, with approximately 60% of the land surface comprised of virgin land. The local population within this district is female dominated (Figure 15), with the majority of households being female headed (Figure 16). The population distribution (Figure 17) indicates that the local population within this municipality is predominantly black African, with less than 3 % of the local population belonging to other racial groups (Joe Morolong Municipal Website, 2017).

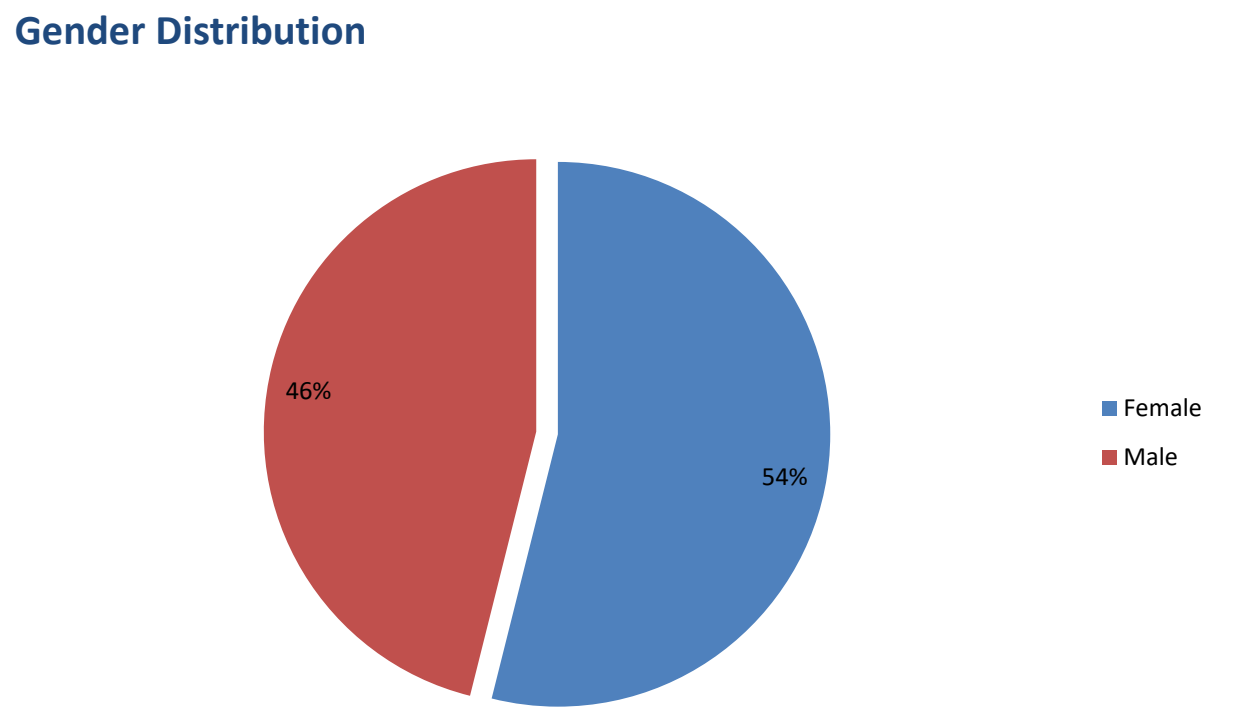


Figure 15: Gender Distribution of Local Population within the Joe Morolong Local Municipality

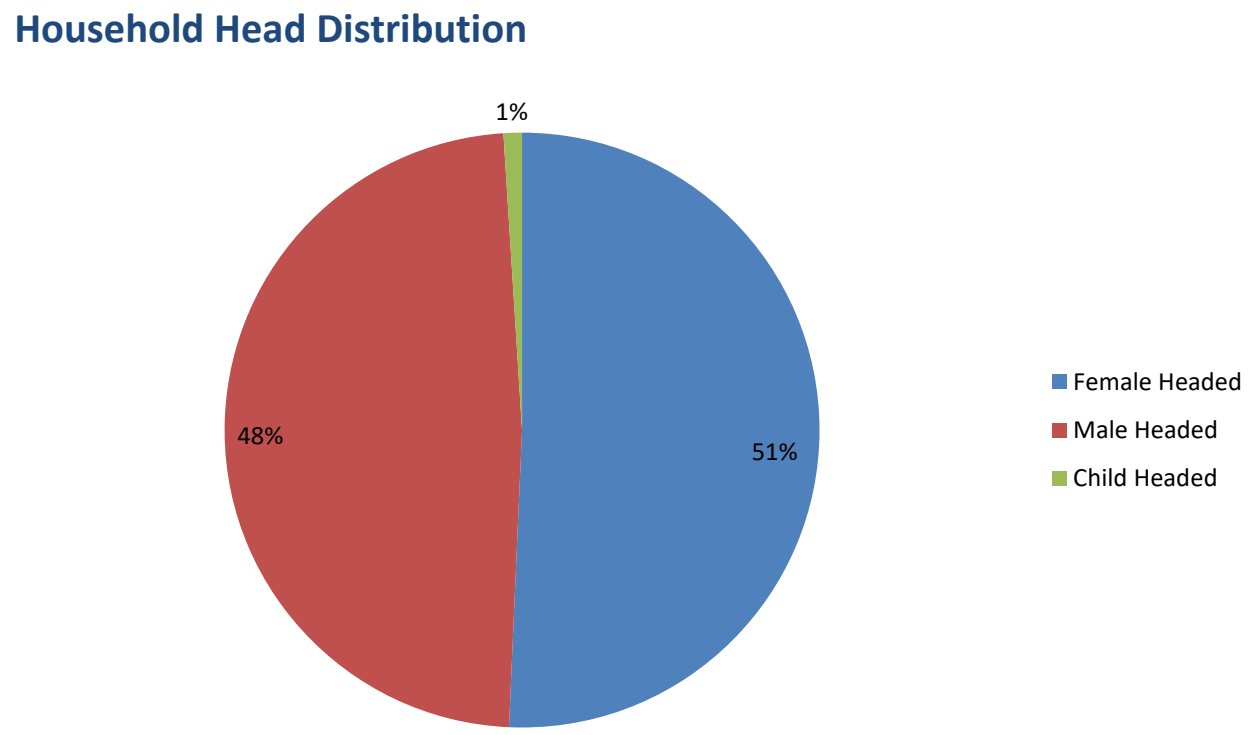


Figure 16: Household Head Distribution within Joe Morolong Local Municipality

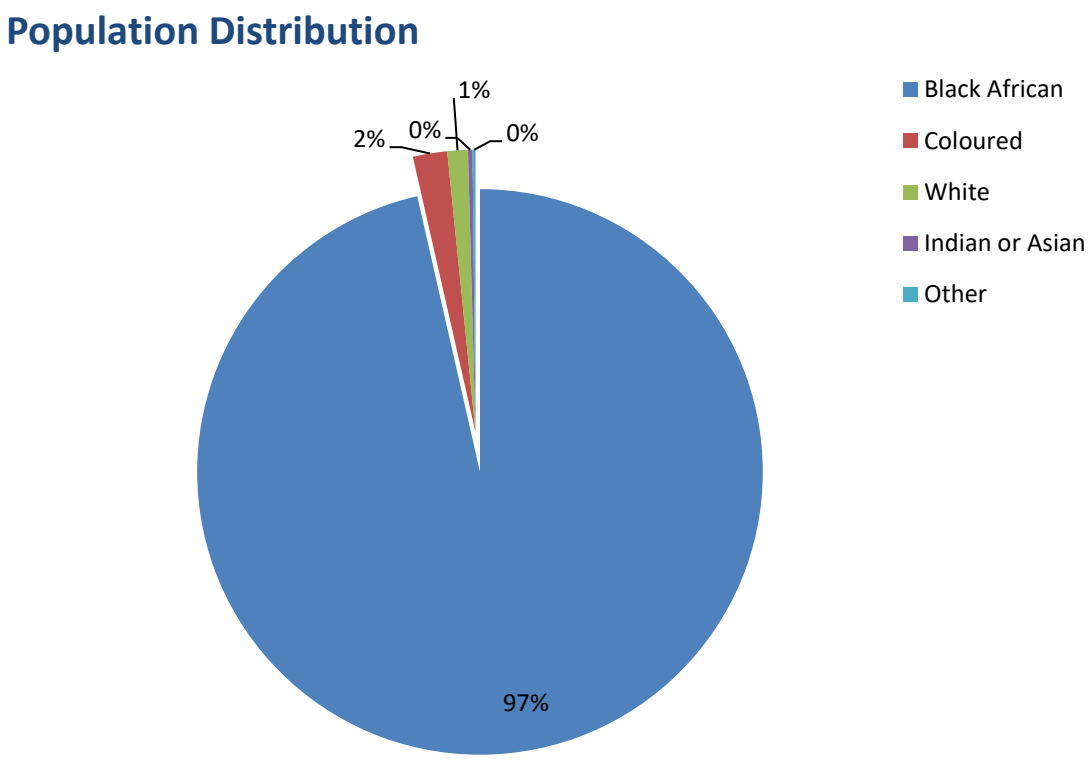


Figure 17: Population Distribution within the Joe Morolong Local Municipality

The municipality is considered the poorest within the John Taolo Gaetsewe District Municipality, likely due to the negative population growth, poor infrastructure, low local employment rates and poor infrastructure. The population within this municipality is below 100 000, and the negative growth rate is attributed to the low employment rate within the municipality (Figure 18), resulting in members of the population potentially migrating towards larger economic centres which offer higher potential employment opportunities (NC451 Draft IDP 2016-17). The high number of female-headed households may be attributed to men moving away for employment whilst the females remain behind.

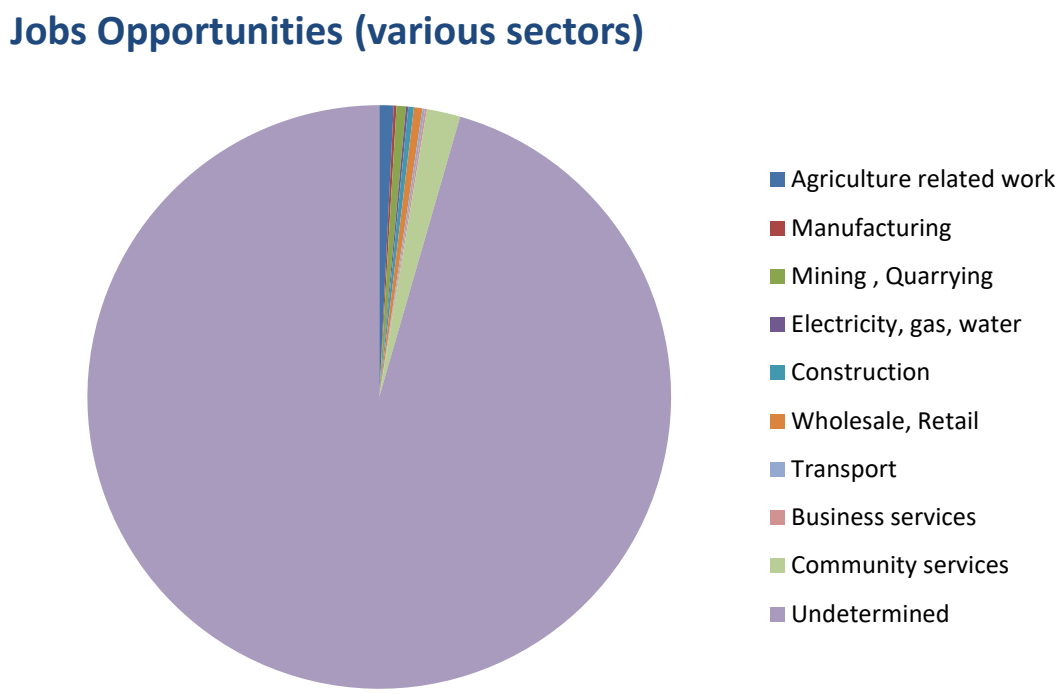


Figure 18: Job Opportunities from Various Sectors within the Joe Morolong Local Municipality

The employment rate within the municipality is significantly low, with only 9 % of the total local population being employed (NC451 Draft IDP 2016-17), while approximately 45 % of the population are unemployed, job seeking or not economically active (Figure 19). The remaining 46 % of the population are not applicable for employment, presumably being minors. Poverty levels within the local municipality are high, with less than 8.9 % earning above R 1 600 monthly, indicating that the majority of the local population rely on grants as the main source of income (JG Afrika, 2016).

Employment Statistics

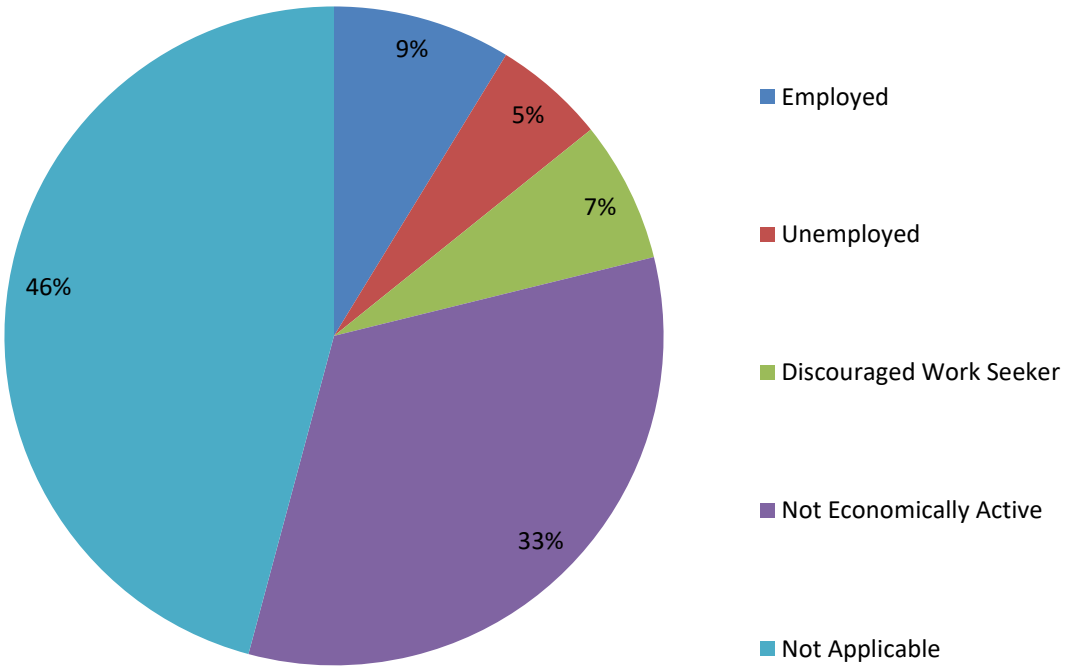


Figure 19: Employment statistics for the Joe Morolong Local Municipality

The education levels within this municipality are considerably low, with 50 % of the population not completing primary school (Figure 20). Of the population, only 13 % have completed Grade 12, whilst only 4 % have obtained some form of tertiary education. The low level of education within this municipality would have a negative effect on the economic growth due to the low number of skilled individuals. Low literacy levels and insufficient access to quality education are identified as key factors contributing to the poverty within this municipality (NC451 Draft IDP 2016-17).

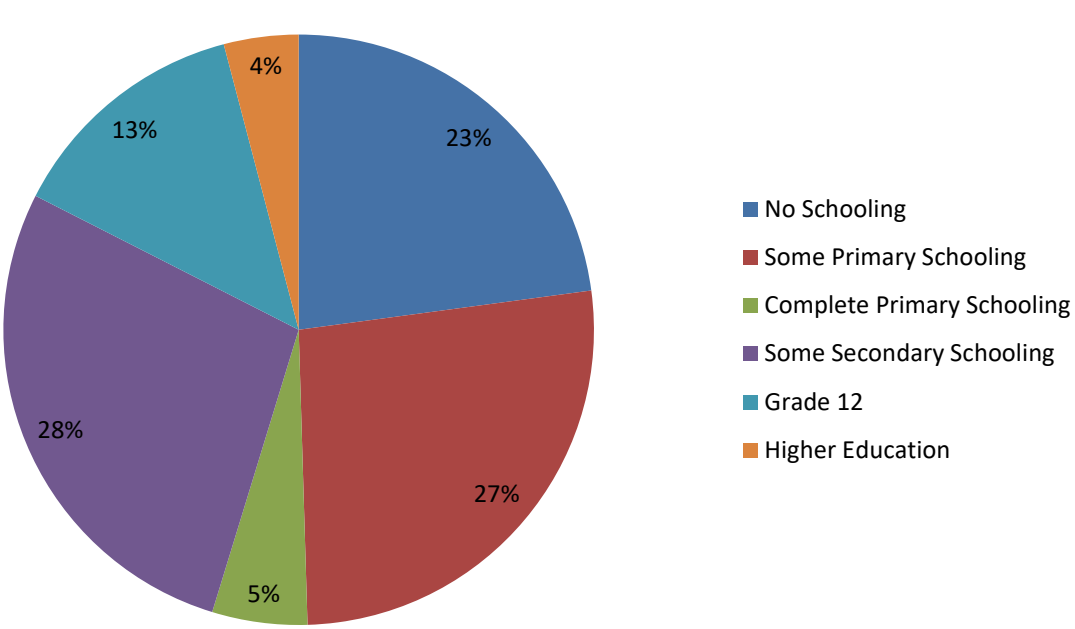


Figure 20: Education Statistics for the Joe Morolong Local Municipality

Within the local municipality, South32 has committed to a variety of social development plans in collaboration with the Department of Mineral Resources (DMR), Department of Roads and Public Works (DRPW), and Department of Energy (DoE) to improve the livelihoods of the local population. Some of the social development plans are focused at improving infrastructure, such as the construction and upgrade of the R31 between Kuruman and Hotazel and of new roads for the Tsineng area, both of which will benefit the local population as well as provide employment opportunities during the construction phase of these projects. Other infrastructure projects include the access of water to the Kanana community, which will also provide local employment opportunities during the construction phase. South32 invests in a multitude of education social development plans, ranging from the construction and upgrade of a school, Rearata Primary, investments in both Hotazel Primary and Hotazel Combined schools, provision of bursaries for post grade 12 learners, and investing in math and science educators and learning centres for the region (South32, 2016).

b) Description of the current land uses.

The proposed project is concerned with updating the Environmental Management Programme (EMPr) for the entire mining operation for HMM Wessels Mine. This project is therefore applicable to the existing Mining Right area (approved as per reference NC/30/5/1/2/3/2/1/ (253) MR), with mining being the only current land use activity.

The surrounding land cover map, depicting areas around the HMM Wessels Mine can be seen in Figure 21. It is apparent that the most significant activity is mining in the area. The area is also dominated by undeveloped land / low intensity grazing (woodland/ open bush, grassland and low

shrub land). A portion of the area is also comprised of infrastructure related to urban developments (industrial, residential and recreational areas).

c) Description of specific environmental features and infrastructure on the site.

There are no significant environmental features on the HMM Wessels Mine, since most of the mine concession is utilised for mining. The surface layout (as shown in Figure 2) illustrates that most of the mining concession is comprised of disturbed land. The closest attributes to the HMM Wessels Mine are two non-perennial rivers; namely the Kuruman (13 km) and Ga-Mogara River (4.7 km) (Knight Piésold, 2017). Please refer to **Part A (iv)** for a detailed description concerned with the environmental baseline of the HMM Wessels Mine. Significant infrastructure on site is detailed in **Part A, Section (d) (ii).** The significant surface infrastructure is listed as follows:

- Stockpile areas
- Waste rock dumps
- Explosives magazine
- Duck pond/ Return water dam
- Tailings Storage Facility
- Surface wash and screen plant
- Ventilation shaft
- Decline shaft
- Sewage plant
- Administration blocks (training centres, laboratory, security and administration offices, hostel area, workshops, mine store etc.)
- Diesel bay
- Oil separator
- Load out station
- Eskom sub-station
- Waste yard.

d) Environmental and current land use map.

(See Figure 21 below)

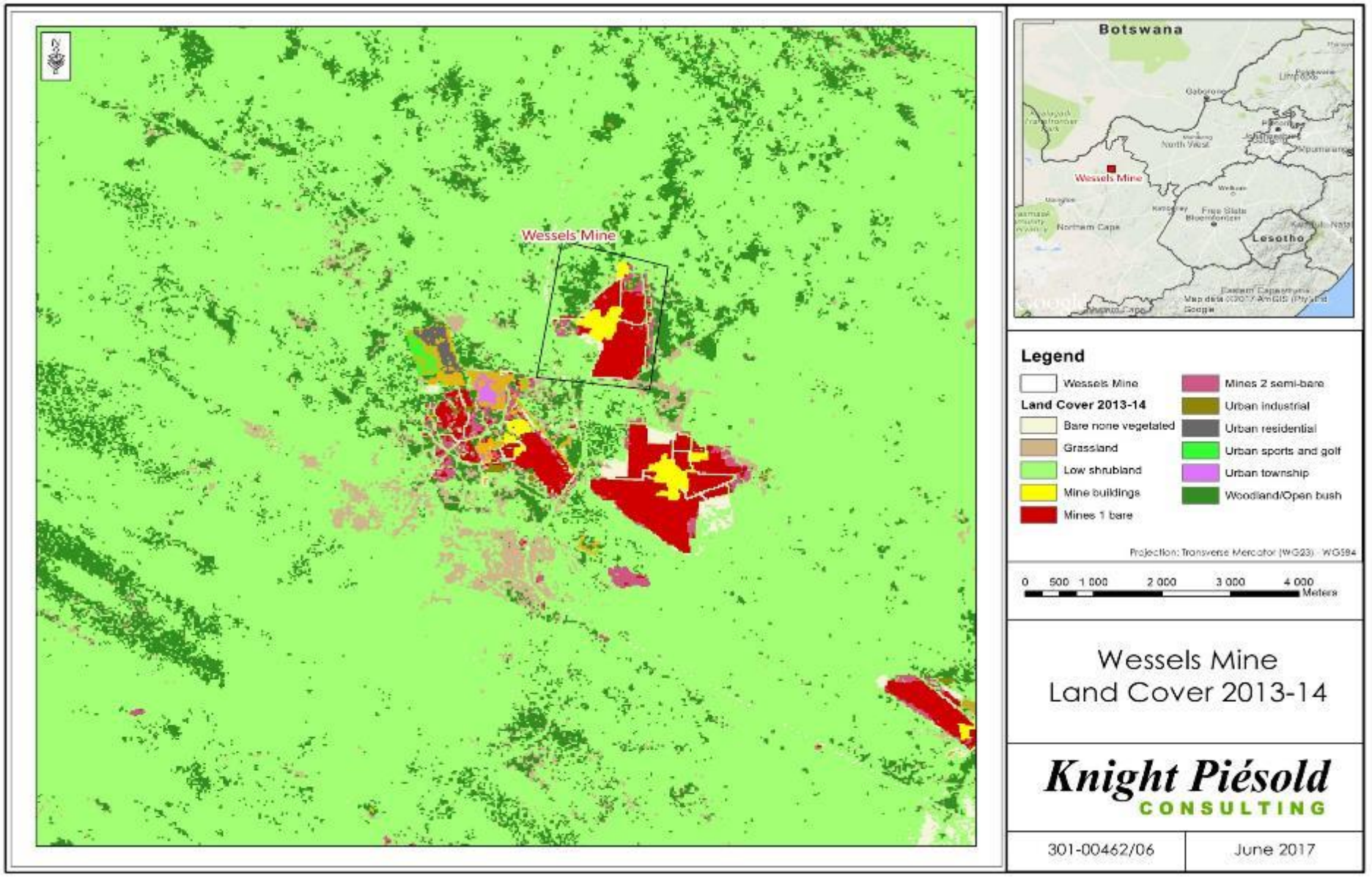


Figure 21: Land use map for area around HMM Wessels Mine

v) **Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts**

Table 6: Impacts and significance ratings pre-mitigation

Activity	Potential impact	Phase	Significance before mitigation						
			M	R	D	S	P	TOTAL	SP
SURFACE WATER									
Mining Activities	Catchment reduction: The mining operations and facilities will reduce the catchment area that feeds the local water resources. The flow that reports to the river system will be reduced.	Operational	1	3	5	3	3	36	M
	Erosion and sediment accumulation in impoundments: It is likely that there will be significant quantities of sediment generated by extreme rainfall events, which may result in erosion and loss of capacity in the dams.	Operational	4	3	2	1	5	50	M
	Contamination of receiving environment: Potential discharge of oil contaminated surface water into the receiving environment at points of generation or from storage areas.	Operational	1	5	2	3	1	11	L
	Contamination of ground water: Potential seepage of contaminated surface water into the receiving ground water environment at unlined dams.	Operational	4	3	4	3	4	56	M
	Climate Change: Increase in surface water evaporation.	Operational	1	3	5	1	2	20	L
	Use of tailings material for creating berms: Contamination of surface water.	Operational	4	3	4	2	4	52	M
	Creating of open areas due to vegetation, topsoil and /or infrastructure removal: Increase surface water runoff.	Closure	4	3	2	1	5	50	M
Mine Decommissioning	Contamination of surface water.	Closure	2	3	2	3	2	20	L
	Localised ponding of water.	Post-closure	1	1	1	1	3	12	L
GROUND WATER									
Storage of Explosives	Explosives Magazine: Spillages or leakages of explosives liquids may cause groundwater contamination (increase in nitrates).	Operational	1	1	4	1	2	14	L
Storage of Hydrocarbon Material and Fuel	Surface Oil Skimmers, Hazardous Waste Hardstands, Re-Fuelling Bays, and Leaking Mine Vehicles of All Types: Fuel & hydrocarbons spillages may cause groundwater contamination.	Operational	1	3	4	1	3	27	L
RWD Storage of Dirty / Process Water	Water contained in dirty water dams may affect groundwater quality by means of seepage to underlying receiving aquifer (increase salt loading to aquifer).	Operational	2	1	5	1	4	36	M
Tailings Disposal Area of Waste Rock Fines	Volume of leachate seeping to underlying receiving aquifer.	Operational	2	3	5	1	4	44	M
	Water quality of leachate seeping to underlying receiving aquifer.		2	3	5	2	4	48	M
Old Waste Yard Groundwater contamination1	Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping to underlying receiving aquifer may cause groundwater contamination.	Operational	1	1	5	1	1	8	L
Waste Handling and Storage Facility Groundwater contamination1	Waste Separation & Temporary Storage Facility (Domestic & Hazardous Waste): Possible spillages or rainfall events may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Operational	1	3	4	1	2	18	L
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	North and South Waste Rock Discard Stockpiles [Coarse Grained Material], (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from the waste rock stockpiles, in terms of volume and water quality leachate (increase salt loading to aquifer).	Operational	2	3	5	1	2	22	L
Stockpile Area Groundwater contamination1	Product stockpile Area: Potential for groundwater contamination due to seepages from the stockpiles, in terms of volume and water quality leachate (increase salt loading to aquifer).	Operational	3	3	4	1	3	33	M
Treatment and Storage of Sewage Water	Sewage Treatment Works and Evaporation Ponds for treated sewage effluent: Possible spillages and leakages from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Operational	1	1	4	1	2	14	L
Pumping of groundwater from the Wessels Underground sections.	Reduction of borehole/ aquifer yields of I&APs as a result of dewatering due to the influx into the underground mining sections.	Operational	1	1	1	1	1	4	L

Activity	Potential impact	Phase	Significance before mitigation						
			M	R	D	S	P	TOTAL	SP
	Ingress of water into the underground sections may cause safety concerns. The higher volume of influx water, the higher the associated pumping costs and dewatering impacts during life of mine.	Operational	2	1	1	3	2	14	L
	Underground workings water or ingress water quality. Ingress water may be exposed to waste rock ore as well as potential hydrocarbons from mechanical workshops, which may degrade the water quality of the water. Use of diesel machinery in trackless (mechanized) mining results in fuel and oil spills, which create a problem in the underground settlers and may give rise to groundwater contamination problems on the surface when the water is utilised as process water in the surface plant.	Operational	3	3	5	1	3	36	M
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	Plant Area (plant facilities where water containing waste are stored and managed, which includes surface reservoirs of the UG water storage, clarifier dam and thickener dam): Possible spillages or leaking dams or slurry pipelines may cause groundwater contamination (increase salt load into aquifer)	Operational	1	1	4	1	2	14	L
Storage of Dirty Water in an Evaporation Dam	Evaporation Ponds for treated oil Skimmer Effluent (Lined): Possible spillages or leaking ponds may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Operational	1	3	4	1	2	18	L
Storage of Explosives	Explosives Magazine: Spillages or leakages of residual explosive liquids may cause groundwater contamination (increase in nitrates).	Closure	1	1	3	1	1	6	L
Storage of Hydrocarbon Material and Fuel	Surface Oil Skimmers, Hazardous Waste Hardstands, and Refuelling Bays, leaking Mine Vehicles of All Types: Residual fuel and hydrocarbons may cause groundwater contamination.	Closure	1	3	3	1	1	8	L
RWD Storage of Dirty / Process Water	Duck pond Dam (Return Water Dam of the TSF): Seepage from RWD to underlying receiving aquifer.	Closure	2	1	5	1	3	27	L
Tailings Dam Disposal Area of Waste Rock Fines	Volume of leachate seeping into the underlying receiving aquifer.	Closure	2	3	5	1	3	33	M
	Quality of leachate seeping into the underlying receiving aquifer.	Closure	2	3	5	2	3	36	M
Old Disposal Area of Domestic Waste	Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping into the underlying receiving aquifer may cause groundwater contamination.	Closure	1	1	5	1	1	8	L
Temporary Storage of Hazardous and Domestic Waste	Waste Separation and Temporary Storage Facility (Domestic and Hazardous Waste): Residual or leftover contaminants may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Closure	1	3	3	1	1	8	L
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	North and South Waste Rock Discard Stockpiles (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from waste rock stockpiles, in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).	Closure	1	3	5	1	2	20	L
Stockpile Area	Product Stock Pile Area: Potential for groundwater contamination due to seepages from waste rock stockpiles, in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).	Closure	2	3	5	1	3	33	M
Treatment and Storage of Sewage Water	Sewage Treatment Works: Residual waste material from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Closure	1	1	2	1	1	5	L
Potential Decants at Wessels Mine Shaft, Vents Shaft and Decline	Mine Shaft, Decline and Vent Shaft: Underground mines that flood and discharge contaminated water from one or more shafts, boreholes, geological features, etc., into the surface or ground water resource. The topography and the floor contours of the Wessels UG confirm that no decant will take place after closure. The 2016 hydro census static groundwater elevations of the surrounding privately owned farm boreholes of the I&APs and the mine monitoring boreholes has indicated that no dewatering cone exists in the upper receiving aquifer.	Closure	1	1	1	1	1	4	L

Activity	Potential impact	Phase	Significance before mitigation						
			M	R	D	S	P	TOTAL	SP
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	Plant Area (areas where water-containing wastes are stored and managed, which includes Surface Reservoirs of the UG water, Thickener Dam and Leaking Process Water Pipe Lines): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Closure	1	1	2	1	1	5	L
Storage of Dirty Water in an Evaporation Dam and Evaporation Ponds	Evaporation Ponds for Treated Oil Skimmer Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Closure	1	3	3	1	1	8	L
	Evaporation Ponds for Treated Sewage Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Closure	1	1	3	1	1	6	L
AQUATIC ECO-SYSTEMS									
Surface Water Runoff	Deterioration of aquatic ecosystem	Operation	3	3	5	3	1	14	L
	Deterioration in water quality	Operation	3	3	5	3	1	14	L
BIODIVERSITY - Flora									
Mining operations	Disturbance of protected floral species	Operation	1	3	4	1	3	27	L
Mining operations and vegetation clearing	Habitat Destruction	Operation	4	3	4	2	1	13	L
Mining operations and rehabilitation of disturbed areas	Increase in colonisation of alien invasive plants: The barren and disturbed areas around the mine during the operational phase will increase the likelihood for colonisation of alien/invasive floral species. During the rehabilitation phase, the clearing of surface infrastructure will create disturbed areas, thereby increasing the potential for colonisation of alien invasive species.	Operation and Closure	2	3	4	1	3	30	M
BIODIVERSITY - Fauna									
Mining operations	Loss of faunal species due to poaching and increased accessibility	Operation and closure	1	3	4	2	1	10	L
Mining operations and vegetation clearing	Habitat Destruction	Operation	4	3	4	2	1	13	L
VISUAL IMPACT									
WRD, Tailings facility and stockpiles operation	The operation of surface infrastructure such as the administration area, WRDs, TSF and stockpiles creates a negative visual impact when compared to the surrounding landscape; however, the impact is confined to the mining area only.	Operation	3	3	4	1	5	55	M
Rehabilitation	Demolition and removal of surface infrastructure will have a positive visual impact (positive)	Closure	2	5	5	1	3	39	M+
HERITAGE									
Mining Activities	Extraction of ore underground during mining operation as well as the associated surface activities may disturb culturally significant features and artefacts	Operation and Closure	1	5	5	1	1	12	L
SOCIO-ECONOMIC									
Blasting	Noise from blasting may pose an occupational hazard for exposed labourers.	Operation	2	5	4	2	2	26	L
Increase in ambient noise levels	Surface activities, disposal of waste rock and tailings, mineral processing.	Operation	2	1	4	2	4	36	M

Activity	Potential impact	Phase	Significance before mitigation						
			M	R	D	S	P	TOTAL	SP
Economic impact of job creation (positive)	Direct employment of workers for surface and underground mining, disposal of waste rock and tailings, mineral processing and associated support services	Operation	5	3	4	3	5	75	H+
Demolition and removal of surface infrastructure	Increase in ambient noise levels.	Closure	2	1	1	2	4	24	L
Mining operations	Employment of workers, generation of secondary economic benefits (positive).	Operation	5	3	4	3	5	75	H+
Rehabilitation: Levelling and contouring of areas to be rehabilitated, replacement of topsoil	Dust and inhalable particulates may affect the environment and human health.	Closure	4	3	1	2	4	40	M
Mine closure	Economic impact of retrenchment and increase in unemployment, impact on secondary economic activities (business, goods and services).	Closure	5	3	4	3	5	75	H
	Reduction of institutional capacity to manage social infrastructure.	Closure	5	5	5	3	4	72	H

vi) **Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;**

Knight Piésold uses a simple, clearly defined method in order to accurately determine the significance of the predicted impact on, or benefit to, the surrounding natural and/or social environment. An impact assessment will contain a degree of subjectivity, as it is based on the value judgement of various specialists and Environmental Assessment Practitioners. The evaluation of significance is contingent upon values, professional judgement and dependent upon the environmental and community context. Ultimately, impact significance involves a process of determining the acceptability of a predicted impact to society.

The purpose of the impact assessment is to identify and evaluate the likely significance of the potential impacts on identified receptors and resources according to defined assessment criteria. This is used to develop and describe measures that will be taken to avoid, minimise, reduce or compensate for any potential adverse environmental effects and to report the significance of the residual impacts that remain following mitigation.

Methodology

The purpose of this methodological approach to impact assessments serves to identify economic, environmental and social impacts of a potential project and the implications thereof which need to be taken into account during the planning stages. By predicting possible impacts during project planning and design, it provides the project planners with the opportunity to reduce adverse impacts and to provide alternatives to the decision makers of the project. By utilising this methodology, both environmental and economic targets can be reached, such as reducing cost and time of project implementation and design, avoided treatment/clean-up costs and impacts of laws and regulations, and finally, assisting with client approval of proposed projects.

Defining the Nature of the Impact

An impact is essentially any change to a resource or receptor brought about by the presence of the proposed project component or by the execution of a proposed project related activity. The terminology used to define the nature of an impact is detailed in Table 7.

Table 7: Impact nature

Term	Definition
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.

Significance rating system: The significance of potential impacts can be determined using the factors described below:

Significance of Impact

The significance of an impact can be derived from the following factors:

- Severity / magnitude M
- Reversibility R
- Duration of impact D
- Spatial extent S
- Probability P

Severity / Magnitude (M): The severity of an impact relates to the degree of alteration of the affected environmental component and it may be very low, low, medium, high, or very high.

Reversibility (R): Reversibility deals with the ability of an environmental component to return to its original characteristics, or close to its original characteristics, after a given environmental change has been caused by a project activity. Depending on the nature of the impact, the effects on the environment may be reversible, recoverable or irreversible. A recoverable impact is one where specific action must be taken in order for the impact to be ameliorated. A reversible impact is one where the impact will be reversed without the application of rehabilitation measures.

Duration (D): Duration is defined by how long the impact may prevail.

Spatial extent (*S*): The extent indicates the geographical scope of the impact over a given environmental or social component. It may be contained to the site only, local, regional, national, or international. A local impact is one that has no immediate or subsequent effect outside of the specific area of the impact. A regional impact is one that has effects outside of the specific area and/or moment of the impact, but within a localised area. A national impact is one that has wide-ranging effects outside of the project area but within a national scope. An international impact is one that has wide-ranging effects that cross international boundaries. Some impacts may transform from one spatial extent to another and be “cumulative”.

Probability (*P*): The probability of occurrence refers to the likelihood of an impact occurring where no mitigation measures have been implemented.

Assessing significance

The Knight Piésold impact significance rating system is based on the following equation:

Significance of Environmental or Social Impact = Consequence x Probability

The consequence of an impact can be derived from the sum of following factors:
Severity / Magnitude – the degree of change brought about in the environment;
Reversibility – the ability of the receptor to recover after an impact has occurred;
Duration – how long the impact may be prevalent; and
Spatial Extent – the physical area which could be affected by an impact

The **severity, reversibility, duration, and spatial extent** are ranked using the criteria indicated in Table 8 and then the overall consequence is determined by adding up the individual scores and

multiplying it by the **overall probability** (the likelihood of such an impact occurring). Once a score has been determined, this is checked against the **significance** descriptions indicated in Table 9.

Mitigation and Residual Impacts

It is expected that for the identified significant impacts, the project team will work with the client in identifying suitable and practical mitigation measures that are implementable. These measures will be fit for purpose, concise and clearly articulated. Mitigation that can be incorporated into the Project design in order to avoid or reduce the negative impacts or enhance the positive impacts will be developed. A description of these mitigation measures will also be included within the Environmental and Social Management Plan (ESMP).

Residual impacts are those impacts, which remain once the mitigation measures have been designed and applied. Once the mitigation is applied, each impact is re-evaluated (assuming that the mitigation measure is effectively applied) and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

Table 8: Ranking Criteria

Severity / magnitude (M)	Reversibility (R)	Duration (D)	Spatial extent (S)	Probability (P)
5 – Very high – The impact causes the characteristics of the receiving environment/ social receptor to be altered by a factor of 80 – 100 %	5 – Irreversible – *Environmental* - where natural functions or ecological processes are altered to the extent that it will permanently cease. *Social* - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.	5 – Permanent - Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	5 – International - Impacts that affect internationally important resources such as areas protected by international conventions, international waters etc.	5 – Definite - The impact will occur.
4 – High – The impact alters the characteristics of the receiving environment/ social receptor by a factor of 60 – 80 %		4 – Long term - impacts that will continue for the life of the Project, but ceases when the Project stops operating.	4 – National - Impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.	4 – High probability – 80% likelihood that the impact will occur
3 – Moderate – The impact alters the characteristics of the receiving environment/ social receptor by a factor of 40 – 60 %	3 – Recoverable *Environmental* - where the affected environment is altered but natural functions and ecological processes may continue or recover with human input. *Social* - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support or intervention.	3 – Medium term - Impacts are predicted to be of medium duration (5 – 15 years)	3 – Regional - Impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem.	3 – Medium probability – 60% likelihood that the impact will occur
2 – Low – The impact alters the characteristics of the receiving environment/ social		2 – Short term - Impacts are predicted to be of short duration (0 – 5 years)	2 – Local - Impacts that affect an area in a radius of 2 km around the site.	2 – Low probability - 40% likelihood that the impact will occur

receptor by a factor of 20 – 40 %				
1 – Minor – The impact causes very little change to the characteristics of the receiving environment/ social receptor and the alteration is less than 20%	1 – Reversible Environmental - The impact affects the environment in such a way that natural functions and ecological processes are able to regenerate naturally. Social - People/ communities are able to adapt with relative ease and maintain pre-impact livelihoods.	1 – Temporary - Impacts are predicted to be intermittent/ occasional over a short period.	1 – Site only - Impacts that are limited to the site boundaries.	1 – Improbable - 20% likelihood that the impact will occur

Table 9: Significance Definitions

Score According to Impact Assessment Matrix	Significance Definitions	Colour Scale Ratings	
		Negative Ratings	Positive Ratings
Less than 30 significance points indicate Low Significance	An impact of low significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.	Low	Low
Between 30 and 60 significance points indicate Moderate Significance	An impact of moderate significance is one within accepted limits and standards. The impact on the receptor will be noticeable and the normal functioning is altered, but the baseline conditions prevail, albeit in a modified state.	Moderate	Moderate

Score According to Impact Assessment Matrix	Significance Definitions	Colour Scale Ratings	
		Negative Ratings	Positive Ratings
More than 60 significance points indicate High Significance	An impact of high significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An impact with high significance will completely modify the baseline conditions. A goal of the EIA process is to get to a position where the project does not have any high negative residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be high residual impacts after all practicable mitigation options have been exhausted. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.	High	High

vii) **The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.**

The HMM Wessels Mine has an existing Environmental Management Programme which was compiled and approved in 2005. Other listed and waste activities have been authorised under Section 20 of the Environmental Conservation Act, 1989. This proposed activity is concerned with the administrative update of the HMM Wessels. The end use objective is to increase the applicability of the EMPr to the Wessels mining activities. The update is comprised of administrative changes and no changes in mining processes or operation have taken place nor are any changes envisioned in the near future. There will also be no changes to the site layout. There will also be no additional impacts to the receiving community due to the update of the EA and EMPr.

No project alternatives were considered due to the administrative nature of the EA update. However, impacts (positive and negative) associated with the already approved listed activities of the HMM Wessels mining operation has been rated for the purposes of this EA update. In addition, applicable mitigation measures have been proposed for impacts where appropriate (please refer to Table 10 and Table 16).

viii) **The possible mitigation measures that could be applied and the level of risk.**

The only issues raised were from the Department of Water and Sanitation (DWS), see Annexure F. All comments and concerns from the DWS communication are addressed in Summary of issues raised by I&APs (page 41) of this document. The main comments pertain to the implementation of mitigation measures during the pre-construction and construction phase. The HMM Wessels Mine is a fully operational mine and therefore these comments are not applicable to current operations. However, these comments were noted and will be considered during any new developments in the future.

Comments pertaining to the operational and closure phases are addressed in the table; Summary of issues raised by I&APs (page 41) of this document. Where applicable, reference is made to specific sections of this report which addresses measures put in place at Wessels Mine.

ix) **Motivation where no alternative sites were considered.**

The HMM Wessels Mine is an existing mine with no new activities undertaken or planned in the near future. All operations remain the same as stated in the authorised EA. The update of the EA is concerned with administrative changes only to improve the specificity of the EA. As such, no alternatives are applicable for this project.

x) **Statement motivating the alternative development location within the overall site.**

Not applicable in accordance with ix above.

h) **Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity.**

(i) The following specialist investigations informed this Environmental Impact Assessment Report (EIAR):

- Geohydrological Study
- Waste Classification Study
- Surface Water Study

The impacts identified by the specialists were included in the impact table (Table 10). In addition to specialist input, historical data from the HMM Wessels Mine was utilised to determine the baseline conditions at the mine as well as to determine the significance of identified impacts.

(ii) The methodology employed by the EAP to identify, assess and rank the impacts and risks is detailed in Part A (vi) of this report.

i) **Assessment of each identified potentially significant impact and risk**

Table 10: Identified impacts and risk

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Significance (If not mitigated) TOTAL	SP	Mitigation type	Significance (If Mitigated) TOTAL	SP
SURFACE WATER								
Mining Activities	Catchment reduction: The mining operations and facilities will reduce the catchment area that feeds the local water resources. The flow that reports to the river system will be reduced.	Surface water	Operational	36	M	Control through implementation of Stormwater Management Plan	27	L
	Erosion and sediment accumulation in impoundments: It is likely that there will be significant quantities of sediment generated by extreme rainfall events, which may result in erosion and loss of capacity in the dams.	Surface water	Operational	50	M	Use of standard erosion control measures; Implementation of progressive rehabilitation and management measures	4	L
	Contamination of receiving environment: Potential discharge of oil contaminated surface water into the receiving environment at points of generation or from storage areas.	Surface water	Operational	11	L	Control through management and monitoring	4	L
	Climate Change: Increase in surface water evaporation.	Surface water	Operational	20	L	No mitigation possible	45	M
	Use of low grademateriał for creating berms: Contamination of surface water.	Surface water	Operational	52	M	Management measures- Adherence to GN 704 regulations of the National Water Act (36 of 1998).	36	M
	Creating of open areas due to vegetation, topsoil and /or infrastructure removal: Increase surface water runoff.	Surface water	Closure	50	M	Control through implementation of management measures and monitoring	27	L
Mine Decommissioning	Contamination of surface water.	Surface water	Closure	20	L	Control through management and monitoring	20	L
	Localised ponding of water.	Surface water	Post-closure	12	L	Control through implementation of management measures and monitoring	4	L
GROUNDWATER								
Storage of Explosives	Explosives Magazine: Spillages or leakages of explosives liquids may cause groundwater contamination (increase in nitrates).	Groundwater	Operational	14	L	Control through management and monitoring	7	L
Storage of Hydrocarbon Material and Fuel	Surface Oil Skimmers, Hazardous Waste Hardstands, Re-Fuelling Bays, and Leaking Mine Vehicles of All Types: Fuel & hydrocarbons spillages may cause groundwater contamination.	Groundwater	Operational	27	L	Control through management and monitoring	9	L
RWD Storage of Dirty / Process Water	Water contained in dirty water dams may impact on groundwater quality by means of seepage to underlying receiving aquifer (increase salt loading to aquifer).	Groundwater	Operational	36	M	Control through management measures, monitoring and re-use of water	27	L

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Significance (If not mitigated)		Mitigation type	Significance (If Mitigated)	
				TOTAL	SP		TOTAL	SP
TSF Disposal Area of Waste Rock Fines	Volume of leachate seeping to underlying receiving aquifer.	Groundwater	Operational	44	M	Control and minimisation of pollutants through the implementation of Best Practise Guidelines and management measures Removal and selling of tailings	33	M
	Water quality of leachate seeping to underlying receiving aquifer.			48	M		36	M
Old Waste Yard	Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping to underlying receiving aquifer may cause groundwater contamination.	Groundwater	Operational	8	L	Control through monitoring	8	L
Waste Handling and Storage Facility	Waste Separation & Temporary Storage Facility (Domestic & Hazardous Waste): Possible spillages or rainfall events may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Groundwater	Operational	18	L	Control through management and monitoring	9	L
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	North and South Waste Rock Discard Stockpiles [Coarse Grained Material], (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from the waste rock stockpiles; in terms of volume and water quality leachate (increase salt loading to aquifer).	Groundwater	Operational	22	L	Control through management and monitoring and through modifying infrastructure to prevent pollution	20	L
Stockpile Area	Product Stockpile Area: Potential for groundwater contamination due to seepages from the stockpiles; in terms of volume and water quality leachate (increase salt loading to aquifer).	Groundwater	Operational	33	M	Control through management	30	M
Treatment and Storage of Sewage Water	Sewage Treatment Works and Evaporation Ponds for treated sewage effluent: Possible spillages and leakages from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Groundwater	Operational	14	L	Control through management and monitoring	7	L
Pumping of groundwater from the Wessels Underground sections.	Reduction of borehole/ aquifer yields of I&APs because of dewatering due to the influx into the underground mining sections.	Groundwater	Operational	4	L	Control through monitoring	4	L
	Ingress of water into the underground sections may cause safety concerns. The higher volume of influx water, the higher the associated pumping costs and dewatering impacts during life of mine.	Groundwater	Operational	14	L	Control through management, modification of current activity (engineering intervention)	7	L
	Underground workings water or ingress water quality. Ingress water may encounter waste rock ore as well as potential hydrocarbons from mechanical workshops, which may degrade the water quality of the water. Use of diesel machinery in trackless (mechanized) mining results in fuel and oil spills, which create a problem in the underground settlers and may also give rise to groundwater	Groundwater	Operational	36	M	Control through management	33	M

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Significance (If not mitigated) TOTAL	SP	Mitigation type	Significance (If Mitigated) TOTAL	SP
	contamination problems on the surface when the water is utilised as process water in the surface plant.							
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	Plant Area (plant facilities where water containing waste are stored and managed, which includes surface reservoirs of the UG water storage, clarifier dam and thickener dam): Possible spillages or leaking dams or slurry pipelines may cause groundwater contamination (increase salt load into aquifer)	Groundwater	Operational	14	L	Control through management and monitoring	7	L
Storage of Dirty Water in an Evaporation Dam	Evaporation Ponds for treated Oil Skimmer Effluent (Lined): Possible spillages or leaking ponds may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Groundwater	Operational	18	L	Control through management and monitoring	9	L
Storage of Explosives	Explosives Magazine: Spillages or leakages of residual explosive liquids may cause groundwater contamination (increase in nitrates).	Groundwater	Closure	6	L	Control through implementation of rehabilitation measures and monitoring	4	L
Storage Of Hydrocarbon Material and Fuel	Surface Oil Skimmers, Hazardous Waste Hardstands, and Refuelling Bays, leaking Mine Vehicles of All Types: Residual fuel and hydrocarbons may cause groundwater contamination.	Groundwater	Closure	8	L	Control through implementation of rehabilitation measures and monitoring	4	L
RWD Storage of Dirty / Process Water	Duck Pond Dam (Return Water Dam of the TSF Dam): Seepage from RWD to underlying receiving aquifer.	Groundwater	Closure	27	L	Control of pollutants through rehabilitation measures	16	L
TSF Disposal Area of Waste Rock Fines	Volume of leachate seeping into the underlying receiving aquifer.	Groundwater	Closure	33	M	Control through rehabilitation measures and management Control through removal and selling of tailings	20	L
	Quality of leachate seeping into the underlying receiving aquifer.	Groundwater	Closure	36	M	Control through management and monitoring	22	L
Old Waste Yard	Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping into the underlying receiving aquifer may cause groundwater contamination.	Groundwater	Closure	8	L	Rehabilitation	8	L
Waste Handling and Storage Facility	Waste Separation and Temporary Storage Facility (Domestic and Hazardous Waste): Residual or leftover contaminants may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Groundwater	Closure	8	L	Rehabilitation and monitoring	6	L
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	North and South Waste Rock Discard Stockpiles (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from waste rock stockpiles; in terms of the volume and	Groundwater	Closure	20	L	Rehabilitation and monitoring	10	L

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Significance (If not mitigated) TOTAL	SP	Mitigation type	Significance (If Mitigated) TOTAL	SP
	water quality leachate in post closure phase (increase salt loading to aquifer).							
Stockpile Area	Product stockpile area: Potential for groundwater contamination due to seepages from waste rock stockpiles in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).	Groundwater	Closure	33	M	Rehabilitation	4	L
Treatment and Storage of Sewage Water	Sewage Treatment Works: Residual waste material from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Groundwater	Closure	5	L	Rehabilitation and monitoring	4	L
Potential Decants at Wessels Mine Shaft, Vents Shaft and Decline	Mine Shaft Decline and Vent Shaft: Underground mines that flood and discharge contaminated water from one or more shafts, boreholes, geological features, etc., into the surface or ground water resource. The topography and the floor contours of the Wessels UG confirm that no decant will take place after closure. The 2016 hydrocensus static groundwater elevations of the surrounding privately-owned farm boreholes of the IAP's and the mine monitoring boreholes has indicated that no dewatering cone exists in the upper receiving aquifer.	Groundwater	Closure	4	L	Management and monitoring	4	L
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	Plant Area (areas where water-containing wastes are stored and managed, which includes Surface Reservoirs of the UG water, Thickener Dam and Leaking Process Water Pipe Lines): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Groundwater	Closure	5	L	Rehabilitation, management and monitoring	4	L
Storage of Dirty Water in an Evaporation Dam and Evaporation Ponds	Evaporation Ponds for Treated Oil Skimmer Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Groundwater	Closure	8	L	Rehabilitation and monitoring	4	L
	Evaporation Ponds for Treated Sewage Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Groundwater	Closure	6	L	Rehabilitation and monitoring	4	L
AQUATIC ECO-SYSTEMS								
Surface Water Runoff	Deterioration of aquatic ecosystem	Aquatic eco-system	Operation	14	L	Control through implementation of an engineered stormwater management plan	14	L
	Deterioration in water quality		Operation	14	L	Control through implementation of an engineered stormwater management plan and adherence to water balance of the site	14	L

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Significance (If not mitigated) TOTAL	SP	Mitigation type	Significance (If Mitigated) TOTAL	SP
BIODIVERSITY - Flora								
Mining operations	Disturbance of protected floral species	Floral Biodiversity	Operation	27	L	Possible relocation of protected flora Rehabilitation and monitoring	9	L
Mining operations and vegetation clearing	Habitat Destruction	Floral Biodiversity	Operation	13	L	Control through monitoring and management	11	L
Mining operations and rehabilitation of disturbed areas	Increase in colonisation of alien invasive plants: The barren and disturbed areas around the mine during the operational phase will increase the likelihood for colonisation of alien/invasive floral species. During the rehabilitation phase, the clearing of surface infrastructure will create disturbed areas, thereby increasing the potential for colonisation of alien invasive species.	Floral Biodiversity	Operation and Closure	30	M	Control through monitoring and management	20	L
BIODIVERSITY - Fauna								
Mining operations	Loss of faunal species due to poaching and increased accessibility	Faunal Biodiversity	Operation and closure	10	L	Control through management and implementation of increased security measures	10	L
Mining operations and vegetation clearing	Habitat Destruction	Faunal Biodiversity	Operation	13	L	Control through monitoring and management	11	L
VISUAL IMPACT								
WRD, Tailings facility and stockpiles operation	The operation of surface infrastructure such as the administration area, Waste Rock Dump, Tailings Facility and stockpiles creates a negative visual impact when compared to the surrounding landscape; however, the impact is confined to the mining area only.	Visual /Aesthetic	Operation	55	M	Rehabilitation during closure phase	9	L
Rehabilitation	Demolition and removal of surface infrastructure will have a positive visual impact (positive)	Visual /Aesthetic	Closure	39	M	Rehabilitation measures	39	M
HERITAGE								
Mining Activities	Extraction of ore underground during mining operation as well as the associated surface activities may disturb culturally significant features and artefacts	Heritage	Operation and Closure	12	L	No mitigation is required for this impact because this area does not have any historically or culturally significant artefacts according to the Heritage specialist study undertaken.	12	L
SOCIO-ECONOMIC								
Blasting	Noise from blasting may pose an occupational hazard for exposed labourers.	Socio-economic	Operation	26	L	Control through monitoring and management	13	L
Increase in ambient noise levels	Surface activities, disposal of waste rock and tailings, mineral processing.	Socio-economic	Operation	36	M	No mitigation possible	36	M

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Significance (If not mitigated)		Mitigation type	Significance (If Mitigated)	
				TOTAL	SP		TOTAL	SP
Economic impact of job creation (positive)	Employment of workers for surface and underground mining, disposal of waste rock and tailings, mineral processing and associated support services	Socio-economic	Operation	75	H	Enhance positive impact by implementing SLP	75	H
Demolition and removal of surface infrastructure	Increase in ambient noise levels.	Socio-economic	Closure	24	L	No mitigation possible	24	L
Mining operations	Employment of workers, generation of secondary economic benefits.	Socio-economic	Operation	75	H	No mitigation required, enhance through SLP	70	H
Rehabilitation: Levelling and contouring of areas to be rehabilitated, replacement of topsoil	Dust and inhalable particulates may impact on the environment and human health.	Socio-economic	Closure	40	M	Control through monitoring and management	20	L
Mine closure	Economic impact of retrenchment and increase in unemployment, impact on secondary economic activities (business, goods and services).	Socio-economic	Closure	75	H	Modify through alternative method: Closure Plan	70	H
	Reduction of institutional capacity to manage social infrastructure.	Socio-economic	Closure	72	H	Mitigation through capacity training: Closure Plan	32	M

The impact assessment rating conducted by Amelia Briel (EAP) is attached as Annexure B.

j) **Summary of specialist reports.**

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Geohydrology Update of the Geohydrological Report for Wessels Mine (GHT Consulting)	• It is recommended that a routine groundwater hydrocensus be performed of the privately-owned farm boreholes near the Wessels Mine every 2 years.	X	Part A Section (a): Hydrocensus
	• Quarterly groundwater monitoring of the Wessels Mine is to be continued as per WUL conditions. The frequency of sampling is quarterly (according to WUL) although the license states conflicting monthly and quarterly monitoring. It is recommended that the license be amended to a quarterly monitoring frequency as refereed in two places in the license document.	X	Part A: Section (a) Water Quality
	• The decommissioning and the post closure phases are to be a continuation of the operational monitoring.	X	Part A. Section (d) (i) Determination of closure objectives
	• It is recommended that all groundwater monitoring boreholes be safe guarded during the rehabilitation and kept as part of the post closure network groundwater monitoring network.	X	Part A. Section (d) (i) Determination of closure objectives
	• It is also recommended that boreholes be identified from a future routine hydrocensus closer to closure phase. Therefore, these hydrocensus boreholes will act as the background monitoring boreholes that are off-site and the current mine boreholes as the post closure on-site monitoring network.	N/A	N/A
	• The recommended parameters, which should be analysed at three monthly intervals, are as follows for the groundwater and surface water sites. pH, Electrical conductivity (EC), Total Dissolved Solids (TDS), Total Alkalinity (Alk), Chloride (Cl), Sulphate (SO4), Nitrate as Nitrogen (NO3 - N), Nitrite as Nitrogen (NO2 - N), Phosphate (PO4), Ammonium (NH4) Fluoride (F), Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Boron (B), Iron (Fe), Manganese (Mn) and Total Petroleum Hydrocarbons (TPH) for certain monitoring sites.	N/A	N/A Addressed in IWULA and IWWMP
	• The minimum required parameters according to the WUL is pH, Sodium (Na), Calcium (Ca), Magnesium (Mg), Chloride (Cl), Sulphate (SO4), Fluoride (F), Nitrate [NO3-N], Total Alkalinity (T.Alk) Potassium (K) and Manganese (Mn).	N/A	N/A Addressed in IWULA and IWWMP
	• The samples are to be taken to a fully SANAS (South African National Accreditation System) accredited laboratory for analysis.	N/A	N/A
	• If the monitoring boreholes are damaged for instance lockable caps, cement plinth, marker post or marker board the necessary steps are to be taken to repair or replace the damaged items by relevant contractors before the borehole becomes unusable due to foreign object falling into the borehole.	N/A	N/A
	• If the monitoring boreholes have collapsed or blocked due to geological cave-ins of the host rock, the borehole can be rehabilitated by using a percussion drilling rig. Typical activities will include: the rods utilized in the rehabilitations should be normal percussion drilling rods and not RC-Rods as some of the boreholes has 110 mm PVC casings, boreholes are to be cleaned and all obstructions to be	N/A	N/A

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	removed and boreholes is to be developed by compressed air for at least and 2-hours after rehabilitation.		
	• If the monitoring boreholes are destroyed and rehabilitation is found to be impossible it is recommended that boreholes destroyed be replaced by percussion drilling and be drilled right next to the destroyed borehole. The borehole is to be constructed in the same manner as previously.	N/A	N/A
	• No surface decant points are anticipated from the underground workings due to topography and the fact that no part of the undergrounds workings is situated so that a hydraulic gradient exists to induce possible post closure decant at the shaft. No streams or rivers exist within a 5 km radius of the mine or intersects the mine lease. Currently no surface sampling points are necessary to be included in the post closure monitoring network. These might be included in future updates of the Wessels geohydrological report.	X	Part A: Section (a) Water Quality
	• The current water monitoring network is mostly adequate. It is recommended that all monitoring boreholes damaged or destroyed be rehabilitated or replaced to ensure effective monitoring. Boreholes to be rehabilitated or replaced include JB (DGO)31, JB(WES)32 and JB(DGO)29. It is also recommended that an additional monitoring boreholes be constructed at the Waste Separation & Temporary Storage Facility and the Evaporation Ponds for Treated Oil Skimmer Effluent.	N/A	N/A
	• The water quality data of Wessels Mine as well as the regional water quality data indicate that the DWS, RQO for catchment D41K is not in-line or a true reflection of groundwater quality base line conditions of catchment D41K. The DWS, RQO standards for catchment D41K in mg/L for each chemical parameter, which includes pH, Sodium (Na), Calcium (Ca), Magnesium (Mg), Chloride (Cl), Sulphate (SO4), Fluoride (F), Nitrate [NO3-N] and Total Alkalinity (T.Alk) is much lower than the background water quality averages of the hydrocensus groundwater quality data. It is therefore recommended that mine management engage DWS, Northern Cape regarding the DWS, RQO standards for catchment D41K to address the current discrepancies.	X	Part A: Section (a) Water Quality
	• The Wessels Mine management has committed to implementing the flow meter data collection monitoring programme as the current programme and flow meter infrastructure and data are insufficient to calculate an accurate water and salt balance.	N/A	N/A Addressed in IWWMP
	• Some mitigation measures that may be evaluated to mitigate the operational and post operational migration of a groundwater contamination plume should include capping of the tailings and waste rock facilities with a fine material, including soil and vegetation. Another option is to cap the facilities with fine material and a layer of coarse material, if the vegetating of the facilities is deemed infeasible due to the arid climate of the area. In addition the facilities should be landscaped to maximise surface runoff. These options will reduce ingress of water into the facilities, thereby minimising leaching	X	Part A. Section (d) (i) Determination of closure objectives
	• Groundwater monitoring will need to be conducted for some time in the post operational phase to determine whether the implemented mitigation measures are successful. The amount of time will depend on the results of the hydrogeological	X	Part A. Section (d) (i) Determination of closure objectives

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	study in terms of the expected maximum plume migration from the tailings and waste rock facilities.		
Surface Water Study Wessels Mine Stormwater Management Plan (Knight Piésold)	• A total of 8 597 m of unlined water diversion channels will be required • A total of 461 m of lined water diversion channels will be required • 1 lined Sump and 3 unlined Sumps will be required	N/A	Not yet implemented
Waste Classification Waste Type Assessment and Classification of Nine Waste Stream (H+ Solutions)	• South32 Wessels Mine (or appointed Environmental Assessment Practitioner) should engage with the environmental authorities to point out the low risk to water resources presented by tailings, waste rock, and product stockpiles. This may support alternative waste management strategies to the liner systems described in Regulation 636.	X	Part A. Section (c) (ii) Description of activities to be undertaken; Waste Classification Study
	• South32 Wessels Mine should consider treating the spill kit material through land farming. The material waste type will need to be reassessed after the treatment.	X	Part A. Section (c) (ii) Description of activities to be undertaken; Waste Classification Study
	• Sewage plant sludge should be disposed of in a Class A landfill. Alternatively, the sludge should be treated to reduce total Mn and Hg concentrations. The material waste type will need to be reassessed after the treatment.	X	Part A. Section (c) (ii) Description of activities to be undertaken; Waste Classification Study
Biodiversity Management and Action Plan: Wessels Mine Advisian (2017)	• The Biodiversity Management Action Plan was compiled for Wessels Mine in 2017 to provide an update for the biodiversity management on site. This document details information on the type of biodiversity on site (flora and fauna), impacts of the Wessels Mine on said biodiversity; mitigation measures and management plans for the Wessel Mining operation. All of these specialist recommendations are not replicated herein but can be found in the full text attached as an Annexure.	X	Part A: Section (a) Biodiversity (Flora and Fauna); Soil types and capability

Please refer to Annexure C for the full specialist reports.

k) Environmental impact statement

i) Summary of the key findings of the environmental impact assessment

The proposed project is concerned with the administrative update (amendment) of the HMM Wessels Mine EA/EMPr, the mine is an authorised facility as per reference NC/30/5/1/2/3/2/1/ (253) and no new activities will be undertaken at the mine in the near future. However, as a part of this amendment process, the impact of the current mining activities and operations were reassessed and ranked (according to the Knight Piésold impact rating system).

Specialist studies were also undertaken as a part of this project. The findings of the geohydrological report showed that there is a low potential for Acid Mine Drainage (AMD) from leaching of the waste rock dump discards and tailing storage facility (TSF). This result was also confirmed by the kinetic geochemical modelling undertaken in the same study for the HMM Wessels Mine. The specialist investigation incorporated over 13 years of monitoring data into the kinetic model.

The risk of leaching of manganese in concentrations exceeding regulatory guidelines was shown as negligible, whilst risk of nitrate leaching exceeding regulatory guidelines is likely. The origin of nitrate enrichment within the system is suspected to be from the use of ammonium nitrate-based explosive. The use of which is restricted to the operational phase and the risk of nitrate leaching into the post-operational phase is low. The leaching of Boron (B) from waste rock and tailings was shown to be likely in operational and post-operational phase.

The specialist investigation includes a contaminant plume model, which showed that the pollution plume is localised on-site. In addition, the dewatering effects were also proven to be localised, with the aquifer regaining its natural states at 30 - 50 years post closure. Mitigation measures were proposed by the specialist's consultants and are included in this EA.

The surface water, specialist study confirmed that the mining operations are of little risk to the natural aquatic eco-system due to the site's geographical distance from the nearest watercourse. The study also stated that water from the unlined TSF and duck pond are of poor quality but following a risk-based approach based on results from the geohydrology report (contamination plume model and ABA results), the facility posed limited risk to the environment.

All impact ratings and recommendations from the specialist reports were included in this EA update, and the impacts can be addressed using engineering and environmental controls. As such, mitigation measures were proposed per environmental aspect and impact. Each mitigation measure aims at minimising the effect of each impact on environmental and social receptors. The impacts and mitigation measures associated with the mine operation are shown in Table 10 and Table 16. The EAP therefore recommends that the EMPr / EA update be authorised because it will aid with implementation of management measures to limit identified risks.

ii) Final Site Map

The HMM Wessels Mine is an already authorised facility (approved as per reference NC/30/5/1/2/3/2/1/ (253)). The project activities associated with the amendment does not include

any changes to the site layout because the project is concerned with administrative changes to the current EA/ EMPr only.

Investigation into the project description for the Wessels Mine operations showed that some water uses were included in the approved EA; but have not been authorised in terms of the National Water Act (No 36 of 1998, NWA). The outstanding water uses which are stipulated in the approved EA/EMPr; are as follows:
Section 21 (g) for the following facilities:

- Product stockpiles (North, South and Central)
- Waste Rock Dump (North and South)
- Waste rock dumped underground
- Dust suppression with water from undergrounds workings
- Oil separation facility, including evaporation ponds.

Section 21 (e) for

- Sewage plant treated effluent used for irrigation of veld, distributed by means of sprinklers

The findings of the Surface Water Study (Knight Piésold, 2017) recommended the construction of the following infrastructure as an improvement to the site's stormwater management:

- A total of 8 597 m of unlined water diversion channels will be required
- A total of 461 m of lined water diversion channels will be required
- 1 lined Sump and 3 unlined sumps will be required

As a result, the following water new water uses will be also be applied for:
Section 21 (g):

- Sump 1 collecting dirty water on site (unlined)
- Sump 2 collecting dirty water on site (lined)
- Sump 3 collecting dirty water on site (unlined)
- Sump 4 collecting dirty water on site (unlined)
- Lined diversion channels

The authorisation of these water uses will however trigger Activity 6 of Listing Notice 2 (GN 984) of the NEMA EIA Regulations of 2017. However, during the pre-application meeting, it was confirmed by the DMR, that only an amendment process should be followed to undertake an EA update.

Figure 22: Composite map showing current site layout and Section 21 (e) and Section 21 (g) water uses

iii) Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

The listed activities herein are already authorised as part of the previous EMPr/EA. This project deals only with the administrative update of the EA/ EMPr to improve its applicability. However, the impacts associated with the mining operation at HMM Wessels Mine was reassessed and ranked according to the Knight Piésold impact assessment methodology for this EIAR. Geohydrology and surface water specialists' opinions were included in the impact ratings as well as specialist studies undertaken previously were also used to inform the ratings. The outcome of the impact assessment yielded very few ***High*** rated impacts, these are shown below.

High Negative Impacts:

Extraction of ore for mining operations (during Operation, Closure and Post closure)

- Permanent alteration in local geology (the bord and pillar structures will remain unchanged)
- Ore area will become highly permeable compared to original rock mass.

Site rehabilitation and reclamation (during closure):

- Change of land use from mining activity to grazing.

Mine Closure (Closure):

- Economic impact of retrenchment and increase in unemployment, impact on secondary economic activities (business, goods and services)
- Reduction of institutional capacity to manage social infrastructure.

High Positive Impacts:

Economic impact of job creation (Operation):

- Direct employment of workers for surface and underground mining, disposal of waste rock and tailings, mineral processing and associated support services

Mining operations (Operation):

- Employment of workers - Generation of secondary economic benefits (this impact refers to generation of secondary markets due to employment. Secondary markets include service providers, contractors and other informal job creation).

l) **Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr**

Table 11: Proposed impact management objectives and the impact management outcomes

Activity	Aspect	Impact Management Objectives	Impact Management Outcomes
Extraction of ore for mining operations	Geology	To mine resources in a manner that minimises the impact on the geology	Optimal utilisation of mineral resources
Establishment of surface infrastructure	Topography	To minimise the disturbance of the natural area	Reduce erosion and change in landscape
Mining operations	Soil, Land Use and Capability	Avoid sterilisation of land by removal of topsoil; No unnecessary disturbance of the land; no clearing of undisturbed areas outside the mining area;	No unnecessary loss or contamination of soils; No erosion of the exposed surfaces
Soil contamination			
Site rehabilitation and reclamation			
Vehicular movement and traffic	Air Quality	Minimise fugitive dust emissions so that off-site dust fallout rates do not exceed the non-residential standard.	Keep off-site and on-site dust fallout rates below the standards
Waste Rock Dump and stockpile operation			
Rehabilitation of disturbed areas			
Blasting	Noise	Limit nuisance noise impacts and sound emissions	No complaints from surrounding receptors
Mine Operation			
Mine Operation	Vibration	Limit vibration	No complaints from surrounding receptors
Mining Activities	Surface Water	Contain "dirty" water, clean and dirty water separation	No polluted water leaving the mining area and keeping clean water off the mining area
Mine Decommissioning			
Storage of Explosives	Ground Water	Contain "dirty" water, minimise the impact on ground water quality for surrounding water users.	No significant impact on water quality on surrounding water uses, the water quality parameters remain within the guideline limits as per the WUL.
Storage of Hydrocarbon Material and Fuel			
RWD Storage of Dirty / Process Water			
TSF Disposal Area of Waste Rock Fines			
Old Waste Yard			
Temporary Storage of Hazardous and Domestic Waste			
Waste Handling and Storage Facility			
Stockpile Area			
Treatment and Storage of Sewage Water			
Pumping of groundwater from the Wessels Underground sections.			
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)			
Storage of Dirty Water in an Evaporation Dam			
Storage of Explosives			
Storage of Hydrocarbon Material and Fuel			
RWD Storage of Dirty / Process Water			
TSF Dam Disposal Area of Waste Rock Fines			

Activity	Aspect	Impact Management Objectives	Impact Management Outcomes
Old Waste Yard			
Waste Handling and Storage Facility			
Stockpile Area			
Temporary Storage of Product Ore (Manganese)			
Treatment and Storage of Sewage Water			
Potential Decants at Wessels Mine Shaft, Vents Shaft and Decline			
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)			
Storage of Dirty Water in an Evaporation Dam and Evaporation Ponds			
Surface Water Runoff	Aquatic Ecosystems	Minimise impact on the receiving aquatic ecosystem	No impact on the aquatic ecosystem
Mining operations	Flora	No clearing of vegetation outside the mining area, reduce the encroachment of alien vegetation	No unnecessary loss of vegetation outside the designated mining area, control alien vegetation
Mining operations and vegetation clearing	Flora	Keep mining development footprint restricted to layout plans and to limit the floral habitat loss due to the increase of the mining footprint.	Keep mining development footprint restricted to layout plans
Mining operations and rehabilitation of disturbed areas	Flora	No clearing of vegetation outside the mining area, reduce the encroachment of alien vegetation	No unnecessary loss of vegetation outside the designated mining area, control alien vegetation
Mining operations	Fauna	No unnecessary disturbance to the limited faunal species	No poaching or uncontrolled activities within the mining area
Mining operations and vegetation clearing	Flora	Keep mining development footprint restricted to layout plans and to limit the faunal habitat loss due to the increase of the mining footprint.	Keep mining development footprint restricted to layout plans
WRD, Tailings facility and stockpiles operation	Visual	To prevent causing nuisance	No complaints from the surrounding land users
Rehabilitation			
Mining Activities	Heritage	Minimise the physical impacts on heritage resources	No disturbance to heritage resources
Blasting	Socio - Economic	Avoid disturbance to the local communities, minimise complaints, avoid medical emergencies, minimise impact on socio-economics during closure	Limit complaints regarding disturbance and impact of daily activities of surrounding communities; ensure that closure does not result in an unacceptable socio-economic void.
Increase in ambient noise levels			
Economic impact of job creation (positive)			
Demolition and removal of surface infrastructure			
Mining operations			
Rehabilitation: Levelling and contouring of areas to be rehabilitated, replacement of topsoil			
Mine closure			

m) **Final proposed alternatives.**

Not applicable. The HMM Wessels Mine has an existing Environmental Management Programme or the now called Environmental Authorisation which was compiled and approved in 2005. No changes in mining processes or operation have taken place nor are any changes envisioned in the near future. There will also be no additional impacts to the receiving community due to the update of the EIAR.

This update proposes revised mitigation measures which aims to avoid, reduce and/or minimise potential impacts arising from the already approved mining operation (approved as per reference NC/30/5/1/2/3/2/1/ (253) MR) at HMM Wessels Mine. The impacts associated with the HMM Mine operation are detailed in Table 10, corresponding mitigation measures are provided where possible.

n) **Aspects for inclusion as conditions of Authorisation.**

Not applicable.

o) **Description of any assumptions, uncertainties and gaps in knowledge.**

The HMM Wessels Mine is a historical mining facility which was acquired during the period of 1959 to 1987. All operations and processes at the mine have remained the same since the conversion of the original mining lease to a Mining Right in 2005. The unavailability of engineering design information may therefore be considered a limitation due to the age of the facility.

p) **Reasoned opinion as to whether the proposed activity should or should not be authorised**

i) **Reasons why the activity should be authorised or not.**

An Amendment process was followed due to the lack of material changes to the mining operation (as per advice during the pre-application meeting). The proposed update of the HMM Wessels Mine should be authorised because this is an administrative update to the current EA/ EMPr.

In addition, all listed activities concerned with the mining operations have already been authorised as part of the original EMPr (approved as per reference NC/30/5/1/2/3/2/1/ (253) MR), with the exception of the diesel storage tank which received a separate Record of Decision (ROD), as per reference NNO 25/19. The outstanding water uses (described in **Part A (k) (ii)** of this document) require authorisation in terms of the National Water Act (1998), the process of which is being undertaken in parallel with this amendment process.

Mitigation measures for mining related impacts have also been revised to improve their specificity. The mitigation measures proposed with this EA/ EMPr update is aimed at being achievable whilst still ensuring that all environmental impacts are minimised and managed. Continued implementation of monitoring programmes will also assist in reducing significant environmental impacts.

ii) Conditions that must be included in the authorisation

(1) Specific conditions to be included into the compilation and approval of EMPr

The following conditions should form part of the authorisation:

- Concurrent rehabilitation of the WRDs should be prioritised in order to ensure the cover material and vegetation is sustainable
- The implementation of the environmental management measures contained within this report.

(2) Rehabilitation requirements

The rehabilitation of the Waste Rock Dumps (WRD) should be undertaken in accordance with specifications detailed in the REDCO rehabilitation plan (compiled October 2015). Objectives of the latest HMM Wessels Mine closure plan should be aligned with all rehabilitation protocol on the site; alignment with the baseline environmental conditions should also be included. The rehabilitation requirements should also be updated upon subsequent revision of the site closure plan. The current EMPr commitments for Wessels mine, as agreed with the DMR is to rehabilitate the disturbed footprint to grazing land capability. The table below denotes the alternative use for specific infrastructure at Wessels Mine.

The surface infrastructure will be demolished in accordance with the most current closure plan for the site. The rehabilitation and remediation of the plant and infrastructure areas will follow the following steps:

- The plant, administration infrastructure, roads, railways and platforms will be demolished, and the demolition debris disposed,
- Shafts will be sealed,
- The total affected footprint will be dozed and levelled and,
- The total footprint will be ameliorated and vegetated.

Surface rehabilitation will commence with the demolition of the roads, railway lines, walkways, etc. and the disposal of the demolition debris. The site will be secured, and dangerous areas will be fenced off. The dumps will be capped with HDPE liner and 500 mm of soil will be placed to cover the dump areas. Contour drains and chutes will also be constructed to allow for effective stormwater control and management. The cleared areas will then be levelled and shaped, top soil (200 mm) spread over the footprint, and then the area will be ameliorated and revegetated in line with the general vegetation of the area surrounding the HMM being classified as Kalahari Plains Thorn Bushveld. The mining area will be rehabilitated by demolition of the shaft infrastructure and concrete. The shafts will then be backfilled and capped prior to amelioration and vegetation of the footprint.

Table 12: Alternative uses for infrastructure at HMM Wessels Mine

Infrastructure	Alternative Use
Main Office building	Use as a farm administration block
Security building	Re-use
Winder house	Use as a farm warehouse
Stores	Use as a farm workshop
Vent fan buildings and substation	Re-use
Central substation	Re-use
Workshops	Re-use
Transformer yard and brick building	Re-use
Gas store	Re-use

q) Period for which the Environmental Authorisation is required.

The period the Environmental Authorisation is required will be for the duration of the Life of Mine (LoM) for HMM Wessels Mine; or until a performance, assessment audit considers the Environmental Management Programme Report no longer applicable / valid.

r) Undertaking

Please refer to (2) of Part B – Environmental Management Programme Report for the declaration of undertaking.

s) Financial Provision

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

i) Explain how the aforesaid amount was derived.

Please refer to Part B (i) (a – f) for financial provision information.

ii) Confirm that this amount can be provided for from operating expenditure.

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

Wessels financial provision will be funded by South32 SA Holdings (Pty) Ltd: Hotazel Manganese Operations (Pty) Ltd.

t) **Deviations from the approved scoping report and plan of study.**

i) **Deviations from the methodology used in determining the significance of potential environmental impacts and risks.**

Not applicable (please refer to ii below).

ii) **Motivation for the deviation.**

No scoping report was required for this EA update and therefore no Plan of Study. A pre-application meeting was held on the 13th of February 2017 at the DWS Kimberley Regional Offices. The meeting was attended by representatives from the DMR; DWS officials and the project team (comprising of South32 and Knight Piésold employees) (refer to Annexure A). The purpose of the meeting was to discuss the proposed update of the Hotazel Manganese Mines (HMM) Wessels Mine Environmental Management Programme (now EA) and the process to follow.

The mine has an existing Environmental Management Programme which was compiled and approved in 2005. Other listed and waste activities have been authorised under Section 20 of the Environmental Conservation Act, 1989. The update is comprised of administrative changes and no changes in mining processes or operation have taken place nor are any changes envisioned in the near future. DMR confirmed that only an amendment process Regulation 35 and 37 of the Environmental Impact Assessment Regulations of the National Environmental Management Act (Act 107 of 1998), as amended April 2017] should be followed to undertake an EA update. As such, an amendment process did not require the completion of a scoping report.

u) **Other Information required by the competent Authority**

i) **Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-**

(1) Impact on the socio-economic conditions of any directly affected person.

a. The HMM Wessels EA update is concerned with the update of the mine's Environmental Management Programme (EMPr), with changes being solely administrative in nature. The purpose of the update is to increase the specificity of the EMPr to the current mining operations at HMM Wessels. As such, no material changes to the already approved mining process and/or operations will take place.
b. Hotazel Manganese Mines ("HMM") is a subsidiary of Samancor Manganese (Pty) Ltd, and BHPBilliton (60%) and Anglo-American (40%) own the latter. South32 SA Holdings (Pty) Ltd (South32) (HMM) operate the Hotazel Manganese Mines (Pty) Ltd. As a result, no part of the mining concession is owned by a private or external party.

Taking cognisance of the above, no persons will be directly affected by the EA update for HMM Wessels Mine. Similarly, this project will not directly affect the socio-economic conditions of any

persons (other than the personnel employed by the operating company and the owners of HMM Wessels Mine).

(2) Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

Matakoma Heritage Consultants undertook a heritage assessment in 2005 in compliance to the National Heritage Act (No 25 of 1999). The findings of the study indicated that there are no sites of cultural significance within the mining lease areas of Wessels Mine. According to the study, “initial indications from the archival research are that the areas in question were known as the ‘bad lands’ with no inhabitants up to the early part of the 20th century”.

v) Other matters required in terms of sections 24(4)(a) and (b) of the Act.

The motivation explaining the lack of consideration of site alternatives; is presented within this report. The motivation is not provided as a stand-alone appendix.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. Draft environmental management programme.

a) Details of the EAP

The details of the EAP are given in Part A, Section 3 (a) (i) of this report submission.

b) Description of the Aspects of the Activity

The aspects of the activity have been described in Part A, Section (3) (d) of this report. The following Environmental Management Programme Report covers the aspects of these activities.

c) Composite Map

The HMM Wessels Mine is an already authorised facility (approved as per reference NC/30/5/1/2/3/2/1/ (253)), a map showing the mining right area for Wessels Mine is shown in Figure 23 below. The project activities associated with the EA update does not include any changes to the site layout because the project is concerned with administrative changes to the current EMPr only.

However, specific water use activities included in the authorised EMPr/EA were not authorised in terms of the NWA, 1998. The authorisation of these water uses will however trigger Activity 6 of Listing Notice 2 (GN 984) of the NEMA EIA Regulations of 2017. A pre-application meeting was held on February 13, 2017 at the DWS Kimberley Regional Offices, and was attended by South32, DWS and DMR representatives. The DMR confirmed that only an amendment process should be followed to undertake an EA update. However, it was recommended that IWULA applications for these outstanding water uses be undertaken as a parallel process to this project.

The proposed EMPr/ EA update will not result in any changes to the current mining footprint, mining operations and processes will remain the same. There are no environmentally sensitive areas on or near the HMM Wessels Mine. A map depicting the closest protected areas to the site is shown in Figure 25 below.

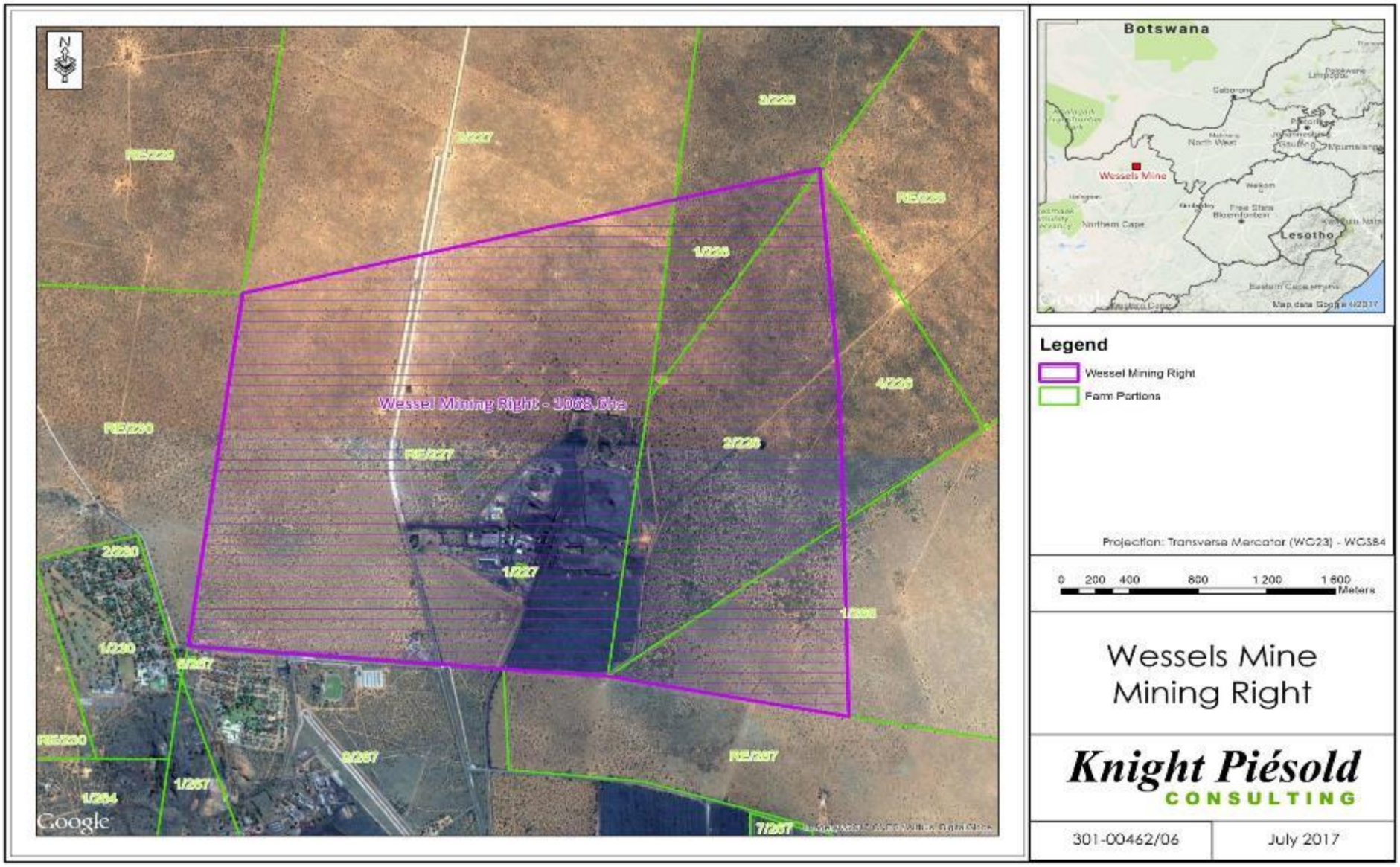


Figure 23: Mining Right area for HMM Wessels Mine

Figure 24: Composite map showing outstanding water uses which require IWULA

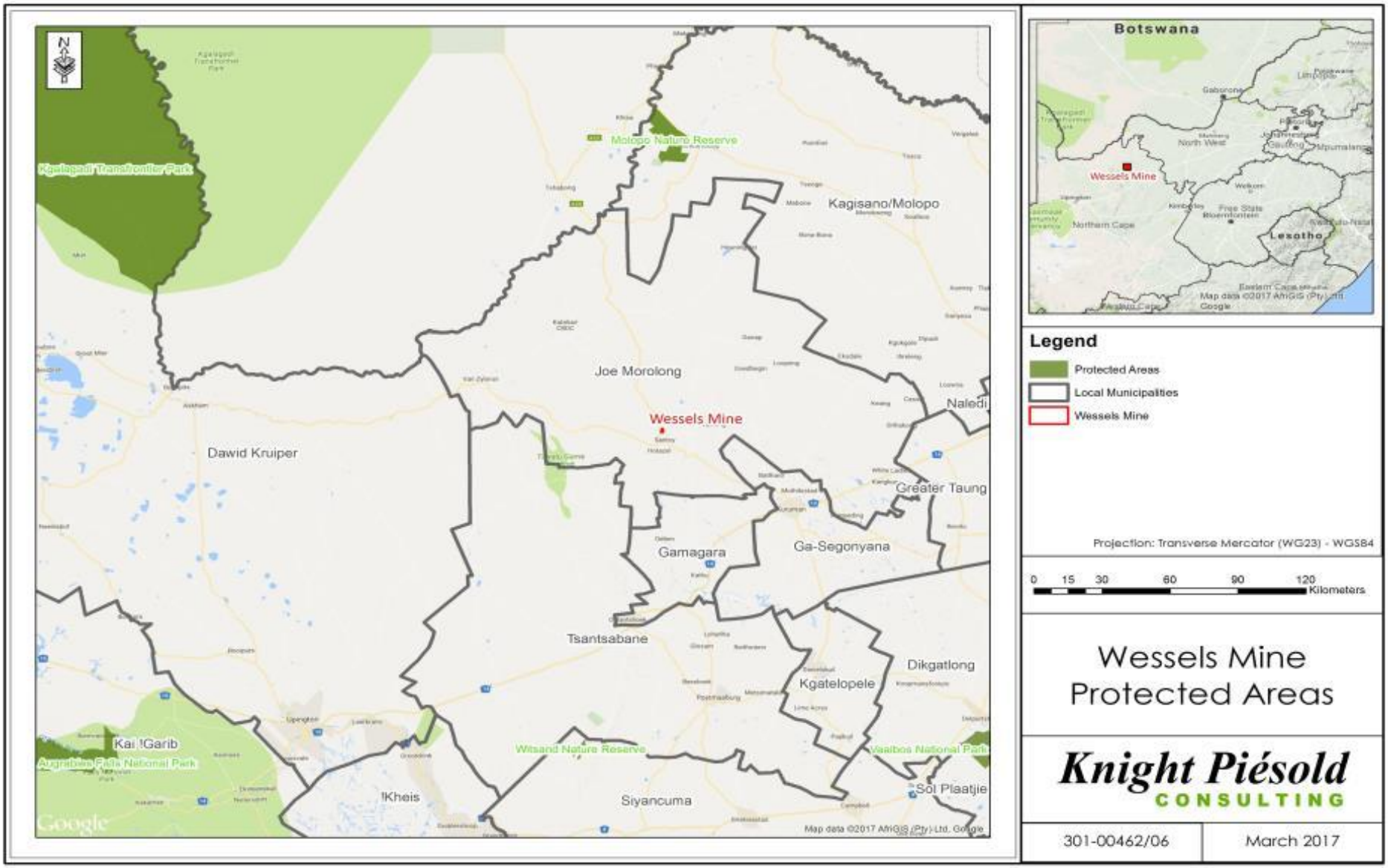


Figure 25: Environmentally sensitive areas near HMM Wessels Mine

d) Description of Impact management objectives including management statements

i) Determination of closure objectives

The general aim for closure at Wessels Mine is as follows; and high-level closure objectives are shown in Table 13:

- To leave the site in a safe condition for post-closure land users
- To create stable, non-polluting and functioning landforms that are, as far as practically achievable, consistent with the surrounding landscape and other environmental values
- Rehabilitation should seek to minimise environmental impacts and disturbance to the ecosystem resulting from mining activities.

Table 13: High level closure objectives (HMM Closure Plan FY 2014)

Closure Aspect	Closure Objective(s)	Generalised completion criteria
Safety	Zero harm to members of the public	• No injuries or deaths occur.
Landform stability and functioning	The area meets landform standards for grazing	• Vegetation establishment is in place • There are no erosion gullies • The land surface profile and carrying capacity allows for the land to be used as grazing land.
Groundwater	The water quality to meet the water use license requirements	• Measured groundwater quality complies with the specified standard in water use license.
Surface water	The water quality to meet the water use license requirements	• Measured surface water quality complies with the specified standard.
Rehabilitation	The rehabilitation must achieve the desired final land use	• Progressive rehabilitation done right the first time with no re-work on areas.
Visual amenity	Rehabilitated sites mimic the surrounding environment	• Observed landform appearance is acceptable to stakeholders.
Dust	Dust emission to meet rural standards guidelines	• Dust levels generated from rehabilitated areas meet the specified rural standards.
Stakeholder and community engagement and participation	To obtain acceptance of the final land use	• Stakeholders give written approval. • Stakeholders are engaged during the formulation and

Closure Aspect	Closure Objective(s)	Generalised completion criteria
		implementation of closure in accordance with the engagement plan.

The final land use for HMM Wessels Mine at closure is the development of grazing land. This option has already been approved in the current EA and involves the top soiling and vegetation of 149.1 ha of the total Wessels footprint. There is also concurrent rehabilitation and rehabilitation trials, which are being undertaken at South32, owned mines. The post closure monitoring, maintenance, and aftercare will occur for a period of 5 years. The monitoring activities and reporting will occur on an annual basis for the 5-year period, with the operational HSE Manager responsible for the monitoring and reporting. The aspects that will be monitored and reported on are:

- The monitoring of surface and subsurface water quality
- The control of wattle and all other alien plants
- The general maintenance, including rehabilitation of cracks and subsidence.

The implementation of the rehabilitation plan as well as the closure objectives will result in the mining area being converted to the most feasible option - grazing land. Please refer to the latest Closure Plan for HMM Wessels Mine in Annexure G.

i) **The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity**

Water quality monitoring is implemented on-site for ground and surface water resources. This allows for early detection of changes in water quality, hence highlighting any pollution emanating from the mine site. A comprehensive ground and surface water monitoring programme was developed by independent groundwater consultants, GHT Consulting in accordance with the mine's Water Use License (WUL) (Licence No.: 10/D41M/AGJ/1536). A comprehensive water quality data set spanning over 10 years exists for the HMM Wessels Mine.

Raw water derived from the underground workings (U/G) is pumped to the surface and utilised as process water for dust suppression and TSF operations. Wessels Mine pumps on average 23 915 m^3/month of raw water from the underground workings. As the process water is pumped out of the underground workings, it is accumulated in the spare dam (underground) from where it is pumped directly to the Surface Plant. The overflow from the Spare Dam is pumped into the duck pond. The approved conceptual surface water study, written by Knight Piésold (Knight Piésold, 2017) proposes four new stormwater sumps, which will contain dirty water from the plant, waste rock dump, stockpile area, TSF, waste yard and fuel storage and vehicle workshop area. The implementation of the proposed plan will ensure efficient management of dirty water on site.

Dewatering activities occur on a small scale from the U/G workings, however due to the low rainfall over the area, most water originates as ingress water (from aquifers) rather than active pumping. An assessment of the extent of the dewatering cone was undertaken by GHT (GHT, 2017) by use of a numerical flow model. The results of the assessment showed that dewatering occurring at Wessels Mine has localised impacts. Currently the radius of influence is about 1 km and the depth of the dewatering cone is 8 m deep relative to the background groundwater level of the area. This indicates in general that no dewatering has occurred regionally. According to the model, the aquifer would have recovered totally in 50 years after closure of the HMM Wessels Mine.

HMM Wessels Mine has a current disturbed footprint area of 149.1 Ha. Mining operations span across this footprint, thereby rendering little available surface area for biodiversity on-site. The potential for ecological degradation in terms of biodiversity is minimal. No new activities are planned for the HMM Wessel Mine in the near future, however an extension outside of the current disturbed footprint may require management measures to mitigate impacts on floral and faunal biodiversity. Monitoring programmes are in place for impacts related to soil disturbance, air pollution etc. The management measures in place for impacts resulting from mining operations have been included in this updated EMPr. Please refer to Table 16, Table 17 and Table 18 for a summary of mitigation and management measures for the HMM Wessels Mine.

ii) Potential risk of Acid Mine Drainage

An Acid/Base Accounting Study was undertaken by GHT Consulting (2017) to determine the potential risk of Acid Mine Drainage (AMD) emanating from site. The Geohydrological Study is attached as Annexure C. The results of the study were concluded as follows:

- The risk of the development of acid mine drainage conditions in the waste rock and tailings facilities at the Wessels Mine site is negligible for the operational and post-operational phases. No mitigation measures are thus required to mitigate AMD at the Wessels mine site
- The risk of leaching of manganese in concentrations exceeding regulatory guideline values is shown by this study to be negligible in the operational and post-operational phases of the Wessels Mine. Therefore, no mitigation measures are required
- The leaching of nitrate from the waste rock and tailings material is likely at the Wessels Mine site. However, the source of the nitrate is not the geological material from which the tailings and waste rock is comprised. The most likely source is the use of ammonium nitrate-based explosives during the mining operation. Therefore, the leaching of nitrate is an operational phase concern and then only if the hydrogeological study indicates that the nitrate plume is likely to migrate a significant distance from the tailings and waste rock facilities. The risk of nitrate leaching in the post-operational phase of the Wessels Mine is shown to be negligible and no mitigation measures are therefore required.

- The leaching of boron is likely to originate from the tailings and waste rock material at the Wessels Mine site. This will likely occur in the operational and post-operational phases of the mining project.

iii) Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

GHT Consulting investigated the potential for AMD in 2012 and 2017. The specialist investigation involved undertaking an ABA study (2012 and 2017) as well as geochemical modelling and kinetic evaluations of waste rock discards and waste rock fines of the TSF, through existing long term monitoring data and dynamic geochemical modelling (2017). Samples were taken from the waste rock / discard dumps and TSF of Wessels Mine and were submitted to the Institute for Groundwater Studies for ABA and leaching tests. Please refer to Table 14 and Figure 26 for the description and sample locality.

The ABA analyses were conducted in terms of water-soluble constituents, complete oxidation and acid (Sulphuric Acid- H_2SO_4) soluble constituents. The analysed chemical variables (pH, Acid Potential, Neutralisation Potential) were entered into the spreadsheet, Acid Base Accounting Cumulative Screening (ABACUS). This programme allowed for assessments to be made in terms of pH values, Net Neutralising Potential (NNP) values and Neutralising Potential Ratios (NPR) for both open and closed systems (in open systems O_2 and CO_2 are able to freely enter and leave the solution, whilst in closed systems, no gas phase is present to supply CO_2 to the system. This reduces the solubility of calcite/calcrete causing the system to have an overall higher acid potential).

In addition to the ABA study, kinetic geochemical modelling was also undertaken by GHT (the full report is included in Annexure C). The objectives of the assessment were as follows:

- Quantify the risk of the development of AMD conditions associated with the HMM geological waste, i.e. tailings and waste rock
- Evaluate the risks to groundwater from leaching of potential contaminants from geological waste, i.e. tailings and waste rock.

The project was conducted in two phases. The first phase was the quantification of the AMD risks associated with the geological waste. For this phase, mineralogical data and ABA data was used. Leach data of leachate under various conditions, i.e. oxidising and acidic, was included in the ABA data. The mineralogical and leachate data was used to develop geochemical models. These models are dynamic and kinetic in nature, i.e. taking rates of reaction of the material into account. Thus, the long-term behaviour of the waste rock and tailings can be assessed, and the risks of the development of AMD conditions and contaminant leaching can be quantified. The software package the Geochemist's Workbench® was used for the geochemical modelling.

The second phase of the project involved a statistical analysis of the groundwater monitoring data. This date spans a monitoring period of 13 years (2003 to 2016). Focus was placed on parameters identified in a groundwater-monitoring programme of Wessels Mine. The geochemical models were developed to simulate a scenario of WRDs, TSF open to the atmosphere, and thus rainfall was the main clean water fluid flux into the geological waste facilities. The results of the kinetic geochemical modelling indicated that the potential for AMD from the geological wastes (tailings and waste rock) was low.

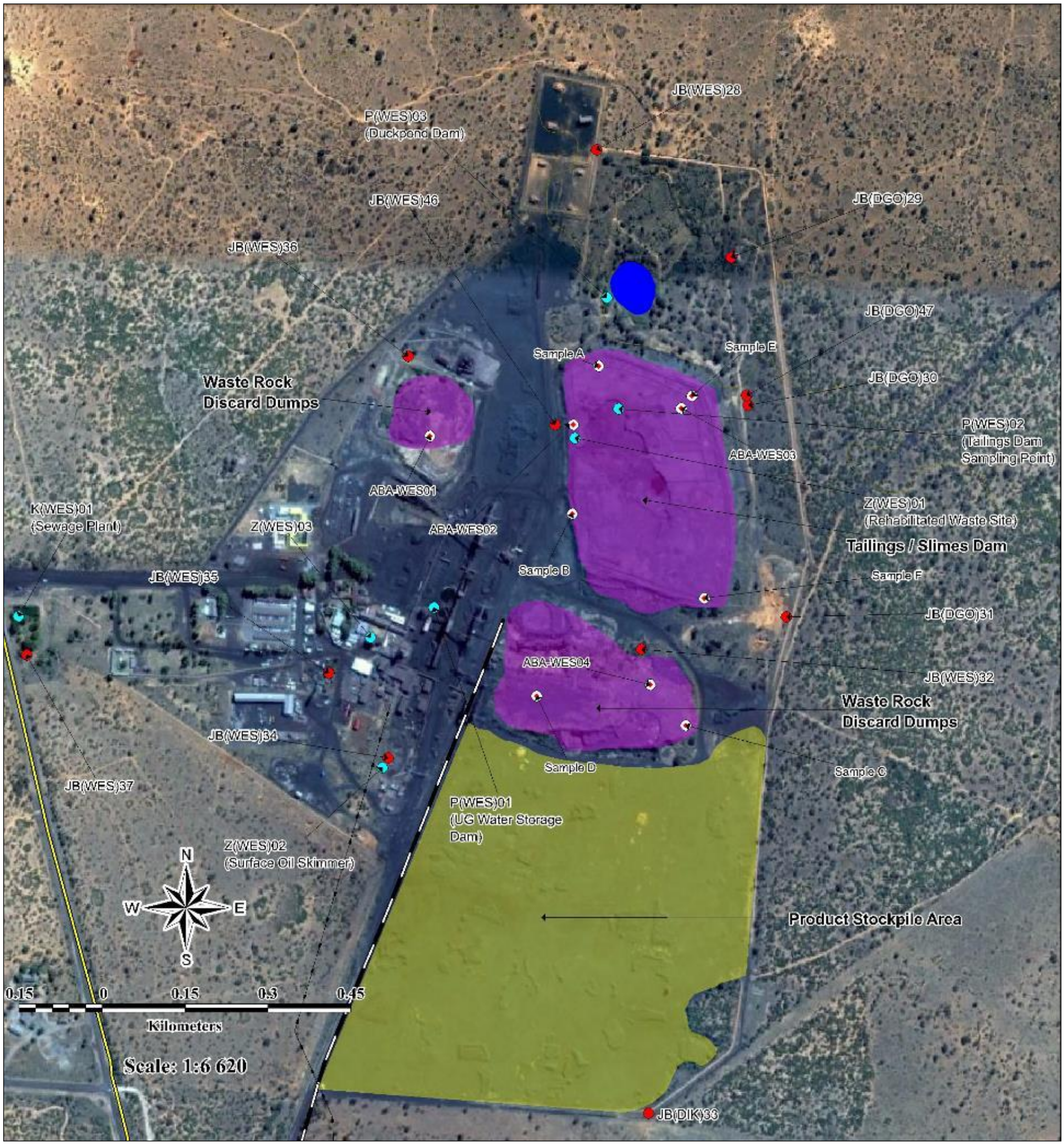


Figure 26: ABA sampling localities for HMM Wessels Mine (GHT, 2017)

Table 14: ABA Sample descriptions for HMM Wessels Mine (GHT, 2017)

Sample Number	Description of Sample (ABA Rock Sample)
ABA-WES01	Waste Rock Discard Dump
ABA-WES02	TSF Material
ABA-WES03	Tailings Dam Material
ABA-WES04	Waste Rock Discard Dump
Sample A	Tailings Fines
Sample B	Old Discards
Sample C	Old Discards
Sample D	Old Discards
Sample E	Newly Mined Tailings Fines
Sample F	Newly Mined Tailings Fines

iv) **Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage**

Due to the low potential for acid mine drainage as reported by the geohydrology specialist report conducted by GHT Consulting (2017), no engineering or mine design solutions are necessary. However, in an effort to comply with best practise guidelines as well as the HMM Wessels authorised Water Use License (Licence No.: 10/D41M/AGJ/1536), monitoring will continue to take place, so that any changes in groundwater quality may be detected.

v) **Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage**

Not applicable due to the results from the ABA study undertaken by GHT Consulting (2017). Water quality monitoring will continue to enable early detection of changes in groundwater quality. The water quality monitoring will also be undertaken annually for 5-year post closure of HMM Wessels Mine.

vi) Volumes and rate of water use required for the mining, trenching or bulk sampling operation

Table 15: Wessels Mine water balance (GHT, 2017)

Wessels Mine Water Balance					
Description: Input / Loss / Usage	**Water Use Activities**	**Water Volume (m^3/year)**	**Water Volume (m^3/month)**	**Water Volume (m^3/day)**	**WaterVolume (L/s)**
Usage Figure	**Potable Water Usage:** • Vaal Gamagara Pipeline Water Diversion Junction and Distribution Reservoir. • M & R Ring Main. • M & R Contractor Camp (G4S Camp). • Laboratory and Training Centre. • Farm Consumption. • Compressor C90 and C700. • Old Tyre Yard, Mine Store, Workshops and Tyre Workshop. • Underground Potable Water. • Old Oil Line, Cable Belt and Drive House. • Change House and Admin Block, Laundry. • Surface Plant Main Ring. • Capital Store and Fire Suppression. • Change House (B), Security Gate and OCC. • Winder House, Clinic and Mine Stores. • Barlows Workshop and Wash Bay. • Potable Water Reservoir at Surface Plant (also supplies potable water to the Surface Tank of Underground Water Supply. • PU10 FDU Gland Seal	83 163	6 930	228	2.64
Usage Figure	Sewage / Grey Water from Offices & Change House to Sewage Plant (based on 2007 values)	14 035	1 170	38	0.45
Input to Aq.	Treated Sewage / Grey Water from Sewage Plant for Irrigation to Aquifer (Evaporation 2276 mm/a & 32% droplet evaporation)	2 971	248	8	0.09
Output from U/G Workings	**Water Pump from Wessels Underground Workings (U/G) utilised as Process Water:** • Underground Dam supplied by underground workings of West Block, Central Block and Muldersdrift. • Take-Off from M & R Drill Water. • Surface Tank where water is stored that is pumped from the underground. • Water Screens and Wessels plant process water usage. • Tailings / Slimes Dam where slurry water is disposed-off. • Ventilation Shaft seepage water is pumped to Surface Tank where water is stored that is pumped from the underground. • PU08 Gooseneck (Dust Suppression). • PU09Surface Plant Fire Suppression & Loadout Station.	286 978	23 915	786	9.10
Water Loss	Net Process Water Loss (Water Loss in Plant & De-Dusting)	28 698	2 391	79	0.91
Water Input	Process Water Pumped on Tailings / Slimes Dam	258 280	21 523	708	8.19
Water Input	Rainfall Recharge Volume to Slimes Dam (2% over a 111766 m^2 Pool Area)	832	69	2	0.03
Water Loss	Evaporation Volume Losses (2276 mm/a)	254 379	21 198	697	8.07
Input	Nett Excess Water Seepage into Tailings / Slimes Dam	4 733	394	13	0.15
Water Loss	Water Retention of Tailings / Slimes Dam material (40%)	1 893	100	5	0.06
Input to Aq.	Seepage to Aquifer from Tailings / Slimes Dam	2 840	237	8	0.09
Input	Oil Seperator Plant to Evaporation Dams near Sewage Plant (based on 2007 data)	2 280	190	6	0.07
Input to U/G	Water Component Recycled (Groundwater Seepage to U/G via Shaft, Vent Shafts and Decline):	2 840	237	8	0.09
Input to Aq.	Seepage from the Northern Waste Rock Discard Pile (Based on Climatic Water Balance of Numerical Model)	190	16	1	0.01
Input to Aq.	Seepage from the Southern Waste Rock Discard Pile (Based on Climatic Water Balance of Numerical Model)	609	51	2	0.02
Input to Aq.	Seepage from the Product Stock Pile Area (Based on Climatic Water Balance of Numerical Model)	2 871	239	8	0.09
Input to Aq.	Seepage from the Duckpond Dam or RWD (Based on Climatic Water Balance of Numerical Model)	66	6	0	0.00

vii) Has a water use licence been applied for?

The water uses employed on the mine have been included in the approved EA but have not been authorised in terms of the National Water Act (No 36 of 1998, NWA). HMM Wessels Mine has an existing water use license (Licence No.: 10/D41M/AGJ/1536), however some water uses were omitted as per the previous authorisation. In an effort to obtain complete compliance, it was decided that an Integrated Water Use License Application (IWULA) under the National Water Act (No 36 of 1998, NWA) is required. The outstanding water uses that have been included in the approved EA/EMPr; are as follows:

Section 21 (g) for the following facilities:

- Product stockpiles (North, South and Central)
- Waste Rock Dump (North and South)
- Waste rock dumped underground
- Dust suppression with water from undergrounds workings
- Oil separation facility, including evaporation ponds.

Section 21 (e) for

- Sewage plant treated effluent used for irrigation of veld, distributed by means of sprinklers

The findings of the Surface Water Study (Knight Piésold, 2017) also recommended the construction of the following infrastructure as an improvement to the site's stormwater management:

- A total of 8 597 m of unlined water diversion channels will be required
- A total of 461 m of lined water diversion channels will be required
- 1 lined Sump and 3 unlined Sumps will be required

As a result, the following new water uses will be also be applied for:
Section 21 (g):

- Sump 1 collecting dirty water on site (unlined)
- Sump 2 collecting dirty water on site (lined)
- Sump 3 collecting dirty water on site (unlined)
- Sump 4 collecting dirty water on site (unlined)
- Lined diversion channels

A pre-application meeting for the water uses mentioned above was held with the DWS in Kimberly on the 01 October 2018. The meeting minutes and attendance register is provided in Annexure A of this document. The IWULA document is attached as an Appendix to this document.

viii) **Impacts to be mitigated in their respective phases**

Measures to rehabilitate the environment affected by the undertaking of any listed activity

Table 16: Mitigation measures for activities undertaken during mining operations

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
GEOLOGY					
Extraction of ore for mining operations ***Permanent alteration in local geology[1]***	• Operation • Closure • Post closure	1068.59ha	No mitigation is proposed.	• N/A	N/A
Extraction of ore for mining operations ***Surface subsidence after mine closure[1]***	• Closure • Post closure		Owing to the depth of mining (about 270 m - 300 m below) surface, subsidence associated with underground mining is unlikely to occur. However, the following mitigation is proposed: · Backfill of excavated areas (in accordance to the mining method) to maintain structural stability · Leave pillars intact · Conduct geotechnical stability testing	• Implementation of operational safety measures should be on-going from the operational phase • Subsidence monitoring should be in accordance with the standards proposed by a geotechnical investigation.	• NEMA • MPRDA • Closure Plan • HMM Mine Health & Safety Act
TOPOGRAPHY					
Establishment of surface infrastructure ***Alteration in natural topography[1]***	• Operation • Closure • Post closure	149.1 ha	The general topography of the area is flat; upon mine closure the surface infrastructure and mine facilities (WRD, TSF and Stockpiles) will be rehabilitated in accordance with the closure plan (2014). ***Rehabilitation:*** • Surface infrastructure will be demolished, or re-used in accordance to the closure plan. The stockpile areas, as well as WRDs will be reshaped and sloped according to the rehabilitation plan. • All areas will be free draining post mining, including the rehabilitated plant areas. • The localised soil and vegetation types will be utilised to return the area to as close as possible to its natural state • Progressive rehabilitation of WRDs should be undertaken where possible. ***Waste Rock Dumps*** • Levelling off the dumps to stable slopes of approximately 12º • Capping of dumps with approximately 0.5 m of nutrient enriched re-vegetated soils • Utilising localised soil types and vegetation to return the area to its natural state Monitoring rehabilitation process ***TSF:*** • The settled tailings is presently sold at a rate of 19 083.33 tonnes/month via load and haul operations. The non-saleable product that remains will be levelled off to around 12°. Tailings may also be capped with 0.5 m of nutrient enriched sand and re-vegetated soil, subject to the outcome of a rehabilitation trial at HMM Mamatwan Mine.	• Progressive rehabilitation from operational phase through to closure and care and maintenance	• NEMA • MPRDA • HMM Wessels Rehabilitation Plan • Guidelines for Rehabilitation of Mined Land • Rehabilitation of Mine Dumps - HSEG-SOP
SOIL, LAND USE AND LAND CAPABILITY					
Mining operations ***Loss of land for grazing[1]***	Operation	149.1 ha (This denotes the surface disturbance; however, the underground	• Remedy through progressive rehabilitation where possible. The target land capability is grazing according to the 2014 Closure Plan. • Stockpiles and dumps will be rehabilitated to sustain similar vegetation, although these areas will most likely be excluded from grazing in the longer term. • Where possible, areas will be cleaned of ore, product and other mining related materials.	• Erosion control measures should be implemented during the rehabilitation / maintenance / aftercare phase and 2-5 years thereafter. Rehabilitation should be progressive	• NEMA • MPRDA • Erosion Control Management Plan should be implemented in accordance with best practise principles • HMM Wessels Waste Management Plan

[1] Impacts associated with activities

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
		workings, which have been, disturbed to an extent greater than 149.1 ha.)	• Material beneath these areas will be sampled once these are removed to assess the extent to which it is contaminated, and if necessary, soil will be placed into the shafts and/or underground.		• Soil management in terms of the Chamber of Mines Guidelines for Rehabilitation • South32 Hydrocarbon Spill Management Plan • Hazardous Material Management Plan • Guidelines for Rehabilitation of Mined Land • HSEG-SOP: Rehabilitation of Mine Dumps • HSEC-SOP: Rehabilitation Plan • HSEC-SOP: Rehabilitation and Soil Farm for Hotazel Manganese Mine • HMM EnviroSys System
Soil contamination ***Hydrocarbon spillage[1]***	Operation	Various areas around the disturbed land area 149.1 ha	At present, the impact of soil contamination from the oil separator is limited by means of concrete floors at wash shops and wash bays. All fuel and oil bays are bunded to contain spillage. However, not all of the workshop areas are bunded, so that there remains a risk of spillage, thereby contaminating surface soil. The following measures are proposed to minimise soil contamination: • Immediate use of spill kits and remediation of contaminated areas • Continue the implementation of Waste Management Plan • The areas where fuel and oil spills are located on site will be rehabilitated immediately (at most within a week) of the spill being reported. The area where the spill occurred will be levelled to ensure that no depression remains. **Post mining:** • Contaminated soils which may impact vegetation or groundwater will be excavated and placed within shafts • Any contaminated soils that will result in either impacts on groundwater or limit the establishment of vegetation will be excavated and placed into the shafts.	• Immediately stop the source. Contaminated area will be remediated • Continuous monitoring for spillages should be undertaken during operational phase and through to closure	• NEMA • MPRDA • Soil Management in terms of the Chamber of Mines Guidelines for Rehabilitation • South 32 Hydrocarbon Spill Management Plan • Hazardous Material Management Plan • Waste Management Plan
Site rehabilitation and reclamation ***Demolition and removal of infrastructure and contouring of facilities[1]***	Closure	149.1 ha	• Soil compaction may also be mitigated by ripping • Increase the frequency of dust suppression techniques during the site clearing and rehabilitation phases. • Correct implementation of rehabilitation measures to ensure the mining area is restored to grazing land.	• Implementation of rehabilitation plan progressively from operational phase • Erosion control measures should be implemented during the rehabilitation phase and for 2-5 years during maintenance and aftercare.	• NEMA • MPRDA • Soil Management in terms of the Chamber of Mines Guidelines for Rehabilitation • Erosion Control Management Plan should be implemented in accordance with best practise principles
Site rehabilitation and reclamation ***Change of land use from mining to grazing[1]***	Closure		No mitigation applicable aside from ensuring rehabilitation objectives are met.		• NEMA • MPRDA • Erosion Control Management Plan should be implemented in accordance with best practise principles
AIR QUALITY					
Vehicular movement and traffic ***Increase in dust, carbon emissions ad inhalable particulates[1]***	• Operation • Closure	149.1 ha	**Vehicle entrained dust** *Operation* • Continuous implementation of dust monitoring program (dust fallout monitoring is undertaken on a monthly basis) • Grading of roads to reduce or limit the amount of fine particles • Implementation of maximum speed limit of 40 km. • Implementation of dust suppression techniques (mobile tankers, dust retardant etc.) *Closure:* • Rehabilitation to reduce windblown dust particles.	• Throughout operational phase and closure phase for a period of 5 years post-closure	• NEM: AQA (Section 53 of Regulation 5) • SANS 1137:2012, ASTM D1739:1998 (Sampling) • SANS 1929:2011 (NO_2, SO_2 and both PM10 and PM2.5) • HSEC-SOP: Rehabilitation Plan • HSEC-SOP: Rehabilitation and Soil Farm for Hotazel Manganese Mine

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
			Increase in carbon emissions • Ensure trucks and vehicles are maintained in accordance to manufactures specified exhaust emissions. New vehicles purchased must comply with maximum permissible diesel exposure standards. • Continue occupational measurements for diesel particulates • Conduct regular inspection and maintenance routines in areas prone to dust release to address spillages on ground level and along conveyors, in order to prevent the re-suspension of settled dust		
Waste Rock Dump and Stockpile Operation ***Increase in fugitive dust[1]***	Operation	Various individual areas, overall surface area is 149.1 ha	Monitoring of dust fallout on a monthly basis (Strategic sampling points have been identified subsequent to prevailing wind direction, zone of influence, and surrounding activities)	• Throughout operational phase	
Rehabilitation of disturbed areas ***Creation of dust and inhalable particulates[1]***	Closure	149.1 ha	Continuation of dust suppression during rehabilitation and closure phase	• Beginning of rehabilitation phase until closure is achieved	
NOISE					
Blasting ***Noise generation[1]***	Operation	1068.59 ha	Noise generation on the surface is minimal due to the depth of mining and blasting activities therefore no mitigation is proposed	• N/A	N/A
Mine Operation ***Increase in ambient noise[1]***	Operation	149.1 ha	Conduct ambient noise study	• Once every two years	N/A
VIBRATION					
Mining operation ***Generation of vibration[1]***	Operation	1068.59 ha	Blasting at Wessels Mine is not continuous and vibration will be limited to the blasting areas. Therefore, no mitigation is possible.	• Throughout operational phase	• Explosive Act • MHSA • Engineering best practises
SURFACE WATER					
Mining Activities ***Catchment reduction[1]***	Operational	149.1 ha	Effective diversion of clean stormwater, by implementation of the proposed Stormwater Management Plan to reduce the impacts of reduced catchment runoff.	• 2 - 3 years. Implementation during dry season	• National Water Act (36 of 1998) • NEM: WA • GN 704 • Wessels Stormwater Management Plan, Knight Piésold 2017 (to be implemented)
Mining Activities ***Erosion and sediment accumulation[1]***	Operational	149.1 ha	• The use of standard erosion control measures, such as interception drains, contour planting, silt fences, establishment of groundcover species, optimal drainage construction, and silt ponds are applied where appropriate. Where possible earthwork activities should be undertaken during dry periods • Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff • Traffic and movement over stabilised areas will be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the Environmental Manager • The total footprint area to be developed will be kept to a minimum by demarcating the construction areas and restricting construction to these areas only	• 2 - 3 years. Implementation during dry season	• Wessels Rehabilitation plan • Engineering best practises • Implement an Erosion Control Management Plan in accordance with best practise principles • Guidelines for Rehabilitation of Mined Land • HSEC-SOP: Rehabilitation Plan • HSEC-SOP: Rehabilitation and Soil Farm for Hotazel Manganese Mine

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
			• Maintenance should be carried out by removing sediment regularly from the storage and conveyance infrastructure. • Limit size of denuded areas, implement erosion control berms		
Mining Activities ***Contamination of receiving environment[1]***	Operational	Erosion and sediment= 149.1 ha and unlined dams=0,0246 ha	• Ensure that as far as practicable, waste oil is collected, stored and disposed of for recycling Measures shall be implemented and recorded to minimize the contamination of waste oil • Oil recovered from machinery is stored in a clearly labelled container and within secondary containment (for containers in excess of 208 L) • Conduct on-going campaigns to sensitize staff not to dispose any oil into the storm or effluent drains, or into a dedicated container allocated to a different material • Conduct monthly inspections of waste oil disposal performance	• Surface water monitoring implemented as per Wessels WUL (Licence No.: 10/D41M/AGJ/1536)	• National Water Act (36 of 1998) • NEM: WA • MPRDA • Wessels WUL (Licence No.: 10/D41M/AGJ/1536) • NEM: WA (Section 7(1)(C) and Section 69(1)(IA)) • Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste
				• Surface Water monitoring should be undertaken in accordance to WUL (Licence No.: 10/D41M/AGJ/1536). • During rehabilitation, surface water monitoring should be undertaken on a quarterly basis from the start of rehabilitation and maintenance until a sustainable situation is reached and after the authorities have signed it off.	• MPRDA • National Water Act (36 of 1998) • NEM: WA • Wessels WUL (Licence No.: 10/D41M/AGJ/1536) • NEM: WA (Section 7(1)(C) and Section 69(1)(IA)) • Guidelines for Rehabilitation of Mined Land • HSEC-SOP: Rehabilitation Plan • Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste
Treatment and Storage of Sewage Water ***Surface water contamination due to spillages from sewage plant[1]***	Operational	0.16 ha	• Operate the sewage plant to the DWS Best Practices Guidelines to prevent spillages and leakages. • Undertake surface water monitoring to monitor water quality impacts due to spillage or leakage	• Monthly and quarterly sampling in accordance with WUL (Licence No.: 10/D41M/AGJ/1536)	• National Water Act (36 of 1998) • Approved EMPr • Applicable Interim Resource Water Quality Objectives for the catchment • Wessels WUL (Licence No.: 10/D41M/AGJ/1536)
Mining Activities ***Groundwater contamination[1]***	Operational	-	• Refer to groundwater mitigations as proposed below	• See groundwater mitigations	• See groundwater mitigation
Mining Activities ***Use of low grade material for creating berms[1]***	Operational	Various areas around surface= 149.1 ha	• Use other inert materials (refer to Acid Base Accounting Study) for the construction of berms and surface water management infrastructure • Adherence to GN 704 regulations	• 2-3 years	• National Water Act (36 of 1998) • NEM: WA • GN 704
Mining Activities	Operational	Disturbed land footprint= 149.1 ha	• Use of standard erosion control measures, such as interception drains, contour planting, silt fences, establishment of groundcover species, optimal drainage construction, and silt ponds are applied where appropriate. Where possible earthwork activities should be undertaken during dry periods • Progressive rehabilitation of disturbed land should be carried out to minimise the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff • Traffic and movement over stabilised areas will be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the Environmental Manager • The total footprint area to be developed will be kept to a minimum by demarcating the construction areas and restricting construction to these areas only • Maintenance should be carried out by removing sediment regularly from the storage and conveyance infrastructure.	• Surface Water monitoring should be undertaken in accordance to WUL (Licence No.: 10/D41M/AGJ/1536). • During rehabilitation, surface water monitoring should be undertaken on a quarterly basis from the start of rehabilitation and maintenance until a sustainable situation is reached and after it has been signed off by the authorities	• Surface Water Monitoring in accordance with National Water Act (36 of 1998) and Wessels WUL (Licence No.: 10/D41M/AGJ/1536) • Guidelines for Rehabilitation of Mined Land • HSEC-SOP: Rehabilitation Plan • MPRDA • Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
Mine Decommissioning ***Contamination of surface water[1]***	Closure	Disturbed land footprint= 149.1 ha	• As far as practicable ensure, waste oil is collected, stored and disposed of by an accredited vendors for recycling • Oil recovered from machinery is stored in a clearly labelled container and within secondary containment (for containers in excess of 208 L) • Conduct on-going campaigns are conducted to sensitize staff not to dispose any oil into the storm or effluent drains, or into a dedicated container allocated to a different material • Conduct monthly inspections of waste oil disposal performance • Implement standard erosion control measures such as interception drains , contour planting, silt fences establishment of groundcover species, optimal drainage construction and silt ponds where appropriate		• National Water Act (36 of 1998) • Guidelines for Rehabilitation of Mined Land • HSEC-SOP: Rehabilitation Plan, • MPRDA • Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste.
Mine Decommissioning ***Localised ponding of water[1]***	Post-closure		• The use of interception drains and berms to prevent surface water runoff • Remove sediment regularly from the storage and conveyance infrastructure.	• Post closure	National Water Act (36 of 1998)
GROUNDWATER					
Storage of Explosives ***Groundwater contamination[1]***	Operational	Overall mining right area (underground) is 1 068.59 ha	Storage, handling, and monitoring at the site to prevent spillages or leakages of explosive material that may cause groundwater contamination.	• On-going	• Storage in accordance with Explosives Act: Chapter 3 • Wessels WUL (Licence No.: 10/D41M/AGJ/1536)
Storage of Hydrocarbon Material and Fuel ***Groundwater contamination[1]***	Operational		• Implement immediate clean up after accidental spillages. • Ensure effective management of the oil skimmers to ensure the effective treatment of all the oil effluent disposed of in the lined evaporation pond. • Proper storage and handling and monitoring at hazardous waste hard stand to prevent spillages and the timely removal of waste to a "Class 1, Hazardous Waste' facility. At present, the impact of soil contamination from the oil separator is limited by means of concrete floors at wash shops and wash bays. All fuel and oil bays are bunded to contain spillage. However, not all of the workshop areas are bunded, so that there remains a risk of spillage, thereby contaminating surface soil. The following measures are proposed to minimise soil contamination: • Immediate use of spill kits and remediation of contaminated areas • Continue the implementation of Waste Management Plan • The areas where fuel and oil spills are located on site will be rehabilitated immediately (at most within a week) of the spill being reported. The area where the spill occurred will be levelled to ensure that no depression remains.	• On-going	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • IWWMP (2017) • NEM: WA National Norm and Standards • Soil Management in terms of the Chamber of Mines Guidelines for Rehabilitation • South 32 Hydrocarbon Spill Management Plan • Hazardous Material Management Plan • Waste Management Plan
RWD Storage of Dirty / Process Water ***Increase salt loading to aquifer[1]***	Operational	0.5781ha	• Re-use water from the RWD as process water in the plant. Wessels is currently in the planning phase to implement such water re-use system for the duck pond Dam (RWD). • Undertake Salt Balance Study	• Already implemented • Salt Balance Study: Annually	• Groundwater Monitoring in accordance with National Water Act (36 of 1998)
TSF Disposal Area of Waste Rock Fines ***Groundwater contamination into receiving aquifer[1]***	Operational	15.49 ha	• Compile and implement an operational management and maintenance programme according to BPG for Mine Residue Deposits, which includes operation manuals. • Removal and selling of tailings material • Compact base remove seepage to duck pond dam (RWD) and contain dirty water with stormwater control.	• Within 1 year after authorisation of this EA	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • Compliance to GN704 • Approved EMPr, • Best Practice Guideline A4: Pollution control dams. Department of Water Affairs and Forestry, 2007 • Best Practice Guideline H4: Water Treatment. Department of Water Affairs and Forestry, 2006 • Best Practice Guideline G3. Water Monitoring Systems. Department of Water Affairs and Forestry, 2006 • Best Practice Guideline G1: Stormwater Management • IWWMP (2017) • NEM: WA National Norm and Standards • NEMWA Regulations for planning and management of residue stockpiles and deposit

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
Old Waste Yard ***Groundwater contamination[1]***	Operational	N/A	• No further disposal of general waste on-site • Progressive rehabilitation of Old Waste Yard • Groundwater monitoring (as part of WUL conditions).	• Removal of waste and rehabilitation of area: One year • In accordance with WUL (Licence No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • NEM: WA National Norms and Standards
Waste Handling and Storage Facility ***Groundwater contamination[1]***	Operational	Various individual areas, overall mining right area (underground) is 1 068.59 ha	• Implement proper storage, handling, and monitoring at the site to prevent spillages or leakages of temporarily stored domestic and hazardous waste material that may cause groundwater contamination. • Store hazardous waste in proper containers to prevent leakages, seepage or rain water from entering the container. • Drill a monitoring borehole down gradient of the site to monitor any possible leakages, spillage or seepage, which may impact the groundwater quality.	• Already implement (on-going) • Within 5 years after authorisation of this EA	
Waste Rock Disposal Area (Coarse Grained and Large Pieces) ***Groundwater contamination[1]***	Operational	WRD 1 = 6.3285 ha and WRD 2 = 3,30 ha	• Operate Waste Rock Discard Stockpiles according to BPG for Mine Residue Deposits, which include operation manuals. • Wash waste rock before deposition to remove fines to reduce water-soluble material for oxidation and to reduce the potential for groundwater contamination. • Prevent Storm / clean water run-off from flowing through the waste rock stockpile by means of berms.	• Already implemented (on-going) • Within 1 year	• Groundwater Monitoring in accordance with WUL • National Water Act (36 of 1998) • IWWMP (2017). • National Water Act (36 of 1998) • Compliance to GN704 • Approved EMPr • NEMWA Regulation for planning and management of residue stockpiles and deposit
Stockpile Area ***Groundwater contamination[1]***	Operational	Various individual areas, overall surface area. Stockpile west = 1.63 ha and stockpile north = 4.85 ha and stockpile south east = 40.99 ha	• Reduce the footprint to the actual need of the mine, as most of the foot print area has been unused as observed during water monitoring fieldwork events during the past 14 years. • Refer to Acid Base Accounting Study for ARD properties of ore stockpiles.	• Within 5 years after authorisation of this EA	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • NEM: WA National Norms and Standards • National Water Act (36 of 1998) • Compliance to GN704 • Approved EMPr
Treatment and Storage of Sewage Water ***Groundwater contamination due to spillages from sewage plant[1]***	Operational	0.16 ha	• Undertake groundwater monitoring to monitor groundwater quality impacts due to spillage or leakage. • Operate the sewage plant to the DWS Best Practices Guidelines to prevent spillages and leakages."	• In accordance with WUL (Licence No.: 10/D41M/AGJ/1536)	
Pumping of groundwater from the Wessels Underground sections ***Reduction of borehole/ aquifer yields[1]***	Operational	Overall mining right area (underground) is 1 068.59 ha	• Conduct a routine regional groundwater hydrocensus every few years to assess the regional impact on groundwater elevation. • Design and implement for maximum underground recycling of water in order to reduce pumping costs. • Properly seal all major water ingress points and ensure that the details of the sealing action are recorded. • Grouting of shaft and vent shaft to minimise the influx of groundwater in the mine to minimise pumping costs, minimise groundwater volume contaminated and to reduce the dewatering impacts during life of mine. • Minimise water retention time within these areas and ensure that these sections are cleaned thoroughly in order to improve the quality of water that is collected in underground workings and abstracted to the surface water quality of the UG workings that are abstracted to the surface.	• On-going • Already implemented (on-going) • Immediate • Within 1 year • Immediate	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) and IWWMP (2017). • National Water Act (36 of 1998) • Compliance to GN704 • Approved EMPr • Applicable Interim Resource Water Quality Objectives for the catchment • Wessels WUL (Licence No.: 10/D41M/AGJ/1536)
Leakages of pipes and seepage/spillage from plant storage dams (Process Water) ***Groundwater contamination[1]***	Operational	Various individual areas, overall surface area is 149.1 ha	• Spillages (product) should be cleaned continuously. • Operate plant facilities where water containing waste are stored and managed in such a manner as to prevent pollution problems. • Inspect plant facilities such as the Surface Reservoirs of the UG Water Storage, Clarifier Dam and Thickener Dam for possible leakages or spillages that may cause groundwater contamination. • The slurry or tailings pipelines should be operated in such a manner as to prevent pollution problems in the event of pipeline ruptures.	• On-going • In accordance with WUL (Licence No.: 10/D41M/AGJ/1536) • Immediate (on-going) • Immediate (on-going)	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • IWWMP (2017)

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
Storage of Dirty Water in an Evaporation Dam ***Groundwater contamination[1]***	Operational	Evaporation pond-sewage = 0,1233 and evaporation pond - oil separation = 0,0246 ha	• Ensure that the capacity of the pond is sufficient to accommodate the volume of effluent disposed of to prevent overflows and spillages. • Regular assessment of pond freeboard to prevent overflow. Groundwater monitoring is to be undertaken • Drill a monitoring borehole down gradient of the site to monitor any possible leakages.	• Immediate (on-going) • Immediate (on-going) • Within 1 year	• National Water Act (36 of 1998) • Freeboard standard of GN 704: 0,8 m. Refer to regulation 77 No. 6 (e) National Water Act (36 of 1998) • Compliance to GN 704 • Approved EMPr • Applicable Interim Resource Water Quality Objectives for the catchment
Storage of Explosives ***Groundwater contamination[1]***	Closure	2,8444 ha	• Rehabilitate the area in total, which includes storage structures and leftover hazardous explosive material and residue is to be removed and disposed of at a "Class 1, hazardous Waste Site".	• After cessation of mine operations. Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • Guidelines for Rehabilitation of Mined Land • HMM EnviroSys System • HSEC-SOP: Rehabilitation Plan • IWWMP (2017) • NEM: WA National Norms and Standards.
Storage of Hydrocarbon Material and Fuel ***Groundwater contamination[1]***	Closure	Various individual areas, overall surface area is 149.1 ha	• Rehabilitate the oil skimmers, which includes storage structures and leftover hydrocarbon material and residue is to be removed and disposed of at a "Class 1, hazardous Waste Site". This will ensure that no further degradation of the underlying receiving aquifer takes place in the post closure phase. • Investigate soils of the immediate area to ensure that no hydrocarbon contaminants are present, if hydrocarbon contaminants are present the soils are to be rehabilitated / land farmed to ensure the breakdown of the hydrocarbon contaminants.	• After cessation of mine operations. Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with National Water Act (36 of 1998). • Freeboard standard of GN 704: 0,8 m. Refer to regulation 77 No. 6 e • Guidelines for Rehabilitation of Mined Land, HMM EnviroSys System • HSEC-SOP: Rehabilitation Plan • IWWMP (2017) and NEM: WA National Norms and Standards. • National Water Act (36 of 1998), • Approved EMPr • Applicable Interim Resource Water Quality Objectives for the catchment
RWD Storage of Dirty / Process Water ***Groundwater contamination[1]***	Closure	0,5781 ha	• Shape and rehabilitate the RWD to avoid ponding on the surface.	• After cessation of mine operations.	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • HMM EnviroSys System, • HSEC-SOP: Rehabilitation Plan • IWWMP (2017).
TSF Disposal Area of Waste Rock Fines ***Groundwater contamination[1]***	Closure	Various areas around surface = 149,1 ha	• Enhanced seepage through the residues may occur if ponding on the surface occurs due to inappropriate shaping of the surface. • Cap and cover with capillary break can also be included if deemed necessary by the environmental engineer designing the rehabilitation system. • Contain dirty water seepage and runoff for evaporation.	• After cessation of mine operations.	• Groundwater Monitoring in accordance with National Water Act (36 of 1998), • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP: Rehabilitation Plan and IWWMP (2017).
Old Waste Yard ***Groundwater contamination1***	Closure	Various areas around surface = 149,1 ha	• Already rehabilitated within the side of the TSF.	• After cessation of mine operations.	• Groundwater Monitoring in accordance with National Water Act (36 of 1998), • Guidelines for Rehabilitation of Mined Land, Rehabilitation of Mine Dumps – • HSEG-SOP-048, HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan and IWWMP (2017).
Waste Handling and Storage Facility ***Groundwater contamination1***	Closure	Various individual areas, overall mining right area (underground) is 1 068.59 ha	• Rehabilitate the Waste Separation and Temporary Storage Facility, which includes storage structures and leftover hydrocarbon material and residue, is to be removed and disposed-of at a "Class 1, hazardous Waste Site". This will ensure that no further degradation of the underlying receiving aquifer takes place in the post closure phase. • Soils of the immediate area are to be investigated to ensure that no hydrocarbon contaminants are present, if hydrocarbon contaminants are present the soils are to be rehabilitated / land farmed to ensure the breakdown of the hydrocarbon contaminants. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536).	• After cessation of mine operations.	• Groundwater Monitoring in accordance with National Water Act (36 of 1998), • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP: Rehabilitation Plan, IWWMP (2017) and • NEM: WA National Norms and Standards

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
Waste Rock Disposal Area (Coarse Grained and Large Pieces) ***Groundwater contamination[1]***	Closure	WRD 1 = 6,3285 ha and WRD 2 = 3,297 ha	• Rehabilitate top and side slopes with erosion resistant cover and re-vegetate, implement stormwater control and separation of clean water and dirty water runoff. • Compaction or rehabilitation or add a capping layer over the TSF to lower hydraulic conductivity and to minimise ingress of rainwater recharge into mine residue deposit.	• After cessation of mine operations. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with National Water Act (36 of 1998), • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP: Rehabilitation Plan and IWWMP (2017).
Stockpile Area ***Groundwater contamination1***	Closure	Various individual areas, overall surface area is 149.1 ha	• Remove (reclaim and / or remove) the contaminated topsoil in the footprint of the Product Stockpile Area. • Shape and re-vegetate areas to prevent ponding of water that may increase seepage potential.	• After cessation of mine operations. • After cessation of mine operations.	• Groundwater Monitoring in accordance with National Water Act (36 of 1998)
Treatment and Storage of Sewage Water ***Groundwater contamination due to spillages from sewage plant[1]***	Closure	1630 m^2	• Rehabilitate the Sewage Treatment Works, which includes storage structures and leftover hazardous material and residue is to be removed and disposed of in a proper manner according to the type of waste. This will ensure that no further degradation of the underlying receiving aquifer takes place in the post closure phase. • Shape and re-vegetated area to prevent ponding of water that may increase seepage potential.	• After cessation of mine operations.	• Groundwater Monitoring in accordance with National Water Act (36 of 1998), • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP: Rehabilitation Plan and IWWMP (2017).
Potential Decants at Wessels Mine Shaft, Vents Shaft and Decline ***Groundwater contamination due to mine decant[1]***	Closure	Overall mining right area (underground) is 1 068.59 ha	• Confirm the existence and/or potential for inter-mine flows into or from adjacent mines after mine closure and flooding of mines before closure. • Institute appropriate water level and water quality monitoring programmes to confirm the rate of water rise and water quality if the mined area floods. • Maintain an ability to access the underground workings for sampling and mine water elevation measurements.	• After cessation of mine operations. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) and IWWMP (2017).
Leakages of pipes and seepage/spillage from plant storage dams (Process Water) ***Groundwater contamination[1]***	Closure	Various individual areas, overall surface area is 149.1 ha	• Rehabilitate the Surface Plant, which includes storage structures and leftover hazardous material and residue is to be removed and disposed-off in a proper fashion according to the type of waste. This will ensure that no further degradation of the underlying receiving aquifer takes place in the post closure phase. • Soils of the immediate area are to be investigated to ensure that no hydrocarbon contaminants are present, if hydrocarbon contaminants are present the soils are to be rehabilitated / land farmed to ensure the breakdown of the hydrocarbon contaminants. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536).	• After cessation of mine operations. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • Guidelines for Rehabilitation of Mined Land • HSEG-SOP: Rehabilitation and Soil Farm for Hotazel Manganese Mines • HSEC-SOP: Rehabilitation Plan • IWWMP (2017) • Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste.
Storage of Dirty Water in an Evaporation Dam and Evaporation Ponds ***Groundwater contamination[1]***	Closure	Evaporation Pond-Sewage = 1630 m^2 and Evaporation Pond - Oil separation = 246 m^2	• Rehabilitate the Evaporation Ponds, which includes storage structures and leftover hazardous hydrocarbon material and residue is to be removed and disposed-off in a proper fashion according to the type of waste. • Backfill, shape and rehabilitate the evaporation pond to avoid ponding on the surface. This will ensure that no further degradation of the underlying receiving aquifer takes place in the post closure phase. • Soils of the immediate area are to be investigated to ensure that no hydrocarbon contaminants are present, if hydrocarbon contaminants are present the soils are to be rehabilitated / land farmed to ensure the breakdown of the hydrocarbon contaminants. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536).	• After cessation of mine operations. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with National Water Act (36 of 1998) • Guidelines for Rehabilitation of Mined Land • HSEG-SOP: Rehabilitation and Soil Farm for Hotazel Manganese Mines • HSEC-SOP: Rehabilitation Plan, IWWMP (2017) • Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste.
AQUATIC ECO-SYSTEMS					
Surface Water Runoff ***Deterioration in water quality and aquatic ecosystem[1]***	Operation	Various individual areas, overall surface infrastructure area is 149.1 ha	• Minimise surface water runoff from site by using berms and diversion channels • Contain dirty water on-site by implementing the stormwater management plan.	• 2 - 3 years	• National Water Act (36 of 1998) National Water Act (36 of 1998) • Compliance to GN704 • Approved EMPr • Applicable Interim Resource Water Quality Objectives for the catchment
BIODIVERSITY - Flora					

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards

Mining operations
 	
Disturbance of protected floral species[1]
	Operation	Disturbed land footprint= 149.1 ha	• If the mining footprint expands, surveys should be undertaken for protected floral species (*Nymania capensis* and *Acacia erioloba*). If found, permits from Competent Authority should be applied for the removal of such species.
			• Rehabilitation:
			  ○ Sloping, shaping and placement of a soil cover,
			  ○ Site to be seeded with material harvested from adjacent areas
			  ○ Monitor affected areas annually
			  ○ Remove alien & invasive plants on an annual basis before they flower
				• As and when required, newly disturbed areas should be surveyed for indigenous flora.	• NEMA
					• NEM:BA
					• HMM Land Disturbance Management Procedure
					• HSEC-SOP: Biodiversity and Land Management Plan

Mining operations Habitat destruction by vegetation clearing1	Operation	Disturbed land footprint= 149.1 ha	• The removal of the isolated indigenous trees and shrubs should only occur on the construction footprint area of the development and not over the larger area. Where possible, vegetation should be retained in between infrastructural elements associated with the project. • Conduct flora species search and rescue efforts before ground clearing begins in order to reduce negative impacts on species of concern. • Remove and relocate any plants of botanical or ecological significance as indicated by the ecologist or Environmental Control Officer (ECO) • Vegetation to be removed as it becomes necessary. • Construction should preferably take place in winter to reduce disturbance to breeding fauna and flowering flora. • Remove and relocate any plants of botanical or ecological significance as indicated by the ecologist or Environmental Control Officer (ECO). • Vegetation to be removed as it becomes necessary – do not clear the entire footprint simultaneously. • Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. • Monitoring should be implemented during the construction activities to ensure that minimal impact is caused to the flora of the area.	• Ongoing	• NEMA Regulation 543 Section 32 • NEMBA Section 56 (1), 57 (1), 57 (2) and 57 (4) • Limpopo Environmental Management Act Schedules 2, 3, 11 and 12
Mining operations and rehabilitation of disturbed areas ***Increase in colonisation of alien invasive plants[1]***	Operation and Closure	Disturbed land footprint= 149.1 ha	• Implement an alien vegetation control programme. • Restricting vehicle movement to existing roads. • Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish. Implement progressive rehabilitation on the TSF side slopes, WRDs and other areas not actively used. • Establishment of an eradication programme around the mine concession to eradicate invasive plants on an on-going basis. • Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to site or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. • Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. • Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented; and • A detailed plan should be developed for control of noxious weeds and invasive plants that could colonize the area as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations.	• Throughout operational phase • All disturbed areas should be monitored for the establishment of alien plant species for 2-5 years biannually post closure.	• NEM:BA Sections 66(1), 67(1), 70(1)(a), 71(3) and 71A • Notice 3 (List 1: National list of Invasive Terrestrial and Fresh-water Plant Species) • HSEC-SOP: Biodiversity and Land Management Plan • Biodiversity Management Action Plan (Advisian, 2017).
BIODIVERSITY - Fauna					
Mining operations ***Loss of faunal species[1]***	Operation and closure	Disturbed land footprint= 149.1 ha	• Securing the mining area through fencing of the property • Enforce no hunting rule • Regular patrols to destroy snares • Implement 40 km/h speed limit	• Ongoing.	• HMM Land Disturbance Management Procedure • HSEC-SOP: Biodiversity and Land Management Plan

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
Mining operations Habitat destruction by vegetation clearing1	Operation	Disturbed land footprint= 149.1 ha	• The ECO should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ECO should enforce any measures that he/she deem necessary. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation; • Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction; and • Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. Poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.	• Ongoing	• NEMA Regulation 543 Section 32 • NEMBA Section 56 (1), 57 (1), 57 (2) and 57 (4) • Limpopo Environmental Management Act Schedules 2, 3, 11 and 12
VISUAL IMPACT					
WRD, Tailings facility and stockpiles operation ***Negative visual impact[1]***	Operation	WRD= 3.297 ha and TSF= 1.0028 ha and Stockpiles= 56.29 ha	• No mitigation measures are proposed to mitigate the negative visual impact of surface infrastructure during the operational phase of the mine. • The impact is limited to the mining right area. Implementation of rehabilitation measures to transform the mining area to grazing land will reverse the negative visual impact.	• N/A	• MPRDA • NEMA • HMM Wessels Rehabilitation and Closure Plan • Guidelines for Rehabilitation of Mined Land • HSEC-SOP: Rehabilitation Plan.
Rehabilitation ***Demolition and removal of infrastructure[1]***	Closure	57.09 ha	• Dumps and stockpiles to be rehabilitated by flattening and re-vegetation of slopes.	• At end of LoM and/or beginning of rehabilitation phase	• MPRDA, NEMA, • HMM Wessels Rehabilitation and Closure Plan, Guidelines for Rehabilitation of Mined Land, • HSEG-SOP-048: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP: Rehabilitation Plan.
HERITAGE					
Mining Activities ***Disturbance of culturally significant artefacts[1]***	Operation and Closure	Surface footprint= 149.1ha and	• No mitigation is required for this impact due to the fact that the area does not have any historically or culturally significant artefacts according to the Heritage specialist study undertaken.	• N/A	• HRA
SOCIO-ECONOMIC					
Blasting ***Generation of occupational noise[1]***	Operation	Various areas, overall mining right area (underground) is 1 068.59 ha	• Continue occupational exposure tests for employees • Evacuate personnel from blasting areas prior to blasts • Measure occupational noise exposure	• Annually during operational phase	• MPRDA • HMM Wessels Closure Plan • HMM Social and Labour Plan • MHS Act, SABS Code 0103, MSA-HSE-SOP-01: Stakeholder Engagement Management Plan.
Surface activities, disposal of waste rock and tailings, mineral processing. ***Increase in ambient noise levels[1]***	Operation	Surface footprint 149.1ha	• No mitigation possible	• N/A	• N/A
Economic impact of job creation (positive) ***Employment creation[1]***	Operation	-	• No mitigation required, short term impact	• N/A	• N/A
Demolition and removal of surface infrastructure ***Increase in ambient noise[1]***	Closure	149.1 ha	• Implement Closure and Rehabilitation Plan	• In accordance with the HMM Wessels Closure and Rehabilitation Plan	

Activity	Phase	Size and Scale of disturbance	Mitigation measures	Time period for implementation	Compliance with standards
Mining operations ***Creation of secondary economic benefits[1]***	Operation		• Control measures implemented to minimise dust generation: ○ Water spray used to control dust around surface roadways ○ Rehabilitation of vegetation will reduce windblown dust ○ Vehicles maintained to ensure compliance with manufacturer specified exhaust emissions ○ New vehicles must comply with maximum permissible diesel exposure standards ○ Regular inspection and maintenance routines will be implemented in areas prone to dust release to address spillages on ground level and along conveyors, thereby preventing the re-suspension of settled dust ○ Implementation of dust monitoring program, dust buckets analysed on a monthly basis.	• Implementation throughout operational phase and through to rehabilitation and closure	• MPRDA, HMM Wessels Closure Plan, • HMM Social and Labour Plan, OHSA, Section 53 of • NEM: AQA Regulation 5, • SANS 1137:2012, ASTM D1739:1998 (Sampling) and SANS 1929:2011 (NO_2, SO_2 and both PM10 and PM2.5), • MSA-HSE-SOP: Stakeholder Engagement Management Plan.
Rehabilitation: Levelling and contouring of areas to be rehabilitated, replacement of topsoil ***Generation of dust and inhalable particles[1]***	Closure		• Implement Social Labour Plan and Closure Plan	• In accordance with the HMM Wessels Social Labour Plan	• Section 53 of NEM: AQA Regulation 5: Section 53, • SANS 1137:2012, ASTM D1739:1998 (Sampling) and SANS 1929:2011 (NO2, SO2 and both PM10 and PM2.5), • MSA-HSE-SOP-01: Stakeholder Engagement Management Plan.
Mine closure ***Retrenchment and loss of jobs[1]***	Closure	-	• Implement Closure and Rehabilitation Plan	• In accordance with the HMM Wessels Closure and Rehabilitation Plan	• MPRDA, HMM Wessels Closure Plan, • HMM Social and Labour Plan, • MSA-HSE-SOP: Stakeholder Engagement Management Plan.
Mine closure ***Reduction of institutional capacity to manage social infrastructure[1]***	Closure	-	• Implement Closure and Rehabilitation Plan	• In accordance with the HMM Wessels Closure and Rehabilitation Plan	• MPRDA, HMM Wessels Closure Plan, • HMM Social and Labour Plan, • MSA-HSE-SOP: Stakeholder Engagement Management Plan.

[1] : Denotes an impact for the respective activity

e) **Impact Management Outcomes**

Table 17: Impact management outcomes

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Mitigation type	Standard to be achieved
GEOLOGY					
Extraction of ore for mining operations	• Permanent alteration in local geology (the bord and pillar structures will remain unchanged) • Ore area will become highly permeable compared to original rock mass	Geology	Operation, Closure and Post closure	No mitigation possible	N/A
	• Surface subsidence after mine closure	Geology	Closure and post closure	Management measures	Closure objectives
TOPOGRAPHY					
Establishment of surface infrastructure	• Alteration in natural topography due to TSF, Waste Rock Dumps (WRD) and Product Stockpiles	Topography	Operation	Implementation of rehabilitation measures during mine closure.	Mitigate change in topography
SOIL, LAND USE AND LAND CAPABILITY					
Mining operations	• Loss of land for grazing (Surface disturbances are confined to the plant area, including the various dumpsites. The underground mining has no impact on the surface)	Soil, land use and land capability	Operation	Remedy through rehabilitation	Minimise and control loss of fertile land
Soil contamination	• There is a potential for hydrocarbon spillages and/or leaks from the oil separator, hydrocarbon storage areas and mobile equipment, which may contaminate surface soils. • In addition, spillage from conveyors and/or haulage routes may contaminate soils.	Land capability	Operation	Control through management and monitoring	Mitigate occurrence and potential for soil contamination
Site rehabilitation and reclamation	• Rehabilitation activities will consist of demolition and removal of infrastructure as well as contouring and levelling of specific facilities around the site. The increase vehicular movement will cause an increase in compaction of soils and will also result in an increase in erosion of un-vegetated areas.	Land capability	Closure	Management and rehabilitation	Rehabilitation standards
	• Change of land use from mining activity to grazing.	Land use	Closure	Ensuring rehabilitation objectives are met.	Rehabilitation standards
AIR QUALITY					
Vehicular movement and traffic	• Increase in vehicle entrained dust from use of unpaved roads (mining and plant vehicles)	Air quality	Operation and Closure	Control through management and monitoring during operation. Control through rehabilitation to reduce erosion during closure	Mitigate generation of fugitive dust
	• Increase in carbon emissions from vehicular traffic	Air quality	Operation and Closure	Management measures	Minimise carbon emissions
Waste Rock Dump and stockpile operation	Increase in generation of fugitive dust due to the operation of stockpiles (continuous piling of material)	Air quality	Operation	Control through monitoring	Mitigate generation of fugitive dust

Rehabilitation of disturbed areas	• Increase in dust and inhalable particulates due to the following activities in the rehabilitation phase:
	  ○ Demolition and removal of surface infrastructure
	  ○ Levelling and contouring of facilities and disturbed areas
		Air quality	Closure	Management measures	Rehabilitation standards

NOISE					
Blasting	• Generation of noise due to blasting (HMM Wessels operates and underground mining facility, the depth of mining precludes significant surface noise impacts on the due to blasting).	Air Quality - Noise generation	Operation	No mitigation is possible	No complaints from I&APs
Mine Operation	• Increase in ambient noise due to processing activities and utilisation and loading of trains	Air Quality - Noise generation	Operation	No mitigation is possible	N/A
VIBRATION					
Mining operation	• Generation of vibration from blasting activities	Vibration	Operation	No mitigation is possible but vibration monitoring will be implemented	N/A
SURFACE WATER					
Mining Activities	• Catchment reduction: The mining operations and facilities will reduce the catchment area that feeds the local water resources. The flow that reports to the river system will be reduced.	Surface water	Operational	Control through implementation of stormwater management plan	Avoid catchment reduction

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Mitigation type	Standard to be achieved
	• Erosion and sediment accumulation in impoundments: It is likely that there will be significant quantities of sediment generated by extreme rainfall events, which may result in erosion and loss of capacity in the dams.	Surface water	Operational	Use of standard erosion control measures; Implementation of progressive rehabilitation measures and management measures	Rehabilitation standards effects of erosion repaired
	• Contamination of receiving environment: Potential discharge of oil contaminated surface water into the receiving environment at points of generation or from storage areas.	Surface water	Operational	Control through management and monitoring	Mitigate against contamination of surface water
	• Contamination of groundwater: Potential seepage of contaminated surface water into the receiving ground water environment at unlined dams.	Surface water	Operational	Control through management and monitoring	Mitigate against contamination of groundwater from contaminated surface water
	• Climate Change: Increase in surface water evaporation.	Surface water	Operational	No mitigation possible	N/A
	• Use of tailings material for creating berms: Contamination of surface water.	Surface water	Operational	Management measures- Adherence to GN 704 regulations of the National Water Act (36 of 1998).	Prevent contamination of surface water
	• Creating of open areas due to vegetation, topsoil and /or infrastructure removal: Increase surface water runoff.	Surface water	Closure	Control through implementation of management measures and monitoring	Rehabilitation objectives
Mine Decommissioning	• Contamination of surface water.	Surface water	Closure	Control through management and monitoring	Prevent contamination of surface water
	• Localised ponding of water.	Surface water	Post-closure	Control through implementation of management measures and monitoring	Closure objectives
GROUND WATER					
Storage of Explosives	• Explosives Magazine: Spillages or leakages of explosives liquids may cause groundwater contamination (increase in nitrates).	Groundwater	Operational	Control through management and monitoring	Mitigate against spillages
Storage of Hydrocarbon Material and Fuel	• Surface Oil Skimmers, Hazardous Waste Hardstands, Re-Fuelling Bays, and Leaking Mine Vehicles of All Types: Fuel & hydrocarbons spillages may cause groundwater contamination.	Groundwater	Operational	Control through management and monitoring	Mitigate against spillages
RWD Storage of Dirty / Process Water	• Water contained in dirty water dams may impact on groundwater quality by means of seepage to underlying receiving aquifer (increase salt loading to aquifer).	Groundwater	Operational	Control and prevention through management measures and re-use of water	Mitigate against groundwater contamination
TSF Disposal Area of Waste Rock Fines	• Volume of leachate seeping to underlying receiving aquifer.	Groundwater	Operational	Control and minimisation of pollutants through the implementation of Best Practise Guidelines and management measures	Mitigate against groundwater contamination
	• Water quality of leachate seeping to underlying receiving aquifer.	Groundwater			
Old Waste Yard	• Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping to underlying receiving aquifer may cause groundwater contamination.	Groundwater	Operational	Control through monitoring	Monitor for indications of groundwater contamination
Waste Handling and Storage Facility	• Waste Separation & Temporary Storage Facility (Domestic & Hazardous Waste): Possible spillages or rainfall events may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Groundwater	Operational	Control through management and monitoring	Mitigate against groundwater contamination

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Mitigation type	Standard to be achieved
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	• North and South Waste Rock Discard Stockpiles [Coarse Grained Material], (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from the waste rock stockpiles; in terms of volume and water quality leachate (increase salt loading to aquifer).	Groundwater	Operational	Control through management and monitoring and through modifying infrastructure to prevent pollution	Mitigate against groundwater contamination
Stockpile Area	• Product stockpile Area: Potential for groundwater contamination due to seepages from the stockpiles, in terms of volume and water quality leachate (increase salt loading to aquifer).	Groundwater	Operational	Control through management	Mitigate against groundwater contamination
Treatment and Storage of Sewage Water	• Sewage Treatment Works and Evaporation Ponds for treated sewage effluent: Possible spillages and leakages from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Groundwater	Operational	Control through management and monitoring	Mitigate against spillages
Pumping of groundwater from the Wessels Underground sections.	• Reduction of borehole/ aquifer yields of I&APs as a result of dewatering due to the influx into the underground mining sections.	Groundwater	Operational	Control through monitoring	Mitigate against spillages and groundwater contamination
	• Ingress of water into the underground sections may cause safety concerns. The higher volume of influx water, the higher the associated pumping costs and dewatering impacts during life of mine.	Groundwater	Operational	Control through management, modification of current activity (engineering intervention)	Implement operational safety standards
	• Underground workings water or ingress water quality. Ingress water may come into contact with waste rock ore as well as potential hydrocarbons from mechanical workshops, which may degrade the water quality of the water. Use of diesel machinery in trackless (mechanised) mining results in fuel and oil spills, which create a problem in the underground settlers and may also give rise to groundwater contamination problems on the surface when the water is utilised as process water in the surface plant.	Groundwater	Operational	Control through management	Mitigation against decrease in groundwater quality
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	• Plant Area (plant facilities where water containing waste are stored and managed, which includes surface reservoirs of the UG water storage, clarifier dam and thickener dam): Possible spillages or leaking dams or slurry pipelines may cause groundwater contamination (increase salt load into aquifer)	Groundwater	Operational	Control through management and monitoring	Mitigate against spillages and groundwater contamination
Storage of Dirty Water in an Evaporation Dam	• Evaporation Ponds for treated oil Skimmer Effluent (Lined): Possible spillages or leaking ponds may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Groundwater	Operational	Control through management and monitoring	Mitigate against groundwater contamination
Storage of Explosives	• Explosives Magazine: Spillages or leakages of residual explosive liquids may cause groundwater contamination (increase in nitrates).	Groundwater	Closure	Control through implementation of rehabilitation measures and monitoring	Mitigate against groundwater contamination
Storage of Hydrocarbon Material and Fuel	• Surface Oil Skimmers, Hazardous Waste Hardstands, and Refuelling Bays, leaking Mine Vehicles of All Types: Residual fuel and hydrocarbons may cause groundwater contamination.	Groundwater	Closure	Control through implementation of rehabilitation measures and monitoring	Mitigate against groundwater contamination
RWD Storage of Dirty / Process Water	• Duck Pond Dam (Return Water Dam of the TSF): Seepage from RWD to underlying receiving aquifer.	Groundwater	Closure	Control of pollutants through rehabilitation measures	Mitigate against spillages and groundwater contamination
TSF Disposal Area of Waste Rock Fines	• Volume of leachate seeping into the underlying receiving aquifer.	Groundwater	Closure	Control through rehabilitation measures and management	Mitigate against spillages and groundwater contamination
	• Quality of leachate seeping into the underlying receiving aquifer.	Groundwater	Closure	Control through management and monitoring	Minimise groundwater seepage
Old Waste Yard	• Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping into the underlying receiving aquifer may cause groundwater contamination.	Groundwater	Closure	Rehabilitation	Implement rehabilitation objectives
Waste Handling and Storage Facility	• Waste Separation and Temporary Storage Facility (Domestic and Hazardous Waste): Residual or leftover contaminants may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Groundwater	Closure	Rehabilitation and monitoring	Implement rehabilitation objectives
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	• North and South Waste Rock Discard Stockpiles (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from waste rock stockpiles in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).	Groundwater	Closure	Rehabilitation and monitoring	Implement rehabilitation objectives

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Mitigation type	Standard to be achieved
Stockpile Area	• Product stockpile area: Potential for groundwater contamination due to seepages from waste rock stockpiles in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).	Groundwater	Closure	Rehabilitation	Implement rehabilitation objectives
Treatment and Storage of Sewage Water	• Sewage Treatment Works: Residual waste material from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Groundwater	Closure	Rehabilitation and monitoring	Implement rehabilitation objectives
Potential Decants at Wessels Mine Shaft, Vents Shaft and Decline	• Mine Shaft, Decline and Vent Shaft: Underground mines that flood and discharge contaminated water from one or more shafts, boreholes, geological features, etc., into the surface or ground water resource. The topography and the floor contours of the Wessels UG confirm that no decant will take place after closure. The 2016 hydro census static groundwater elevations of the surrounding privately owned farm boreholes of the I&AP's and the mine monitoring boreholes has indicated that no dewatering cone exists in the upper receiving aquifer.	Groundwater	Closure	Management and monitoring	Achieve end use objectives
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	• Plant Area (areas where water containing wastes are stored and managed, which includes Surface Reservoirs of the UG water, Thickener Dam and Leaking Process Water Pipe Lines): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Groundwater	Closure	Rehabilitation, management and monitoring	Implement rehabilitation objectives
Storage of Dirty Water in an Evaporation Dam and Evaporation Ponds	• Evaporation Ponds for Treated Oil Skimmer Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Groundwater	Closure	Rehabilitation and monitoring	Implement rehabilitation objectives
	• Evaporation Ponds for Treated Sewage Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Groundwater	Closure	Rehabilitation and monitoring	Implement rehabilitation objectives
AQUATIC ECO-SYSTEMS					
Surface Water Runoff	• Deterioration of aquatic ecosystem	Aquatic eco-system	Operation	Control through implementation of an engineered stormwater management plan	Prevent deterioration of aquatic eco-system
	• Deterioration in water quality	Aquatic eco-system	Operation	Control through implementation of an engineered stormwater management plan	Prevent deterioration of water quality
BIODIVERSITY - Flora					
Mining operations	• Disturbance of protected floral species	Floral Biodiversity	Operation	Rehabilitation and monitoring	Avoid and receive permits if disturbance cannot be avoided
Mining operations and vegetation clearing	• Habitat destruction	Floral Biodiversity	Operation	Rehabilitation and monitoring	Keep mining development footprint restricted to layout plans
Mining operations and rehabilitation of disturbed areas	• Increase in colonisation of alien invasive plants: The barren and disturbed areas around the mine during the operational phase will increase the likelihood for colonisation of alien/invasive floral species. During the rehabilitation phase, the clearing of surface infrastructure will create more disturbed areas, thereby increasing the potential for colonisation of alien invasive species.	Floral Biodiversity	Operation and Closure	Control through monitoring and management	Control alien & invasive plants, monitor efficacy
BIODIVERSITY - Fauna					
Mining operations	• Loss of faunal species due to poaching and increased accessibility	Faunal Biodiversity	Operation and closure	Control through management and implementation of increased security measures	Avoid loss of faunal species
Mining operations and vegetation clearing	• Habitat destruction	Floral Biodiversity	Operation	Rehabilitation and monitoring	Keep mining development footprint restricted to layout plans
VISUAL IMPACT					
WRD, Tailings facility and stockpiles operation	• The operation of surface infrastructure such as the administration area, WRDs, TSF and stockpiles creates a negative visual impact when compared to the surrounding landscape; however the impact is confined to the mining area only.	Visual /Aesthetic	Operation	Rehabilitation during closure phase	Rehabilitation and end use objectives

Activity (Whether listed or not listed)	Potential impact	Aspects Affected	Phase (In which impact is anticipated)	Mitigation type	Standard to be achieved
Rehabilitation	• Demolition and removal of surface infrastructure will have a positive visual impact (positive)	Visual /Aesthetic	Closure	Rehabilitation measures	Rehabilitation objectives
HERITAGE					
Mining Activities	• Extraction of ore underground during mining operation as well as the associated surface activities may disturb culturally significant features and artefacts	Heritage	Operation and Closure	No mitigation is required for this impact due to the fact that this area does not have any historically or culturally significant artefacts according to the Heritage specialist study undertaken.	N/A
SOCIO-ECONOMIC					
Blasting	• Noise from blasting may pose an occupational hazard for exposed labourers.	Socio-economic	Operation	Control through monitoring and management	Mitigation to reduce noise
Increase in ambient noise levels	• Surface activities, disposal of waste rock and tailings, mineral processing.	Socio-economic	Operation	No mitigation possible	Mitigation to reduce noise
Economic impact of job creation (positive)	• Employment of workers for surface and underground mining, disposal of waste rock and tailings, mineral processing and associated support services.	Socio-economic	Operation	Enhance positive impact by implementing SLP	Mitigation to reduce noise
Demolition and removal of surface infrastructure	• Increase in ambient noise levels.	Socio-economic	Closure	No mitigation possible	N/A
Mining operations	• Employment of workers, generation of secondary economic benefits.	Socio-economic	Operation	No mitigation required, enhance through SLP	Rehabilitation and end use objectives
Rehabilitation: Levelling and contouring of areas to be rehabilitated, replacement of topsoil	• Dust and inhalable particulates may impact on the environment and human health.	Socio-economic	Closure	Control through monitoring and management	Reduction in dust generation
Mine closure	• Economic impact of retrenchment and increase in unemployment, impact on secondary economic activities (business, goods and services).	Socio-economic	Closure	Modify through alternative method: Closure Plan	Closure objectives
	• Reduction of institutional capacity to manage social infrastructure.	Socio-economic	Closure	Mitigation through capacity training: Closure Plan	Closure objectives

f) Impact Management Actions

Table 18: Impact management actions

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
GEOLOGY				
Extraction of ore for mining operations	• Permanent alteration in local geology (the bord and pillar structures will remain unchanged) • Ore area will become highly permeable compared to original rock mass	No mitigation possible	N/A	N/A
	• Surface subsidence after mine closure	Management measures	Implementation of operational safety measures should be on-going from the operational phase. Subsidence Monitoring should be in accordance with the standards proposed by a geotechnical investigation	• NEMA • MPRDA, • Closure Plan, • Mine Health & Safety Act
TOPOGRAPHY				
Establishment of surface infrastructure	• Alteration in natural topography due to TSF, Waste Rock Dumps (WRD) and Product Stockpiles	Implementation of rehabilitation measures during mine closure.	Progressive rehabilitation from operational phase through to closure and care and maintenance	• NEMA • MPRDA • HMM Wessels Rehabilitation Plan • Guidelines for Rehabilitation of Mined Land • Rehabilitation of Mine Dumps - HSEG-SOP-048 • HMM EnviroSys System.
SOIL, LAND USE AND LAND CAPABILITY				
Mining operations	• Loss of land for grazing (Surface disturbances are confined to the plant area, including the various dump sites. The underground mining has no impact on the surface)	Remedy through rehabilitation	Erosion control measures should be implemented during the rehabilitation / maintenance / aftercare phase and 2-5 years. Rehabilitation should be progressive	• NEMA, MPRDA, • Erosion Control Management Plan should be implemented in accordance with best practise principles, • HMM Wessels Waste Management Plan , • Soil Management in terms of the Chamber of Mines Guidelines for Rehabilitation, • South32 Hydrocarbon Spill Management Plan, • Hazardous material Management Plan, • Guidelines for Rehabilitation of Mined Land, HSEG-SOP-048: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • HSEC-SOP-005: Rehabilitation and Soil Farm for Hotazel Manganese Mine.
Soil contamination	• There is a potential for hydrocarbon spillages and/or leaks from the oil separator, hydrocarbon storage areas and mobile equipment, which may contaminate surface soils. In addition, spillage from conveyors and/or haulage routes may contaminate soils.	Control through management and monitoring	Immediately stop the source, Continuous monitoring for spillages should be undertaken during operational phase and through to closure	• NEMA, • MPRDA, • Soil Management in terms of the Chamber of Mines Guidelines for Rehabilitation.
Site rehabilitation and reclamation	• Rehabilitation activities will consist of demolition and removal of infrastructure as well as contouring and levelling of specific facilities around the site. The increase vehicular movement will cause an increase in compaction of soils and will result in an increase in erosion of un-vegetated areas.	Management and rehabilitation	Erosion control measures should be implemented during the rehabilitation / maintenance / aftercare phase and 2-5 years. Implementation of rehabilitation plan progressively from operational phase	• NEMA, • MPRDA, • Soil Management in terms of the Chamber of Mines Guidelines for Rehabilitation, • Erosion Control Management Plan should be implemented in accordance with best practise principles
	• Change of land use from mining activity to grazing.	Ensuring rehabilitation objectives are met.		• NEMA, • MPRDA,

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
				• Erosion Control Management Plan should be implemented in accordance with best practise principles
AIR QUALITY				
Vehicular movement and traffic	• Increase in vehicle entrained dust from use of unpaved roads (mining and plant vehicles)	Control through management and monitoring during operation. Control through rehabilitation to reduce erosion during closure	Throughout operational phase	• NEM: AQA, Section 53 of Regulation 5, • SANS 1137:2012, ASTM D1739:1998 (Sampling) and SANS 1929:2011 (NO2, SO2 and both PM10 and PM2.5), • HSEC-SOP-062: Rehabilitation Plan, • HSEC-SOP-005: Rehabilitation and Soil Farm for Hotazel Manganese Mine.
	• Increase in carbon emissions from vehicular traffic	Management measures	Throughout operational phase	
Waste Rock Dump and stockpile operation	• Increase in generation of fugitive dust due to the operation of stockpiles (continuous piling of material)	Control through monitoring	Throughout operational phase	
Rehabilitation of disturbed areas	• Increase in dust and inhalable particulates due to the following activities in the rehabilitation phase: ○ Demolition and removal of surface infrastructure ○ Levelling and contouring of facilities and disturbed areas	Management measures	Beginning of rehabilitation phase and through till site is approved by authorities	
NOISE				
Blasting	• Generation of noise due to blasting (HMM Wessels operates and underground mining facility, the depth of mining precludes significant surface noise impacts on the due to blasting).	No mitigation is possible	N/A	N/A
Mine Operation	• Increase in ambient noise due to processing activities and utilisation and loading of trains	No mitigation is possible	N/A	N/A
VIBRATION				
Mining operation	• Generation of vibration from blasting activities	No mitigation is possible but vibration monitoring will be implemented	Vibration monitoring should be on-going during operational phase	• Explosive Act • MHSA, • Engineering best practises
SURFACE WATER				
Mining Activities	• Catchment reduction: The mining operations and facilities will reduce the catchment area that feeds the local water resources. The flow that reports to the river system will be reduced.	Control through implementation of Stormwater Management Plan	Implementation as soon as is financially viable for HMM Wessels	• NWA, • GN 704 • Wessels Stormwater Management Plan (to be implemented), NEM: WA
	• Erosion and sediment accumulation in impoundments: It is likely that there will be significant quantities of sediment generated by extreme rainfall events, which may result in erosion and loss of capacity in the dams.	Use of standard erosion control measures; Implementation of progressive rehabilitation measures and management measures	Implementation as soon as is financially viable for HMM Wessels	• Wessels Rehabilitation plan (progressive), • Engineering best practises, • Implement an Erosion Control Management Plan in accordance with best practise principles, • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • HSEC-SOP-005: Rehabilitation and Soil Farm for Hotazel • Manganese Mine, IWWMP (2017), • MPRDA and • NEM: WA National Norms and Standards.
	• Contamination of receiving environment: Potential discharge of oil contaminated surface water into the receiving environment at points of generation or from storage areas.	Control through management and monitoring	Implementation as soon as is financially viable for HMM Wessels; Surface water monitoring implemented as per Wessels WUL (Licence No.: 10/D41M/AGJ/1536)	• NWA, • NEM: WA, • Wessels WUL (Licence No.: 10/D41M/AGJ/1536) and Section 7(1)(C), Section 69(1)(IA) of NEM: WA, IWWMP (2017), • MPRDA and the • NEM: WA National Norms and Standards

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
	• Contamination of groundwater: Potential seepage of contaminated surface water into the receiving groundwater environment at unlined dams.	Control through management and monitoring	Surface Water monitoring should be undertaken in accordance to WUL (Licence No.: 10/D41M/AGJ/1536). During rehabilitation, surface water monitoring should be undertaken on a quarterly basis from the start of rehabilitation and maintenance until a sustainable situation is reached and after the authorities have signed it off.	• NWA, • NEM: WA, • Wessels WUL (Licence No.: 10/D41M/AGJ/1536) and Section 7(1)(C), Section 69(1)(IA) of NEM: WA, • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • IWWMP (2017), • MPRDA and the • NEM: WA National Norms and Standards
	• Climate Change: Increase in surface water evaporation.	No mitigation possible	N/A	N/A
	• Use of tailings material for creating berms: Contamination of surface water.	Management measures- Adherence to GN 704 regulations of the NWA.	Implementation by HMM Wessels	• NWA • NEM: WA • GN 704
	• Creating of open areas due to vegetation, topsoil and /or infrastructure removal: Increase surface water runoff.	Control through implementation of management measures and monitoring	Surface Water monitoring should be undertaken in accordance to WUL (Licence No.: 10/D41M/AGJ/1536). During rehabilitation, surface water monitoring should be undertaken on a quarterly basis from the start of rehabilitation and maintenance until a sustainable situation is reached and after it has been signed off by the authorities.	• Surface Water Monitoring in accordance with NWA and Wessels WUL (Licence No.: 10/D41M/AGJ/1536), • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • MPRDA and the • NEM: WA National Norms and Standards
Mine Decommissioning	• Contamination of surface water.	Control through management and monitoring	Surface Water monitoring should be undertaken in accordance to WUL (Licence No.: 10/D41M/AGJ/1536). During rehabilitation, surface water monitoring should be undertaken on a quarterly basis from the start of rehabilitation and maintenance until a sustainable situation is reached and after the authorities have signed it off.	• NWA, • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • MPRDA and the • NEM: WA National Norms and Standards
	• Localised ponding of water.	Control through implementation of management measures and monitoring	Implementation as soon as is financially viable for HMM Wessels	• NWA
GROUND WATER				
Storage of Explosives	• Explosives Magazine: Spillages or leakages of explosives liquids may cause groundwater contamination (increase in nitrates).	Control through implementation of Stormwater Management Plan	• On-going	• Storage in accordance with Explosives Act: Chapter 3 • Monitoring in accordance with GN 704 and Wessels WUL (Licence No.: 10/D41M/AGJ/1536)
Storage of Hydrocarbon Material and Fuel	• Surface Oil Skimmers, Hazardous Waste Hardstands, Re-Fuelling Bays, and Leaking Mine Vehicles of All Types: Fuel & hydrocarbons spillages may cause groundwater contamination.	Control through management and monitoring	• On-going	• Groundwater Monitoring in accordance with NWA, IWWMP (2017) • NEM: WA National Norms and Standards
RWD Storage of Dirty / Process Water	• Water contained in dirty water dams may impact on groundwater quality by means of seepage to underlying receiving aquifer (increase salt loading to aquifer).	Control and prevention through management measures and re-use of water	• Continuous improvement and implementation	• Groundwater Monitoring in accordance with NWA
TSF Disposal Area of Waste Rock Fines	• Volume of leachate seeping to underlying receiving aquifer. • Water quality of leachate seeping to underlying receiving aquifer.	Control and minimisation of pollutants through the implementation of Best Practise Guidelines and management measures	• Within 1 year after authorisation of this EA	• Groundwater Monitoring in accordance with NWA, • Department: Water Affairs and Forestry, 2007. Best Practice Guideline A4: Pollution control dams • Department of Water Affairs and Forestry, 2007. Best Practice Guideline H4: Water Treatment. • Department of Water Affairs and Forestry, 2006. Best Practice Guideline G3. Water Monitoring Systems

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
				• Department of Water Affairs and Forestry, 2006. Best Practice Guideline G1: Stormwater Management, IWWMP (2017) • NEM: WA National Norms and Standards • National Water Act (36 of 1998), • Compliance to GN704, IWUL, • Approved EMPr, • NEMWA Regulation for planning and management of residue stockpiles and deposit
Old Waste Yard	• Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping to underlying receiving aquifer may cause groundwater contamination.	Control through monitoring	• In accordance with WUL (Licence No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with NWA • NEM: WA National Norms and Standards
Waste Handling and Storage Facility	• Waste Separation & Temporary Storage Facility (Domestic & Hazardous Waste): Possible spillages or rainfall events may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Control through management and monitoring	• Continuous improvement and implementation • Within 5 years after authorisation of this EA	• Groundwater Monitoring in accordance with NWA, • IWWMP (2017) • NEM: WA National Norms and Standards
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	• North and South Waste Rock Discard Stockpiles [Coarse Grained Material], (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from the waste rock stockpiles, in terms of volume and water quality leachate (increase salt loading to aquifer).	Control through management and monitoring and through modifying infrastructure to prevent pollution	• Already implemented (on-going) • Within 1 year	• Groundwater Monitoring in accordance with NWA • IWWMP (2017).
Stockpile Area	• Product Stock Pile Area: Potential for groundwater contamination due to seepages from the stockpiles, in terms of volume and water quality leachate (increase salt loading to aquifer).	Control through management	• Immediate	• Groundwater Monitoring in accordance with NWA • NEM: WA National Norms and Standards
Treatment and Storage of Sewage Water	• Sewage Treatment Works and Evaporation Ponds for treated sewage effluent: Possible spillages and leakages from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Control through management and monitoring	In accordance with WUL (Licence No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with NWA • IWWMP (2017).
Pumping of groundwater from the Wessels Underground sections.	• Reduction of borehole/ aquifer yields of I&APs as a result of dewatering due to the influx into the underground mining sections.	Control through monitoring	• On-going • Already implemented (on-going) • Immediate • Within 1 year	• Groundwater Monitoring in accordance with NWA • IWWMP (2017).
	• Ingress of water into the underground sections may cause safety concerns. The higher volume of influx water, the higher the associated pumping costs and dewatering impacts during life of mine.	Control through management, modification of current activity (engineering intervention)		
	• Underground workings water or ingress water quality. Ingress water may be exposed to waste rock ore as well as potential hydrocarbons from mechanical workshops, which may degrade the water quality of the water. Use of diesel machinery in trackless (mechanized) mining results in fuel and oil spills, which create a problem in the underground settlers and may give rise to groundwater contamination problems on the surface when the water is utilised as process water in the surface plant.	Control through management	• Immediate	
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	• Plant Area (plant facilities where water containing waste are stored and managed, which includes surface reservoirs of the UG water storage, clarifier dam and thickener dam): Possible spillages or leaking dams or slurry pipelines may cause groundwater contamination (increase salt load into aquifer)	Control through management and monitoring	• In accordance with WUL (Licence No.: 10/D41M/AGJ/1536) • Immediate (on-going) • Immediate (on-going)	• Groundwater Monitoring in accordance with NWA, • IWWMP (2017) • NEM: WA National Norms and Standards
Storage of Dirty Water in an Evaporation Dam	• Evaporation Ponds for treated oil Skimmer Effluent (Lined): Possible spillages or leaking ponds may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Control through management and monitoring	• Immediate (on-going) • Immediate (on-going) • Within 1 year	• NWA, • Freeboard standard of GN 704: 0,8 m. Refer to regulation 77 No. 6 (e)
Storage of Explosives	• Explosives Magazine: Spillages or leakages of residual explosive liquids may cause groundwater contamination (increase in nitrates).	Control through implementation of rehabilitation measures and monitoring	• After cessation of mine operations. Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536))	• Groundwater Monitoring in accordance with NWA, • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • IWWMP (2017)

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
				• NEM: WA National Norms and Standards
Storage of Hydrocarbon Material and Fuel	• Surface Oil Skimmers, Hazardous Waste Hardstands, and Refuelling Bays, leaking Mine Vehicles of All Types: Residual fuel and hydrocarbons may cause groundwater contamination.	Control through implementation of rehabilitation measures and monitoring	• After cessation of mine operations. Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with NWA. • Freeboard standard of GN 704: 0,8 m. Refer to regulation 77 No. 6 e, • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • IWWMP (2017) • NEM: WA National Norms and Standards
RWD Storage of Dirty / Process Water	• Duck Pond dam (Return Water Dam of the TSF): Seepage from RWD to underlying receiving aquifer.	Control of pollutants through rehabilitation measures	• After cessation of mine operations.	• Groundwater Monitoring in accordance with NWA, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • IWWMP (2017)..
TSF Disposal Area of Waste Rock Fines	• Volume of leachate seeping into the underlying receiving aquifer. • Quality of leachate seeping into the underlying receiving aquifer.	Control through rehabilitation measures and management Control through management and monitoring	• After cessation of mine operations.	• Groundwater Monitoring in accordance with NWA, • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP-048: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan • IWWMP (2017).
Old Waste Yard	• Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping into the underlying receiving aquifer may cause groundwater contamination.	Rehabilitation	• After cessation of mine operations.	• Groundwater Monitoring in accordance with NWA, • Guidelines for Rehabilitation of Mined Land, • Rehabilitation of Mine Dumps - HSEG-SOP-048, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan • IWWMP (2017).
Waste Handling and Storage Facility	• Waste Separation and Temporary Storage Facility (Domestic and Hazardous Waste): Residual or leftover contaminants may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	Rehabilitation and monitoring	• After cessation of mine operations. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with NWA, • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP-048: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • IWWMP (2017) • NEM: WA National Norms and Standards
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	• North and South Waste Rock Discard Stockpiles (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from waste rock stockpiles in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).	Rehabilitation and monitoring	• After cessation of mine operations.	• Groundwater Monitoring in accordance with NWA, • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP-048: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan • IWWMP (2017).
Stockpile Area	• Product Stock Pile Area: Potential for groundwater contamination due to seepages from waste rock stockpiles, in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).	Rehabilitation	• After cessation of mine operations.	• Groundwater Monitoring in accordance with NWA
Treatment and Storage of Sewage Water	• Sewage Treatment Works: Residual waste material from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Rehabilitation and monitoring	• After cessation of mine operations.	• Groundwater Monitoring in accordance with NWA, • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan • IWWMP (2017).
Potential Decants at Wessels Mine Shaft, Vents Shaft and Decline	• Sewage Treatment Works: Residual waste material from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).	Rehabilitation and monitoring	• After cessation of mine operations. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with NWA • IWWMP (2017).
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	• Plant Area (areas where water-containing wastes are stored and managed, which includes Surface Reservoirs of the UG water, Thickener Dam and Leaking Process Water Pipe Lines): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Rehabilitation, management and monitoring	• After cessation of mine operations. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with NWA, • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP-005: Rehabilitation and Soil Farm for Hotazel Manganese Mines, • HMM EnviroSys System, HSEC-SOP-062: Rehabilitation Plan, • IWWMP (2017)

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
				• NEM: WA National Norms and Standards
Storage of Dirty Water in an Evaporation Dam and Evaporation Ponds	• Evaporation Ponds for Treated Oil Skimmer Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Rehabilitation and monitoring	• After cessation of mine operations. • Post closure groundwater monitoring for 10 years according to Wessels WUL (License No.: 10/D41M/AGJ/1536)	• Groundwater Monitoring in accordance with NWA, • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP-005: Rehabilitation and Soil Farm for Hotazel Manganese Mines • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan, • IWWMP (2017) • NEM: WA National Norms and Standards
	• Evaporation Ponds for Treated Sewage Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	Rehabilitation and monitoring		
AQUATIC ECO-SYSTEMS				
Surface Water Runoff	• Deterioration of aquatic ecosystem	Control through implementation of an engineered Stormwater Management Plan	Implementation as soon as is financially viable for HMM Wessels	• Engineering best practises, • NWA National Water Act (36 of 1998), • Compliance to GN704, • IWUL, • Approved EMPr, • Applicable Interim Resource Water Quality Objectives for the catchment
	• Deterioration in water quality	Control through implementation of an engineered stormwater management plan		
BIODIVERSITY - Flora				
Mining operations	• Disturbance of protected floral species	Rehabilitation and monitoring	All disturbed areas should be monitored for the establishment of alien plant species for 2-5 years biannually post closure.	• NEMA, • NEM:BA, • HMM Land Disturbance Management Procedure, • HSEC-SOP-050: Biodiversity and Land Management Plan.
Mining operations Habitat destruction by vegetation clearing1	• Operation	Rehabilitation and monitoring	Ongoing	• NEMA Regulation 543 Section 32 • NEMBA Section 56 (1), 57 (1), 57 (2) and 57 (4) • Limpopo Environmental Management Act Schedules 2, 3, 11 and 12 • Biodiversity Management Action Plan
Mining operations and rehabilitation of disturbed areas	• Increase in colonisation of alien invasive plants: The barren and disturbed areas around the mine during the operational phase will increase the likelihood for colonisation of alien/invasive floral species. During the rehabilitation phase, the clearing of surface infrastructure will create disturbed areas, thereby increasing the potential for colonisation of alien invasive species.	Control through monitoring and management	Newly disturbed areas (if the mine expands on their surface footprint) should be surveyed for indigenous flora.	• NEM:BA Sections 66(1), 67(1), 70(1)(a), 71(3) and 71A and Notice 3 • (List 1: National list of Invasive Terrestrial and Fresh-water Plant Species), • HSEC-SOP-050: Biodiversity and Land Management Plan.
BIODIVERSITY - Fauna				
Mining operations	• Loss of faunal species due to poaching and increased accessibility	Control through management and implementation of increased security measures	Immediate	• HMM Land Disturbance Management Procedure , • HSEC-SOP-050: Biodiversity and Land Management Plan.
Mining operations Habitat destruction by vegetation clearing[1]	• Operation	Rehabilitation and monitoring	Ongoing	• NEMA Regulation 543 Section 32 • NEMBA Section 56 (1), 57 (1), 57 (2) and 57 (4) • Limpopo Environmental Management Act Schedules 2, 3, 11 and 12
VISUAL IMPACT				
WRD, Tailings facility and stockpiles operation	• WRD, Tailings facility and stockpiles operation	The operation of surface infrastructure such as the administration area, Waste Rock Dump, Tailings Facility and stock piles creates a negative visual impact when compared to the surrounding landscape; however the impact is confined to the mining area only.	At end of LoM and/or beginning of rehabilitation phase	• MPRDA, • NEMA, • HMM Wessels Rehabilitation and Closure Plan, • Guidelines for Rehabilitation of Mined Land, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Rehabilitation: Demolition and removal of surface infrastructure	• Demolition and removal of surface infrastructure will have a positive visual impact (positive) due to the change in land use.	Demolition and removal of surface infrastructure will have a positive visual impact (positive)	At end of LoM and/or beginning of rehabilitation phase	• MPRDA, • NEMA, • HMM Wessels Rehabilitation and Closure Plan, • Guidelines for Rehabilitation of Mined Land, • HSEG-SOP-048: Rehabilitation of Mine Dumps, • HMM EnviroSys System, • HSEC-SOP-062: Rehabilitation Plan.
HERITAGE				
Mining Activities	• Extraction of ore underground during mining operation as well as the associated surface activities may disturb culturally significant features and artefacts	No mitigation is required for this impact because this area does not have any historically or culturally significant artefacts according to the Heritage specialist study undertaken.	N/A	• HRA
SOCIO-ECONOMIC				
Blasting	• Noise from blasting may pose an occupational hazard for exposed labourers.	Control through monitoring and management	Annually during operational phase	• MPRDA, • HMM Wessels Closure Plan, • HMM Social and Labour Plan, • MHS Act, SABS Code 0103, • MSA-HSE-SOP-01: Stakeholder Engagement Management Plan.
Increase in ambient noise levels	• Surface activities, disposal of waste rock and tailings, mineral processing.	No mitigation possible	Annually during operational phase	N/A
Economic impact of job creation (positive)	• Employment of workers for surface and underground mining, disposal of waste rock and tailings, mineral processing and associated support services	Enhance positive impact by implementing SLP	N/A	N/A
Demolition and removal of surface infrastructure	• Increase in ambient noise levels.	No mitigation possible	During operation and closure	N/A
Mining operations	• Employment of workers, generation of secondary economic benefits.	No mitigation required, enhance through SLP	Implementation throughout operational phase and through to rehabilitation and closure	• MPRDA, • HMM Wessels Closure Plan, • HMM Social and Labour Plan, • OHSA • NEM: AQA Regulation 5: Section 53, • SANS 1137:2012, ASTM D1739:1998 (Sampling) • SANS 1929:2011 (NO_2, SO_2 and both PM_{10} and $PM_{2.5}$), • MSA-HSE-SOP-01: Stakeholder Engagement Management Plan.
Rehabilitation: Levelling and contouring of areas to be rehabilitated, replacement of topsoil	• Dust and inhalable particulates may impact on the environment and human health.	Control through monitoring and management	In accordance with the HMM Wessels Social and Labour Plan	• Section 53 of NEM: AQA Regulation 5, • SANS 1137:2012, ASTM D1739:1998 (Sampling) • SANS 1929:2011 (NO_2, SO_2 and both PM_{10} and $PM_{2.5}$), • MSA-HSE-SOP-01: Stakeholder Engagement Management Plan.
Mine closure	• Economic impact of retrenchment and increase in unemployment, impact on secondary economic activities (business, goods and services).	Modify through alternative method: Closure Plan	In accordance with the HMM Wessels Social and Labour Plan	• MPRDA, • HMM Wessels Closure Plan, • HMM Social and Labour Plan, • MSA-HSE-SOP-01: Stakeholder Engagement Management Plan.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Mine closure	• Reduction of institutional capacity to manage social infrastructure.	Mitigation through capacity training: Closure Plan	In accordance with the HMM Wessels Social and Labour Plan	• MPRDA, • HMM Wessels Closure Plan, • HMM Social and Labour Plan, • MSA-HSE-SOP-01: Stakeholder Engagement Management Plan.

i) **Financial Provision**

2. Determination of the amount of Financial Provision

a) **Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein**

The baseline conditions of the HMM Wessels Mine are not precisely known due to the age of the facility. However, current baseline conditions were investigated by means of specialist studies, which were undertaken at various stages throughout the operational phase. The outcomes of specialist investigations were incorporated into the previous approved EMPr for the mine and were used to inform this EA update. The closure objectives used to inform this report was based on the latest available information at the time.

The closure objectives for the HMM Wessels Mine were also determined based on the principles for Mine Closure as specified in the MPRDA (2002). The high-level closure objectives for the site are:

1) To leave the site in a safe condition for post-closure land users
2) To create stable, non-polluting and functioning landforms that are, as far as practically achievable, consistent with the surrounding landscape and other environmental values
3) Rehabilitation should seek to minimise environmental impacts and disturbance to the eco-system resulting from mining activities.

Integration of surrounding land use with the established baseline conditions on-site has also informed the final land use option for the HMM Wessels Mine area. Therefore, the outcomes of these objectives are aligned to baseline conditions. The final land use chosen for HMM Wessels Mine is grazing. A high-level completion criterion for the site is shown in Table 19 below and the safety and compliance criteria are shown in Table 16. These tables illustrate the commitment of the operating company to return the land to grazing, with minimal residual environmental impacts. This commitment directly addresses closure objective (1) and (2). The rehabilitation objectives are also addressed in Table 16. Post closure monitoring is also in place and new monitoring programmes have been proposed in this EA update which will assist in minimising negative impacts on the environment.

The closure plan also specifies the process, which will be followed in order to manage and mitigate negative social impacts associated with mine closure. Positive social impacts will be enhanced through various programmes in place by the operating company and are addressed in the HMM Social and Labour Plan. The closure objectives do not specifically address the social impacts associated with mine closure. However, community engagement closer to the closure phase will ensure that negative impacts are reduced, and positive impacts are enhanced as far as possible.

Mine closure will comply with the legal requirements of the day when closure is implemented.

The regulatory stakeholders will be engaged to obtain a formal agreement on the criteria to be used to assess the completion of site closure, and this will be done prior to executing any closure activities. The formal agreement will mitigate the risks of different standards being used to determine successful closure execution. This engagement will occur in accordance with the closure schedule for the HMM Wessels Mine.

Table 19: High level completion criteria (HMM Closure Plan FY 2014)

Closure Aspect	Closure Objective(s)
Safety	Zero harm to members of the public
Landform stability and functioning	The area meets landform standards for grazing
Groundwater	The water quality to meet the water use license requirements
Surface water	The water quality to meet the water use license requirements
Rehabilitation	The rehabilitation must achieve the desired final land use
Visual amenity	Rehabilitated sites mimic the surrounding environment
Dust	Dust emission to meet rural standards guidelines
Stakeholder and community engagement and participation	To obtain acceptance of the final land use

Table 20: Safety and compliance criteria (HMM Closure Plan FY 2014)

Aspect	Intent	Criteria for Acceptance	Domain
Safety	The site is safe for use by humans and livestock under the agreed final land use.	All hazards that could endanger the safety of any person or animal have been identified and eliminated where practical.	All

Aspect	Intent	Criteria for Acceptance	Domain
		All residual safety and health hazards have been identified, controlled through appropriate active controls, and appropriate isolations (e.g. fences) and warning signs have been put in place. The location and type of buried waste is clearly documented and marked or signed.	
Sustainability	The rehabilitation is sustainable.	Land management requirements for the rehabilitation site should be aligned with baseline assessment.	All
Decommissioning	Infrastructure has been decommissioned and removed.	Any infrastructure not required by the end land user has been removed and the site rehabilitated.	All
Contaminated Sites	Identify all contaminated sites and remediate according to regulatory approvals.	All commitments relating to the identification and management of contaminated sites have been fulfilled, as per HMM-HSE-SOP-	All

Aspect	Intent	Criteria for Acceptance	Domain
		006 Waste Management Plan.	

b) **Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties**

The Closure Plan FY 14 (most recently available document at time of report compilation) specifies a stakeholder engagement timetable (refer to Table 21) which will be adhered to once the HMM Wessels Mine is approaching the closure phase. During this time, all environmental objectives in relation to closure will be communicated within the most relevant (and updated) Closure Plan. However, it should be noted that, some of the closure objectives were already made available to stakeholders during the 2005 EMPr approval process.

Table 21: Closure stakeholder engagement timetable

Issue to Engage On	Who to Engage	When
Submission of closure plans for approval	DMR	5 years before closure
National Heritage Resources Assessment	SAHRA	5 years before closure
Post Closure infrastructure alternative uses	DMR	10 years before closure
Consult the regulatory stakeholder on the closure completion criteria for the expected land uses	DMR	5 years before closure
Engage the communities on the eminent closure of the site	Communities	5 years before closure

c) **Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure**

Please refer to Annexure H for the rehabilitation layout plan, showing the scale and aerial extent of rehabilitation for the Tailings Storage Facility (TSF) and Waste Rock Dumps (WRD).

d) **Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives**

REDCO Consulting compiled a rehabilitation plan for the Tailings Storage Facility (TSF) and the Waste Rock Dumps (WRDs). According to the REDCO report dated 30 June 2015, the rehabilitation process was aligned with the HMM Wessels Mine closure plan requirements as well as the closure plan objectives. The rehabilitation of TSF and WRDs will be undertaken to ensure the facilities are compatible with the agreed final land use of grazing. According to the report, “slopes need to be sufficiently gentle to prevent erosion of the replaced soils at greater than sustainable rates”, whilst ensuring that the rehabilitation is sustainable.

Rehabilitation trials will be conducted at HMM to ensure that all the requirements for grazing land capability will be met. Rehabilitation standards determined specifically for the Mpumalanga Highveld area will be used as the bench-mark, with a slope of not more than 1:5 or 1:7 for grazing. For HMM, these recommended slopes for grazing are used to estimate the costs for rehabilitation and also as a starting point for conducting trials. Should the rehabilitation trials exhibit higher erosion rates that make the bench-mark slopes unsustainable; HMM will engage the regulatory stakeholder to propose a slope that is sustainable for the grazing land capability in the Kalahari Region.

Apart from the sloping requirements, in terms of the guidelines, grazing land must meet the following requirements:

- The land must not qualify as a wetland or an arable land;
- Must have soil or soil-like material, permeable to the roots of native plants, that is more than 0.25 m thick and must contain less than 50 % by volume of rocks or pedocrete fragments larger than 100 mm diameter;
- Must support or can support a stand of native or introduced grass species or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.

The rehabilitation and remediation of the plant and infrastructure areas will follow the following steps in accordance with the most current closure plan for the site:

- The plant, administration infrastructure, roads, railways and platforms will be demolished, and the demolition debris disposed,
- Shafts will be sealed
- The total affected footprint will be dozed and levelled and,
- The total footprint will be ameliorated and vegetated.

Surface rehabilitation will commence with the demolition of, amongst others, the roads, railway lines, walkways and the disposal of the demolition debris. The site will be secured, and dangerous areas will be fenced off. The dumps will be capped with HDPE liner and 500 mm of soil will be placed to cover the dump areas. Contour drains and

chutes will also be constructed to allow for effective stormwater control and management. The cleared areas will then be levelled and shaped, top soil (200 mm) spread over the footprint, and then the area will be ameliorated and revegetated in line with the general vegetation of the area surrounding the HMM being classified as Kalahari Plains Thorn Bushveld.

The mining area will be rehabilitated by demolition of the shaft infrastructure and concrete. The shafts will then be backfilled and capped prior to amelioration and vegetation of the footprint. A total amount of R 19 593 378.19 will be available for engineering and care and maintenance of the site. The closure objective is to return the area to grazing land. The rehabilitated mining area is unlikely to sustain land uses other than low-intensity grazing, as the area is extremely arid, and this is in line with surrounding land uses. Industrial or other similar land uses are unlikely due to the remoteness of the site.

e) **Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline**

The information presented below was extracted from the Wessels Mine DMR Financial Provision FY 16. Addressed to the DMR on the 31 July 2017 and received by the department on the 29 August 2018.

Table 22: DMR Closure Cost Estimate for Wessels Mine: (Manganese SA Asset/ HMM Closure Cost FY 2016)

CLOSURE COST: WESSELS MINE FY16 DMR CLOSURE COST ASSESSMENT						
Item	*Description*	*Works*	*P&G*	*Subtotal*	*Contingency*	*Total*
			15 % 6 %		30%	
1	**Sealing of Shafts**	R 1 436 388	R 215 458	R 1 651 847	R 495 554	R 2 147 401
2	**Demolition of Plant**	R 10 726 518	R 643 591	R 11 370 109	R 3 411 033	R 14 781 142
3	**Demolition of Buildings & Structures**	R 12 147 980	R 728 879	R 12 876 859	R 3 863 058	R 16 739 917
4	**Demolition of Roads, Railways and Platforms**	R 2 311 881	R 346 782	R 2 658 663	R 797 599	R 3 456 261
5	**Opencast Rehabilitation**	-	-	-	-	-
6	**Rehabilitation of Dumps**	R 24 808 732	R 3 721 310	R 28 530 042	R 8 559 012	R 37 089 054
7	**Fencing**	-	-	-	-	-
8	**General Surface Rehabilitation**	R 36 242 585	R 2 174 555	R 38 417 140	R 11 525 142	R 49 942 282
9	**Stormwater Management**	-	-	-	-	-
10	**Maintenance and Aftercare**	R 9 953 039	R 1 492 956	R 11 445 995	R 3 433 798	R 14 879 793
11	**Engineering and Management Cost**	R 10 542 729	R 1 581 409	R 12 124 138	R 3 637 241	R 15 761 380
TOTAL		**R 108 169 852**	**R 10 904 940**	**R 119 074 792**	**R 35 722 438**	**R 154 797 229**

f) **Confirm that the financial provision will be provided as determined**

The total quantum liability is R 154 797 229 as of the 30 June 2016. The financial provision will be provided as per the amounts stipulated below:

a) **Bank Guarantee** – R 85 418 00

b) **Top up Bank Guarantee** – R 48 980 212

The top up guarantees will be provided after review and approval of the financial provisioning by the DMR.

c) **Trust Fund** – R 20 399 017

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

a) **Monitoring of Impact Management Actions**
b) **Monitoring and reporting frequency**
c) **Responsible persons**
d) **Time period for implementing impact management actions**
e) **Mechanism for monitoring compliance**

Table 23: Mechanisms for monitoring compliance

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and responsibilities	Monitoring and Reporting Frequency And Time Periods For Implementing Impact Management Actions
GEOLOGY				
Extraction of ore for mining operations	• Surface subsidence after mine closure	None	• Mining operation department • Rock Engineering • Mining Department	• On-going with mining programme.
TOPOGRAPHY				
Establishment of surface infrastructure	• Alteration in natural topography due to TSF, Waste Rock Dumps (WRD) and Product Stockpiles	None	• HSE Execution Team	• Rehabilitation to begin progressively where possible and upon cessation of mining activity
SOIL, LAND USE AND LAND CAPABILITY				
Mining operations	• Loss of land for grazing (Surface disturbances are confined to the plant area, including the various dumpsites. The underground mining has no impact on the surface)		• HSE Execution Team, South32 Engineering	• Rehabilitation to begin progressively where possible and upon cessation of mining activity
Soil contamination	• There is a potential for hydrocarbon spillages and/or leaks from the oil separator, hydrocarbon storage areas and mobile equipment, which may contaminate surface soils. • In addition, spillage from conveyors and/or haulage routes may contaminate soils.	Hydrocarbon Spill Kits	• HSE Execution Team	• Continuous monitoring for hydrocarbon spillages with immediate action to remove contaminated soils • Monitoring should continue throughout the operational phase to closure
Site rehabilitation and reclamation	• Rehabilitation activities will consist of demolition and removal of infrastructure as well as contouring and levelling of specific facilities around the site. The increase vehicular movement will cause an increase in compaction of soils	None	• HSE Execution Team	• Implementation after cessation of mine activities (after demolition stages)

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and responsibilities	Monitoring and Reporting Frequency And Time Periods For Implementing Impact Management Actions
	and will result in an increase in erosion of un-vegetated areas.			
AIR QUALITY				
Vehicular movement and traffic	• Increase in vehicle entrained dust from use of unpaved roads (mining and plant vehicles) • Increase in carbon emissions from vehicular traffic	• Dust fallout stands/samplers in accordance with SANS 1137:2012. Analysis of dust fallout should comply with ASTM D1739:1998 • Clear signage depicting speed limits (40 km) • Dust suppression equipment (water tankers, dust retardants)	• HSE Execution Team • South32 Engineering Department	• Dust fallout monitoring is already implemented on-site and to continue on monthly basis • Rehabilitation measures to begin progressively where possible and upon cessation of mining activity for a period of one year post mine closure
Waste Rock Dump and Stockpile Operation	• Increase in generation of fugitive dust due to the operation of stockpiles (continuous piling of material)			
Rehabilitation of disturbed areas	• Increase in dust and inhalable particulates due to the following activities in the rehabilitation phase: • Demolition and removal of surface infrastructure • Levelling and contouring of facilities and disturbed areas			
GROUND WATER				
Storage of Explosives	• Explosives Magazine: Spillages or leakages of explosives liquids may cause groundwater contamination (increase in nitrates).	N/A	• HSE Execution Team	• Implementation should be immediate. Routine monitoring to ensure explosives are stored in a safe manner and maintained to prevent spillages.
Storage of Hydrocarbon Material and Fuel	• Surface Oil Skimmers, Hazardous Waste Hardstands, Re-Fuelling Bays, and Leaking Mine Vehicles of All Types: Fuel & hydrocarbons spillages may cause groundwater contamination.	• Hydrocarbon Spill Kits	• HSE Execution Team	• Monitoring for hydrocarbon spills should be on-going. This monitoring is already implemented on-site.
RWD Storage of Dirty / Process Water	• Water contained in dirty water dams may impact on groundwater quality by means of seepage to underlying receiving aquifer (increase salt loading to aquifer).	Sterile labelled sample bottles for sample collection, water quality (WQ) probes to record in-situ data, SANAS accredited lab for water sample analysis	• HSE Execution Team Independent consultant to conduct WQ monitoring	• Groundwater monitoring as per WUL (Licence No.: 10/D41M/AGJ/1536)
Old Waste Yard	• Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping to underlying receiving aquifer may cause groundwater contamination.			

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and responsibilities	Monitoring and Reporting Frequency And Time Periods For Implementing Impact Management Actions
Temporary Storage of Hazardous and Domestic Waste	• Waste Separation & Temporary Storage Facility (Domestic & Hazardous Waste): Possible spillages or rainfall events may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	• Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis • New monitoring borehole drilled down gradient of site to monitor possible leakages.	• HSE Execution Team • HSE Manager for borehole drilling approval • Independent consultant to conduct WQ monitoring	• Groundwater monitoring as per WUL (Licence No.: 10/D41M/AGJ/1536) • Additional borehole to be included in monitoring programme once drilled.
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	• North and South Waste Rock Discard Stockpiles [Coarse Grained Material], (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from the waste rock stockpiles, in terms of volume and water quality leachate (increase salt loading to aquifer).	• Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis	• HSE Execution Team Independent consultant to conduct WQ monitoring	• Groundwater monitoring as per WUL (Licence No.: 10/D41M/AGJ/1536)
Stockpile Area	• Product Stockpile Area: Potential for groundwater contamination due to seepages from the stockpiles, in terms of volume and water quality leachate (increase salt loading to aquifer).			
Treatment and Storage of Sewage Water	• Sewage Treatment Works and Evaporation Ponds for treated sewage effluent: Possible spillages and leakages from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).			
Pumping of groundwater from the Wessels Underground sections.	• Underground workings water or ingress water quality. Ingress water may be exposed to waste rock ore as well as potential hydrocarbons from mechanical workshops, which may degrade the water quality of the water. Use of diesel machinery in trackless (mechanised) mining results in fuel and oil spills, which create a problem in the underground settlers and may give rise to groundwater contamination problems on the surface when the water is utilised as process water in the surface plant.			
Leakages of pipes and seepage/spillage from plant storage	• Plant Area (plant facilities where water containing waste are stored and managed, which includes surface reservoirs of the UG water storage, clarifier dam and thickener dam): Possible spillages or leaking dams or slurry pipelines may			

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and responsibilities	Monitoring and Reporting Frequency And Time Periods For Implementing Impact Management Actions
dams (Process Water)	cause groundwater contamination (increase salt load into aquifer)			
Storage of Dirty Water in an Evaporation Dam	• Evaporation Ponds for treated oil Skimmer Effluent (Lined): Possible spillages or leaking ponds may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).	• Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis Visual monitoring to ensure freeboard of 0.8m is kept at all times (as per GN 704).	• HSE Execution Team Independent consultant to conduct WQ monitoring	• Groundwater monitoring as per WUL (Licence No.: 10/D41M/AGJ/1536) • Immediate implementation of routine visual monitoring / inspection to ensure adequate freeboard is maintained
Storage of Explosives	• Explosives Magazine: Spillages or leakages of residual explosive liquids may cause groundwater contamination (increase in nitrates).	• Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis	• HSE Execution Team Independent consultant to conduct WQ monitoring	• Post closure groundwater monitoring for a period of 10 years according to WUL (Licence No.: 10/D41M/AGJ/1536)
Storage of Hydrocarbon Material and Fuel	• Surface Oil Skimmers, Hazardous Waste Hardstands, and Refuelling Bays, leaking Mine Vehicles of All Types: Residual fuel and hydrocarbons may cause groundwater contamination.	• Visual inspection for hydrocarbon contaminated soil. • Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis	• HSE Execution Team Independent consultant to conduct WQ monitoring	• Post closure groundwater monitoring for a period of 10 years according to WUL (Licence No.: 10/D41M/AGJ/1536) • Inspection of hydrocarbon contaminated soil in accordance with closure schedule and rehabilitation plan in HMM Wessels Mine closure plan
RWD Storage of Dirty / Process Water	• Duck Pond Dam (Return Water Dam of the TSF): Seepage from RWD to underlying receiving aquifer.	• Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis	• HSE Execution Team Independent consultant to conduct WQ monitoring	• Post closure groundwater monitoring for a period of 10 years according to WUL (Licence No.: 10/D41M/AGJ/1536) Monitoring of rehabilitation progress in accordance with rehabilitation and closure plan
Old Waste Yard	• Old Rehabilitated Domestic Waste Site (within southern side of TSF): Leachate seeping into the underlying receiving aquifer may cause groundwater contamination.			

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and responsibilities	Monitoring and Reporting Frequency And Time Periods For Implementing Impact Management Actions
Waste Handling and Storage Facility	• Waste Separation and Temporary Storage Facility (Domestic and Hazardous Waste): Residual or leftover contaminants may cause groundwater contamination (increase salt loading to aquifer and hydrocarbon contaminants).			
Waste Rock Disposal Area (Coarse Grained and Large Pieces)	• North and South Waste Rock Discard Stockpiles (stockpile near new vent shaft): Potential for groundwater contamination due to seepages from waste rock stockpiles, in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).			
Stockpile Area	• Product Stockpile Area: Potential for groundwater contamination due to seepages from waste rock stockpiles, in terms of volume and water quality leachate in post closure phase (increase salt loading to aquifer).			
Treatment and Storage of Sewage Water	• Sewage Treatment Works: Residual waste material from sewage ponds may cause groundwater contamination (increase salt loading to aquifer, such as nitrates).			
Potential Decants at Wessels Mine Shaft, Vents Shaft and Decline	• Mine Shaft, Decline and Vent Shaft: Underground mines that flood and discharge contaminated water from one or more shafts, boreholes, geological features, etc., into the surface or ground water resource. The topography and the floor contours of the Wessels UG confirm that no decant will take place after closure. The 2016 hydrocensus static groundwater elevations of the surrounding privately owned farm boreholes of the I&APs and the mine monitoring boreholes has indicated that no dewatering cone exists in the upper receiving aquifer.	• Development of water level monitoring programme to confirm rate of water rise • Maintenance and availability of access routes to underground workings for monitoring post closure. • Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis	• HSE Execution Team Independent consultant to conduct WQ and water level monitoring	• Post closure groundwater monitoring for a period of 10 years according to WUL (Licence No.: 10/D41M/AGJ/1536) • Monitoring of water levels at least 3 years before closure
Leakages of pipes and seepage/spillage from plant storage dams (Process Water)	• Plant Area (areas where water-containing wastes are stored and managed, which includes Surface Reservoirs of the UG water, Thickener Dam and Leaking Process Water Pipe Lines): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	• Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis	• HSE Execution Team Independent consultant to conduct WQ monitoring	• Post closure groundwater monitoring for a period of 10 years according to WUL (Licence No.: 10/D41M/AGJ/1536)

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and responsibilities	Monitoring and Reporting Frequency And Time Periods For Implementing Impact Management Actions
				• Monitoring of rehabilitation progress in accordance with rehabilitation and closure plan
Storage of Dirty Water in an Evaporation Dam and Evaporation Ponds	• Evaporation Ponds for Treated Oil Skimmer Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer). • Evaporation Ponds for Treated Sewage Effluent (Lined): Residual waste material may cause groundwater contamination (increase salt loading to aquifer).	• Sterile labelled sample bottles for sample collection, WQ probes to record in-situ data, SANAS accredited lab for water sample analysis • Visual monitoring to ensure freeboard of 0.8m is kept at all times (as per GN 704).	• HSE Execution Team Independent consultant to conduct WQ monitoring	• Post closure groundwater monitoring for a period of 10 years according to WUL (Licence No.: 10/D41M/AGJ/1536) • Immediate implementation of routine visual monitoring / inspection to ensure adequate freeboard is maintained
BIODIVERSITY - Flora				
Mining operations	• Disturbance of protected floral species	N/A	• HSE Execution Team	• Monitoring for protected floral species should occur if the mining operations expand outside of the current disturbed footprint (149.1 ha)
Mining operations	• Habitat destruction by vegetation clearing	As per biodiversity Management and Action Plan	• HSE Execution Team	• As per biodiversity Management and Action Plan
Mining operations and rehabilitation of disturbed areas	• Increase in colonisation of alien invasive plants: The barren and disturbed areas around the mine during the operational phase will increase the likelihood for colonisation of alien/invasive floral species. During the rehabilitation phase, the clearing of surface infrastructure will create disturbed areas, thereby increasing the potential for colonisation of alien invasive species.	• Alien vegetation control programme: Workforce to physically monitor and remove alien vegetation	• HSE Execution Team • Contractor to remove alien vegetation	• Monitoring of rehabilitation progress in accordance with rehabilitation and closure plan • 2 -5 years bi-annually post closure
BIODIVERSITY - Fauna				
Mining operations	• Habitat destruction by vegetation clearing	As per biodiversity Management and Action Plan	• HSE Execution Team	As per biodiversity Management and Action Plan
SOCIO-ECONOMIC				

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and responsibilities	Monitoring and Reporting Frequency And Time Periods For Implementing Impact Management Actions
Blasting	• Noise from blasting may pose an occupational hazard for exposed labourers.	N/A	• OHS Department	• Already implementation on-site, and should continue throughout operational phase
Rehabilitation: Levelling and contouring of areas to be rehabilitated, replacement of topsoil	• Dust and inhalable particulates may impact on the environment and human health.	• Dust suppression equipment (water tankers, dust retardants) • Issue Personal Protective Equipment	• HSE Execution Team	Throughout closure and rehabilitation phase

l) **Indicate the frequency of the submission of the performance assessment report.**

The performance assessment report should be conducted annually and submitted to the Competent Authority in accordance with the NEMA Regulations, 1998 (Act No. 107 of 1998), GN No. 982 of December 2014. The last performance assessment audit for HMM Wessels Mine which was available prior to finalisation of this amendment was undertaken on the 13th July 2016.

m) **Environmental Awareness Plan**

(1) Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

Wessels Mine has a well-established internal and external communication strategy that was developed and successfully implemented as part of the integrated management system of the mine. Wessels Mine has implemented OHAS 18001 in August 2005. The Environmental Awareness Plan forms a major part of the communication strategy, together with other issues such as health, safety, operations, productions, etc. The communication strategy is reviewed on a regular basis (at least annually) and revised if necessary.

Internal Communication and Awareness Campaign: The mine has a newsletter, as well as various Communication Meetings.
External Communication and Awareness Campaign: The mine holds meetings with I&APs and issues an annual Health, Safety, Environment and Community (HSEC) Report.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

The mitigation measures specified in this EMPr update should be implemented to minimise the risk of pollution and degradation of the environment. Environmental awareness training in the following areas is issued to general workers and visitors:

Hydrocarbon management: Protocol and procedure in place to avoid spills and to remediate contaminated areas
Waste management: Littering and recycling
Water awareness: Communication to employees regarding water saving, measure implemented to minimise water use as far as possible. The mitigation measures included in this EMPr update also cover those management measures, which are already being, implemented at HMM Wessels Mine. These include the following:

Hydrocarbon spills

Continuous monitoring for hydrocarbon spillages is undertaken on-site. An external service provider has also been contracted to remove any contaminated soil. In addition to this, Wessels Mine has a Waste Management Plan in place to guide rehabilitation and clean-up of hydrocarbon spills for employees concerned.

Management measures

HMM Wessels Mine has adopted several Standard Operating Procedures (SOP) from the South32 head office to control and uniformly management risks. These SOPs include procedures pertaining to reducing environmental risks as well as health and safety risks. SOPs implemented on site include soil management, handling of hazardous wastes and rehabilitation (Rehabilitation of Mine Dumps and rehabilitation plans), Code of practise for Mine Residue Deposits, traffic and road management plans as well as ergonomics risk assessments and standards.

Monitoring – Air Quality

Dust fallout sampling and analysis is implemented on site on a monthly basis. The OHS department also undertakes occupational noise measurements on-site and Personal Protective Equipment (PPE) is administered to persons within the vicinity of blasting.

Monitoring – Water Quality

A comprehensive surface and groundwater monitoring plan is currently being undertaken on-site. The current water quality data set spans a period of 13 years; this is beneficial in establishing statistically significant trends in terms of the mine water quality and allows for easy detection of any changes resulting from pollution events. The water quality monitoring has been conducted in accordance with the issued water use license (Licence No.: 10/D41M/AGJ/1536). Conditions stipulated in any new WUL issued to HMM Wessels Mine would also be incorporated into the monitoring programme if required.

Future management measures have also been highlighted in this update

The implementation of the Stormwater Management Plan will reduce surface water impacts, and ensure clean and dirty water separation.

n) Specific information required by the Competent Authority

- The financial provision will be reviewed annually in accordance with the most current Closure Plan and relevant legislation at the time.
- The performance assessment audit must be conducted annually as per Section 34 of the EIA Regulations (GN982), as amended.
- The EMPr will need to be updated should the mining operations and footprint expand outside the approved area.

(2) UNDERTAKING

The EAP herewith confirms

f) the correctness of the information provided in the reports ☒

g) the inclusion of comments and inputs from stakeholders and I&APs ; ☒

h) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and

i) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

-END-

REFERENCES

- Acoustic Consulting, 2011. Noise Study for the BHP Billiton Wessels Mine near Hotazel.
- Advisian (2017). Biodiversity Management and Action Plan - Wessels Mine.
- Anderson, T.A., 2001. Botanical reconnaissance survey of proposed mining sites on Smartt and Rissik, Mamatwan Mine, Hotazel.
- Bredenkamp, G., Granger, J.E. & van Rooyen, N. 1996. Kalahari Bushveld. In: Low, A.B. & Robelo, A.G. (eds) Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs and Tourism, Pretoria.
- Department of Water Affairs and Forestry, (DWAF), 2003. Lower Vaal Management Area: Overview of Water Resources Availability and Utilisation. Report No. P WMA 10/000/00/0203
- GHT Consulting, 2017. Final Draft-Hotazel Manganese Mines: Update of the Geohydrological Report for Wessels Mine. Report No.: RVN770.1/1701.1
- HMM, 2016a. Social and Labour Plan Annual Report for Hotazel Manganese Mines: Mamatwan Mine and Wessels Mine
- HMM, 2016b. Mandatory Code of Practice to Combat Rock Fall and Rock Burst Accidents in the Underground Working of Wessels Mine. Ref. No.: WSL-MIN-COP-001.
- JG Afrika, 2016. Draft Scoping Report: Proposed development of a slimes handling and bulk water storage facility at Hotazel Manganese Mines (Pty) Ltd: Mamatwan Mine, near Hotazel, Northern Cape.
- Joe Morolong Municipal Website, 2017. http://joemorolong.gov.za/AboutUs.htm. Accessed on 07 July 2017.
- Jones and Wagener Consulting Civil Engineers, 2005. Environmental Management Programme Wessels Mine. Report No.: JW65/05/A095.
- Knight Piésold, 2017. Surface Water Study, 3010046206
- Matakoma Heritage Consultants, 2005. Hotazel manganese Mines – Heritage Assessment.
- Malherbe, F le R, 2018. Noise Study for The South32 Wessels Mine at Hotazel: Report No 17/10/1
- Montabert, 2017. How South Africa will feature in the need for Manganese.
- http://www.montabertsa.co.za/south-africa-will-feature-need-manganese/. Accessed on 07 July 2017.
- NC451 Draft IDP, 2016. Joe Morolong Local Municipality Draft IDP for the 2016/17 financial year.
- Smithers, J., & Schulze, R. 2002. Design Rainfall and Flood Estimation in South Africa. WRC, Water Research Commission.
- Solution [H] +, 2017. Waste type assessment and classification of nine materials from Wessels mine.
- South32, 2016. Manganese SA FY16 Report.
- Stats SA, 2016. Community Survey 2016, Statistical release P0301.
- Taolo Gaetsewe Municipal Website, 2017. http://www.taologaetsewe.gov.za:80/profile.php. Accessed on 07 July 2017.

- World Weather Online, 2017. https://www.worldweatheronline.com/hotazel-weather-averages/north-western-province/za.aspx. Accessed on 03 May 2017
- http://waterresourceswr2012.co.za/. Accessed on 17 July 2017. Last updated 2017.