

ANNEXURE A REQUEST FOR CONFIDENTIAL TREATMENT OF INFORMATION SUBMITTED TO THE ENERGY REGULATOR

Instructions:

- 1. This form must be used for all requests for confidential treatment of information submitted to the Energy Regulator.
- 2. Please note that this form has five sections (A, B, C, D & E).
- 3. All requests must be based on and substantiated in terms of the relevant provisions of:
 - the Gas Act, 2001 (Act No. 48 of 2001); and/or
 - the Promotion of Access to Information Act, 2000 (Act No. 2 of 2000).
- 4. All requests must be accompanied by a detailed motivation supporting the request.
- 5. You must clearly indicate and highlight which information in your submission(s) is confidential as the Energy Regulator will not accept general claims of confidentiality of entire documents.
- 6. All information submitted to the Energy Regulator without this request shall be treated as non-confidential and will be made available to the public.
- 7. The completed form with supporting documentation must be delivered to the Energy Regulator:
 - by registered mail to: P O Box 40343, Arcadia 0007;
 OR
 - by hand at: Kulawula House, 526 Vermeulen Street, Arcadia, Pretoria.
- 8. An electronic version of the completed form **may** also be e-mailed to: pipedgas@nersa.org.za.

ENQUIRIES:

Contact: Executive Manager: Gas Regulation

Contact no.: (012) 401 4600 Fax no.: (012) 401 4700

Official Use Only

Date received:	

Reference number:

SECTION A: PARTICULARS OF THE PARTY MAKING THE REQUEST FOR CONFIDENTIAL TREATMENT OF INFORMATION

	Name Telephone number	Tetra4 Proprietary Limited 010 045 6000 / 081 374 3438
3.	Fax number	N/A
4.	E-mail address	Stefano@renergen.co.za
5.	Details of mandated representati	ve, including:
	(a) designation(b) family name(c) first name(d) telephone number(e) fax number	Chief Executive Officer Marani Stefano 0100456000 / 081 374 3438 N/A

(f) email address <u>Stefano@renergen.co.za</u>

SECTION B: PARTICULARS REGARDING THE TYPE OF SUBMISSION

The request for confidential treatment of information is with regards to (tick the appropriate box below):

A licence application	\checkmark
An application for an amendment of a licence	
An application for the revocation of a licence	
An application for the registration of a gas activity	
An objection to a licence application	
A complaint in terms of section 31 of the Act	
A tariff application	
Other (specify)	

SECTION C: DETAILS OF THE CONFIDENTIALITY REQUEST

On separate sheets of paper, list the following information regarding each piece of information:

Column1	The name of the document that contains the information considered to be confidential
Column 2	The page number, paragraph number and line number at which the confidential information begins and ends
Column 3	Facts and evidence supporting the request for confidential treatment of information identified in column 2
Column 4	The nature of the economic value of the information
Column 5	The applicable sections of the Gas Act, 2001(Act No. 48 of 2001) or the Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)

SECTION D: ORAL REPRESENTATIONS TO THE ENERGY REGULATOR

Indicate your wish to orally present your request to the Energy Regulator: YES

✓

NO

APPLICANT'S RESPONSE TO CONFIDENTIALITY REQUEST:

Name of Document	Page number/ paragraph number / line number	Facts and evidence supporting the request for confidential treatment of information identified in column 2	The nature of the economic value of the information	Applicable sections of Gas Act and Promotion of Information Act
Chapter 2 Item 8 specifically schedule B 3"	Schedule " B 3 "	This section contains information about the Applicants supplier that is producing the liquefaction facility, which information is confidential.	Disbursement of the information may have a negative impact on the Applicant's supplier as well as breach the Applicant's supply agreement with the Supplier.	Section 65 of the Promotion of Access to Information Act (Act 2 of 2000)
Chapter 3 Item 4 A – names and addresses of existing customers	Schedules " G " – " J ".	The terms on which the applicant supplies products/gas to its customers are confidential.	Dissemination of the terms on which different customers obtain product may make negatively impact the applicant's negotiations with future customers and potentially be anticompetitive. The terms of the supply agreements must remain confidential.	Section 68 of the Promotion of Access to Information Act (Act 2 of 2000)
Chapter 3 Item 4. B – details of potential customers	Page 17	This section contains information about potential customers which is not readily available to the public.	The applicant is a wholly owned subsidiary of an entity listed on the Johannesburg Stock Exchange and the Australian Stock Exchange. This information has an effect on the share price of the listed entity and accordingly is price sensitive information which must be kept confidential.	Act (Act 2 of 2000)
Chapter 3 Item 4 (d) – names and addresses of existing customers	Page 18	The terms on which the applicant supplies products/gas to its customers are confidential	Dissemination of the terms on which different customers obtain product may make negatively impact the applicant's negotiations with future customers and potentially be anticompetitive. The terms of the supply agreements must remain confidential.	Section 68 of the Promotion of Access to Information Act (Act 2 of 2000)

Chapter 3 Item 5 – Proof of financial viability and Schedules "K" "O"	Page 19 and Schedules " K " – " O "	The financial viability section contains confidential information related to the applicant, including but not limited to its cash flow/financial model.	The applicant is a wholly owned subsidiary of an entity listed on the Johannesburg Stock Exchange and the Australian Stock Exchange. This information has an effect on the share price of the listed entity and accordingly is price sensitive information which must be kept confidential. Further, unauthorised distribution and/use of the financial model or any content of Schedule "M" would be in contravention of the listings regulations.	the Promotion of Access to Information
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BY

REQUESTER/

MANDATED

DECLARATION

SECTION E: SOLEMN

REPRESENTATIVE
I (full names) Stefano Marani Identity Number 7708245076089 hereby declare that:
 (a) I am authorised by resolution of the board of directors dated 2 September 2020 to make this declaration (attach the authorisation); and (b) All information provided herein is within my personal knowledge and is both true and correct. Signature
I certify that the deponent: (a) has acknowledged that she/he knows and understands the contents of this application form and its annexures, that she/he has no objection to taking the prescribed oath and that she/he considers the oath binding on her/his conscience; and
(b) has in the prescribed manner sworn that the contents of this application form and its annexures are true and signed same before me at proved wast (place) on this day of September (month)
COMMISSIONER OF OATHS
Name Tonnith Ross Address Bompass Dunkeld West Capacity Tax Practioner

I certify that the DEPONENT has acknowledged that he she knows and understands the contents of this affidavit, that he she does not have any objection to taking the cath, and that he/she considers it to be binding on his/her conscience, and which was sworn to and signed before me

COMMISSIONER OF OATHS (RSA)
SAIT MEMBER: T. ROSS
Ex Officio TT (SA)
1 BOMPAS ROAD, DUNKELD WEST
TEL: 011 502 2800
PRACTICE NO: 59229369



ANNEXURE B FORM: APPLICATION FOR A LICENCE

Application for a licence in terms of the Gas Act, 2001 (Act No. 48 of 2001)

Instructions:

- 1. Prior to completing this form, you are advised to read the following documents:
 - (a) the Gas Act, 2001 (Act No. 48 of 2001) and its regulations; and
 - (b) the Rules made in terms of the Gas Act, specifically rules 1 to 11.
- 2. Please note that this form has three chapters and that applicants must provide all information and supporting documentation required. Incomplete applications will not be accepted.
- 3. The completed form with supporting documentation must be delivered to the Energy Regulator:
 - by registered mail to: P O Box 40343, Arcadia, 0007;
 OR
 - by hand at: Kulawula House, 526 Vermeulen Street, Arcadia, Pretoria.
- 4. An electronic version of the completed form **must** also be e-mailed to: pipedgas@nersa.org.za.
- 5. If you want to request the confidential treatment of certain information in your application, you must make the request in accordance with rule 4.

ENQUIRIES:

Contact: Executive Manager: Gas Regulation

Contact no.: (012) 401 4600 Fax no.: (012) 401 4700

Reference number

Official Use Only Date received ______

CHAPTER 1 GENERAL INFORMATION

You are required to provide the following information / documentation:

SECTION A: PARTICULARS OF APPLICANT

1. Full registered name of the applicant;

Tetra4 Proprietary Limited (Referred to as the "Applicant" in this application for a licence)

2. Trading name of the applicant (if different from the registered name);

N/A

3. Physical and postal addresses of the principal place of business of the applicant;

Principal Place of Business: First Floor, 1 Bompas Road, Dunkeld West, Johannesburg, 2196

Postal Address: Postnet Suite 610, Private Bag X10030, Randburg 2125

Address of facility/site/operations: Remainder of the Farm Mond van Doornrivier 38, administrative district Theunissen, Province Free State

4. Physical and postal address of the registered office of the applicant (if different from principal place of business);

n/a

5. Telephone number of the applicant;

010 045 6000 / 081 374 3438

6. Fax number of the applicant;

N/A

7. Email address of the applicant; and

Stefano@renergen.co.za

8. Details of the mandated representative of the applicant, including:

(a) designation, Chief Executive Officer

(b) family name,(c) first name,MaraniStefano

(d) telephone number, **010 045 6000 / 081 374 3438**

(e) fax number, and n/a

(f) email address. <u>Stefano@renergen.co.za</u>

SECTION B: DESIRED COMMENCEMENT DATE AND DURATION

1. Desired commencement date of the licence applied for.

The Applicant would like the licence issued as soon as possible. The estimated/expected commencement of the liquefaction facility is 31 March 2021 (however this date may be extended).

2. Desired licence period, i.e. the period for which you desire the licence (if granted) to be valid.

22 years or the length of the granted production right (and any renewals), whichever is the longest.

SECTION C: ADDITIONAL INFORMATION

Provide any other information that you consider relevant to this application.

A copy of the production right is attached as Schedule "A".

SECTION D: LICENCE CONDITIONS

State your desired licence conditions in terms of section 21(1) of the Act.

Refer to schedule "A 1"

SECTION E: SOLEMN DECLARATION BY APPLICANT/ MANDATED REPRESENTATIVE

I (full names) Stefano Marani Identity Number 7708245076089 hereby declare that:

(a)	I am authorised by resolution of the board of directors dated 2 September 202 make this declaration (attach the authorisation); and	0 to
(b)	All information provided herein is within my personal knowledge and is both true correct.	and
Signat	ture	
l certify (a)	by that the deponent: has acknowledged that she/he knows and understands the contents of application form and its annexures, that she/he has no objection to taking prescribed oath and that she/he considers the oath binding on her/his conscient and	the
(b)	has in the prescribed manner sworn that the contents of this application form and annexures are true and signed same before me (place) on day of September (mo	at
COMIN	ISSIONER OF OATHS	
Name Addres Capaci	ss 1 Bompass Dunkeld	

I certify that the DEPONENT has acknowledged that he she knows and understands the contents of this affidavit, that he she does not have any objection to talding the oath, and that he/she considers it to be binding on his/her conscience, and which was sworm to and signed before me

1 BOMPAS ROAD, DUNKELD WEST TEL: 011 502 2800 PRACTICE NO: 59229369

CHAPTER 2 DOCUMENTS TO BE ATTACHED TO THIS APPLICATION

1. If the applicant is a natural person and a South African citizen, a certified copy of the applicant's identity document.

N/A to applicant.

- 2. In the case of a non-South African citizen, a certified copy of her/his:
 - (a) passport;
 - (b) permanent residence permit or employment permit; and
 - (c) proof of residence in South Africa, or proof of domicile in South Africa.

N/A to applicant.

- 3. If the applicant is:
 - (a) a national, provincial or local government;
 - (b) another statutory body;
 - (c) a juristic person established in terms of an Act of Parliament; or
 - (d) a company or other legal body established by statute or government directive, attach a copy of the proclamation establishing such a body or state relevant legislation.

N/A to applicant.

- 4. If the applicant is not a natural person, and is not contemplated in 3 above, attach
 - (a) a document stating -
 - (i) the title of legislation under which it is registered;
 - (ii) the registration number given to it in terms of such legislation;
 - (iii) in the case of companies, the names of current directors and the ownership or shareholding structure, including particulars of the shareholders;
 - (b) a certified copy of the identity document of the mandated representative authorised to make the application, if applicable; and
 - (c) documentary proof of authorisation to make the application.

Refer to Item 1 and 2 of Schedule "B".

5. Provisions to meet any criteria specified in terms of section 19(2) of the Act (if applicable).

N/A to applicant.

6. Documents demonstrating the administrative abilities of the applicant.¹

Refer to item 3 of Schedule "B".

7. Documents demonstrating the financial abilities of the applicant.1

Refer to item 4 of Schedule "B".

8. Documents demonstrating the technical abilities of the applicant.¹

Refer to item 5 of Schedule "B".

¹ Only original or certified copies will be accepted by the Energy Regulator.

- 9. Where the facility is owned by more than one person, the applicant must provide -
 - (a) details of the co-ownership and documentary proof thereof or a solemn declaration to that effect; and
 - (b) written mandate from each of the other owners authorising the applicant to apply for the licence on their behalf.

N/A to applicant.

10. A certified copy of the Record of Decision of the relevant environmental authorities in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) permitting the activity for which the licence is sought, if applicable.

Refer to item 6 of Schedule "B".

- 11. If the Record of Decision in 10 above has not been obtained, then submit:
 - (a) proof of such a permit application; or
 - (b) a solemn declaration outlining the applicant's plans and ability to comply with all applicable labour, health and environmental legislation.

N/A to applicant.

12. If 10 above is not applicable, state reasons thereof.

N/A to applicant.

- 13. List all applicable:
 - (a) legislation;
 - (b) operating and technical standards; and
 - codes and specifications (including those relating to safety) to be used in the activities for which this application is made, for example:
 - (i) the American Society of Mechanical Engineers (ASME) Standards;
 - (ii) American Petroleum Institute (API) Standards; and
 - (iii) European Norms (EN).

Refer to items 7 and 8 of Schedule "B".

- 14. Provide detailed technical specifications of the gas that will be handled at the facility for which this application is made, including:
 - (a) the chemical and physical composition of the gas;
 - (b) calorific values of the gas; and
 - (c) the combustion properties, including the Wobbe Index of the gas.

Refer to item 9 of Schedule "B".

Provide information required by regulations made in terms of the Act concerning mechanisms to promote historically disadvantaged South Africans.

Refer to item 10 of Schedule "B".

CHAPTER 3 DETAILS OF APPLICATION

Complete the appropriate form:

Liquefaction

- Operation of a Liquefaction Facility (GALA.I.F2)

OPERATION OF A GAS LIQUEFACTION FACILITY (GALA.I.F2)

1. The location (address) of the liquefaction facility.

APPLICANT RESPONSE: Remainder of the Farm Mond van Doornrivier 38, district Theunissen, Free State.

- 2. A description of the proposed gas liquefaction facility and key design codes to demonstrate the technical feasibility, adequately specifying the layout of the facility and the physical dimensions and capacity thereof. This must include:
 - (a) the site layout;

APPLICANT RESPONSE: Please refer to Schedule "C"

(b) detailed drawings, including process flow diagrams; mechanical drawings and plant layout;

APPLICANT RESPONSE:



Also refer to Schedules "D", "E" and "F"

(c) a description of the liquefaction process to be used at the facility;

APPLICANT RESPONSE:

The plant will use a cryogenic process to liquefy the natural gas (Figure 1 below). The gas from the natural gas reserve through the gas gathering system will be supplied to the Liquefaction facility at 5 barg and 20 °C. The gas then goes through a feed gas booster compressor where the pressure is increased to 50barg prior to treating the gas in the feed gas treatment units, MDEA Decarburization and Molecular Sieve (MS) Dehydration units.

CO2 and H2S is removed from the natural gas in the MDEA decarburization unit to levels less than 10ppm through the MDEA absorption tower; this is to prevent material corrosion and blockages in the downstream cryogenic process. The decarbonized natural gas processed to the MS Dehydration unit where all saturated water is removed to levels of less than 1ppm, this is to prevent ice blockages in the downstream cryogenic process.

The dry decarburized natural gas is further processed in the Mixed refrigerant (MR) Cold box/Liquefaction process where the MR cools down the gas and methane starts to liquify at -160°C. The stream from the cold box in then processed in the distillation column where the volatile substances are removed

from the liquid/gas mixture through selective evaporation and condensation. The tail gas mixture rich in helium is removed at the top of the distillation column and is processed further in the helium liquefaction plant. The liquid methane stream is removed at the bottom of the distillation column, flows through the J-T valve, and reduce its pressure to become LNG product and is pressure decanted to the storage tanks.

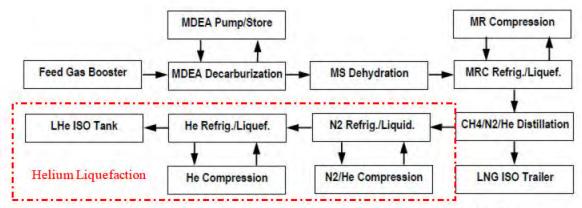


Figure 1: LNG Liquefaction Block Flow diagram incl. Helium liquefaction

(d) the design capacity of the storage tank(s) for the gas to be liquefied (if applicable);

APPLICANT RESPONSE: No gas storage tank on site.

 the design capacity of the proposed liquefaction unit(s) in tonnes of liquefied natural gas (LNG) per annum;

APPLICANT RESPONSE: 16 500 tonnes per annum

(f) the design capacity of the storage tank(s) production capacity

APPLICANT RESPONSE: Total design capacity of 300 m³ splits into 3 tanks of 100m³ each

(g) LNG discharge mode from the facility.

APPLICANT RESPONSE: LNG from the liquefaction plant will be pressure decanted into the onsite storage tanks. The LNG Road tankers will then be filled from these storage tanks using cryogenic filling pumps and the product will then be dispatched to customer sites.

- Details of the geographic location of:
 - (a) the storage facility for liquefied gas (if separate from liquefaction facility); and
 - (b) the storage facility for gas that is to be liquefied (if separate from liquefaction facility).

APPLICANT RESPONSE:

central coordinates are as follows : Lat: 28 °7'37.90" S and Lon: 26°43'10.94" E

- 4. Details of any existing and/or potential customers for the proposed facility, including:
 - (a) the names and physical addresses of existing customers,

APPLICANT RESPONSE:

Name Address		Product
Bulk Hauliers International	334 Tram Street, New	Liquefied Natural Gas
Transport (Pty) Ltd	Muckleneuk, Pretoria,	
	Gauteng	
Black Knight Logistics	120 Sandton Drive,	Liquefied Natural Gas
(Pty) Ltd	Sandton, 2196	
The South African	65 Park Lane, Sandown,	Liquefied Natural Gas
Breweries (Pty) Ltd	Sandton, 2146	
Linde Global Helium, a	575 Mountain Avenue,	Liquefied Helium
division of Linde Gas	Murray Hill, NJ, 07974	
North America LLC		

(b) the names and physical addresses of potential customers,

APPLICANT RESPONSE:



(c) the categorization of each customer, for example, as a distributor, power generator or large user; and

APPLICANT RESPONSE:

Name	Categorization
Bulk Hauliers International	Long-haul Transport
Transport (Pty) Ltd	
Black Knight Logistics	Long-haul Transport
(Pty) Ltd	
The South African	Regional Transport
Breweries (Pty) Ltd	
Linder Global Helium, a	Supplier
division of Linde Gas	
North America LLC	

(d) for each customer, the average or anticipated gas consumption in Gigajoules per annum.

APPLICANT RESPONSE:

Name	Average gas consumption in gigajoules

5.	Proof	of financial viability of the proposed facility, including:
	(a)	commercial structure;
		APPLICANT RESPONSE:
	(b)	proposed or actual (if already operating) financial statements and/or discounted cash flow (DCF) model (providing assumptions used in calculations and sourcing of figures);
		APPLICANT RESPONSE:
	(c)	the status and/or proof of equity financing agreements and finance including terms and conditions; and
		APPLICANT RESPONSE:
	(d)	other incidental costs (please specify whether legal, consulting etc).
		APPLICANT RESPONSE: N/A

- 6. Details of the gas source, including
 - (a) certified, proven saleable reserves; and

APPLICANT RESPONSE: Attached as Schedule "P".

(b) gas production programme to supply gas for the project.

APPLICANT RESPONSE: Attached as Schedule "Q".

7. In the case of existing supply agreements, submit the particulars of such customers.

APPLICANT RESPONSE: Provided under item 4.

8. A copy of the maintenance policy for the liquefaction facility.

APPLICANT RESPONSE: Refer to Schedule "R".

Non-Confidential File SCHEDULE "A"

Production Right - Execution version



PRODUCTION RIGHT

Granted in terms of Section 84(1) of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)







Production Right - Execution version

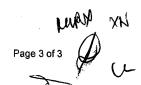
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Non-Confidential File IN THE REGISTER OF Production Right Production Right - Execution version ENDORSEMENT IN TERMS OF SECTION 102 OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT 28 OF 2002, UNDER MPT N AS AMENDED READ WITH SECTION 5 OF ACT 24 OF 2003 The within mentioned right has been amended / varied insertion of RAL: MINERAL RESOURCES The withinmentioned Supporting documents filed under Amdt No. Terms of section44(a) of Act 61 of 1973 as amended, changed its name and is now known as TETRA 4 pp: Director-General: Mineral Pty() Lited of section 44(4) his endorsement is made in the made of Act 61 of 1973 supporting Nots filed as Amendment No:

PRODUCTION RIGHT

pp Director

GRANTED IN TERMS OF SECTION 84(1) OF THE MINERAL AND PETROLEUM RESOURCES

DEVELOPMENT ACT NO. 28 OF 2002, READ TOGETHER WITH REGULATION 35 PUBLISHED IN

THE GOVERNMENT GAZETTE NO. 26275 ON 23 APRIL 2004, PROMULGATED IN TERMS OF

SECTION 107 (1) OF THE ACT.

LET IT HEREBY BE KNOWN THAT:

THE REPUBLIC OF SOUTH AFRICA

is the custodian of the mineral and petroleum resources of the State (the 'Grantor').

Susan Shabangu

is the Minister of Mineral Resources of the State (together with her successors in title and, where relevant, her predecessors in such role, referred to as the 'Minister'). The Minister is empowered by virtue of the provisions of Sections 3(2)(a) and 84(1) of the Act (as defined) to grant production rights.

The Minister has by virtue of the provisions of Section 103 of the Act (as defined) delegated, inter alia, the power to grant production rights to

Dr Thibedi Ramontja

the Director-General of the Department of Mineral Resources (the 'Director-General').

XN MMW Un

2015

Production Right - Execution version

Molopo South Africa Exploration and Production Proprietary Limited (Registration No 2005/012157/07)

(the 'Holder') has applied for a production right for petroleum in respect of the Production Area, an area as defined pursuant to Section 83 of the Act (as defined)

LET IT THEREFORE BE KNOWN THAT:

On this 20th day of September in the year TWO THOUSAND AND TWELVE (2012) before me,

RONEL STRAUGHAN

a Notary Public, duly sworn and admitted, residing and practicing at **CAPE TOWN**, (the 'Notary') and in the presence of the subscribing competent witnesses personally came and appeared,

MTHOZAMI RICHARDSON XIPHU

the Chief Executive Officer of the South African Agency for the Promotion of Petroleum Exploration and Exploitation (Proprietary) Limited (hereinafter referred to as "the Agency"), Registration No. 1999/015715/07, he or she being duly authorised thereto by virtue of the Power of Attorney granted by the Director General of the Department of Mineral Resources at Pretoria on the 29th day of May 2012, which Power of Attorney has this day been exhibited to me, the Notary, and now remains filed of record in my Protocol, and

PETER DEWDNEY PRICE

he being duly authorised thereto under and by virtue of a Resolution of the Board of Directors of the Holder passed on the 5th day of November 2007, a certified copy of which Resolution has this day been exhibited to me, the Notary, and now remains filed on record in my Protocol with the minutes of the meeting at which such Resolution was passed.

AND THE APPEARERS DECLARED THAT:

The Holder currently holds or has held the Exploration Rights and has applied for a production right for petroleum in respect of the Production Area; and

The Grantor has decided to grant to the Holder this production right for petroleum in respect of the Production Area (as defined) on the terms and conditions set out below.

age 6 of 6

Production Right - Execution version

NOW, THEREFORE, THE GRANTOR HEREBY GRANTS TO THE HOLDER, AND THE HOLDER HEREBY ACCEPTS, THIS PRODUCTION RIGHT SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS:

1. Definitions and Interpretation

1.1 Unless the context indicates otherwise, any expression to which a meaning has been assigned in the Act shall bear, when used in this Production Right, the same meaning given thereto at the date upon which the Exploration Right was granted and apply mutatis mutatis mutandis hereto. In this Production Right the following words and expressions shall have the corresponding meanings assigned to them:

'Act' shall mean the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);

'Acquired Data' shall mean all technical information and data (digital or otherwise) and Samples, directly or indirectly, relating to the Production Area that are obtained or created by the Holder in the course of Production Operations (and previous Exploration Operations), including drilling, appraisal, production, completion, and abandonment reports; tests (including reservoir analysis); well logs; maps; production rates, records and statistics; and geological and geophysical information and interpretations; but excluding, for the avoidance of doubt, any Existing Data and/or data which has been obtained from third parties on terms which do not allow for the same to be shared with the Grantor:

'Affiliate' of a person shall mean another person which, directly or indirectly, owns, or is owned by, or is owned by a person which owns, that first-mentioned person; 'owns' and 'owned' in this definition means the beneficial ownership of 50 (fifty) percent or more of the voting shares or other voting securities of such person;

'Agency' shall mean the designated agency as defined in the Act, which, at the date upon which the Exploration Right was granted, was the South African Agency for Promotion of Petroleum Exploration and Exploitation (Soc) Limited, Registration No. 1999/015715/07, also known as Petroleum Agency SA;

'Annual Production Work Programme' shall mean the annual work programme for Production Operations, inclusive of the budget of estimated costs and expenses of carrying out the same, that the Holder prepares in accordance with Clause 15;

'Applicable Laws' shall mean the laws of the State;

'Appraisal Operations' shall mean any operation, study, activity, or matter, whether taking place within or outside of the State, to appraise and evaluate the extent and

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Production Right - Execution version

volume of petroleum within a Discovery made by the Holder in the Production Area and to determine whether such Discovery could be a Commercial Discovery, including, if and to the extent applicable, all production of petroleum necessary in connection with completion and testing of any appraisal well (including, if necessary, any long-term production test) and all plugging and abandonment of any appraisal well and the terms 'to appraise' or 'appraisal' shall be construed accordingly;

'Appraisal Programme' shall mean the appraisal programme for Appraisal Operations that the Holder prepares in accordance with Clause 16;

'Appraisal Report' shall have the meaning ascribed to it in Clause 16.4;

'Chief Executive Officer' shall have the meaning ascribed to it in the preamble;

'Claims' shall have the meaning ascribed to it in Clause 22.2;

'Commercial Discovery' shall mean a Discovery by the Holder of petroleum in such quantities as the Holder believes will permit the economic development thereof, on its own or in combination with other existing Discoveries or as part of a unitised development;

'Confidential Information' shall have the meaning ascribed to it in Clause 24.1;

'Day' shall have the same meaning ascribed to it in the Act.

'Discovery' shall mean the discovery by the Holder of a geological feature within the Production Area that is determined by the Holder to be capable of producing petroleum;

'Discovery Report' shall have the meaning ascribed to it in Clause 16.1.3;

'Divestment Participating Interest' shall have the meaning ascribed to it in Clause 20.1.1;

'Environmental Management Programme' shall have the meaning ascribed to it in the Act, being the environmental management programme for the Production Area prepared by the Holder and approved by the Grantor, a copy of which is attached hereto at Annexure C, as amended from time to time;

'Exploration Operations' shall have the meaning ascribed to it in the Act, which for the purposes of this Production Right shall include Appraisal Operations;

Exploration Right' shall mean the exploration rights in respect of petroleum and its by-products granted by the Grantor to the Holder, with reference numbers

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30/5/2/3/2/86ER,;

30/5/2/3/2/21ER;

30/5/2/3/2/32ER:

30/5/2/3/2/33ER:

30/5/2/3/2/33ER

*3*0/5/2/3/2/34ER; ✓ 30/5/2/3/2/64ER;∨

30/5/2/3/2/94ER

30/5/2/3/2/20ER.

'Gas Market Development Period' shall have the meaning ascribed to it in Clause 6.2;

'Final Reporting Period' shall mean a period beginning on the day after the final complete Quarter of this Production Right and ending on the final day of the Initial Period or, where this Production Right has been renewed in terms of Section 85 of the Act, the final day of the final Renewal Period of this Production Right;

'First Reporting Period' shall mean a period beginning on the Effective Date and ending on the first to occur of 30th June, 30th September, 31st December or 31st March thereafter:

'Gas' shall mean any petroleum which at normal temperature and pressure is in a gaseous phase existing in a natural condition in the earth's crust, regardless of the nature of the host rock, and includes any gas which has in any manner been returned to such natural condition, and includes condensate of such gas, but does not include gas obtained by destructive distillation or gas arising from a marsh or other surface deposit;

'Gas Market Development Period' shall have the meaning ascribed to it in Clause 32.1;

'Good International Petroleum Industry Practices' shall mean those good, sound and generally accepted prevailing standards, practices, considerations, and procedures that are applied by reasonable and prudent companies and operators in the international petroleum industry under conditions and circumstances similar to those experienced in the Production Area;

'Government' shall mean the government of the State;

'Grantor' shall have the meaning ascribed to it in the preamble;

'Grantor Group' shall mean, collectively, the Grantor, the Department of Mineral Resources (including the Minister) and the Agency (including the Chief Executive Officer), and the directors, officers, employees, agents, and representatives of each of the aforementioned;

'HDP' means historically disadvantaged person(s) as defined in the

'Holder' shall have the meaning ascribed to it in the preamble;

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'Holder Group' shall mean, collectively, the Holder, the Holder's Affiliates, contractors and sub-contractors of the Holder and the Holder's Affiliates used in connection with Production Operations hereunder and the directors, officers, employees, agents and representatives of each of the aforementioned;

'Initial Period' shall mean a period 30 (thirty) years commencing from the Effective Date;

'Legislative Changes' shall have the meaning ascribed to it in Clause 27.1.3;

'Minister' shall have the meaning ascribed to it in the Act; 'Participating Interest' shall mean the undivided share (expressed as a percentage) in all of the rights and obligations derived from this Production Right granted in respect of all or any part of the Production Area:

'Party' shall mean the Grantor or the Holder, as the case may be, and 'Parties' shall mean both of them;

'Petroleum' shall have the meaning ascribed to it in the Act;

'Petroleum Bearing Area' shall have the meaning ascribed to it in Clause 31.1;

'Production Area' shall mean the area within the State described in Clause 3, excluding those portions relinquished or abandoned from time to time or severed there from in accordance herewith:

'Production Operations' shall have the meaning ascribed to it in the Act;

'Production Right' shall mean this production right in respect of petroleum and its byproducts, granted in terms of Section 84(1) of the Act read together with Regulation 35 published in the Government Gazette on 23 April 2004 and promulgated in terms of Section 107 (1) of the Act;

'Production Work Programme' shall mean the production work programme attached hereto as Annexure B, as amended from time to time;

'Prospective Buyer' shall have the meaning ascribed to it in Clause 20.1.1;

'Quarter' shall mean a three-month period beginning on 1st January, 1st April, 1st July or 1st October of each Year;

'Regulations' shall mean the regulations promulgated in terms of Section 107(1) of the Act:

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'Renewal Period' shall mean that period of time for which this Production Right is renewed in terms of Section 85 of the Act read together with Regulation 38;

'Respondent' shall have the meaning ascribed to it in Clause 34.6;

'Royalty Legislation' shall mean the Mineral and Petroleum Resources Royalty Act, 2008 (Act No. 28 of 2008) and the Mineral and Petroleum Resources Royalty (Administration) Act, 2008 (Act No. 29 of 2008) and other such legislation which may be promulgated by the State governing the payment of royalties to the State;

'Samples' shall mean physical samples of rock, fluid and other materials acquired by the Holder in the course of conducting Production Operations for the purpose of preserving and analysing such samples;

'State' shall mean the Republic of South Africa;

'State Option' shall have the meaning ascribed to it in Clause 28.1;

'Social and Labour Plan" shall mean the social and labour plan referred to in section 84(1)(i) of the Act read together with Regulation 46, that the holder prepares and which has been approved by the Grantor attached hereto as Annexure D

'Technical Advisory Committee' shall mean the committee established by the Parties in accordance with Clause 8.1;

'Technical Member' shall have the meaning ascribed to it in Clause 34.5;

'Unitisation Proposal' shall have the meaning ascribed to it in Clause 31.1;

'Upstream Training Trust' shall mean the independent Upstream Training Trust registered under registration number IT 1289/98;

'Vis Major Period' shall have the meaning ascribed to it in Clause 29.3; and

'Year' shall mean the period of 12 (twelve) calendar months from the Effective date and each subsequent 12 (twelve) month period thereafter and the terms 'annual,' or 'annually' shall be construed accordingly.

Interpretation in this Production Right

1.2

1.2.1

1.2.1.1

Where the context so requires, in this Production Right:

words importing the masculine gender shall include the feminine and Page 11 of 11 vice versa:

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1.2.1.2	the words 'hereunder', 'herein', 'herewith', 'hereof' and words of similar import are references to this Production Right as a whole and not to any particular provision of this Production Right, unless expressly provided to the contrary; and
1.2.1.3	the words 'include' and 'including' shall mean to be inclusive without limiting the generality of the description preceding such term and are used in an illustrative sense and not a limiting sense.
1.2.2	Headings and sub-headings to Clauses and sub-clauses in this Production Right are inserted for convenience only and are not to be taken into consideration in the interpretation or construction of this Production Right.
1.2.3	References to any Clause or Annexure are to a Clause or Annexure (as the case may be) of this Production Right, unless expressly stated to the contrary.
1.2.4	This Production Right has been written in English and shall be interpreted and construed in accordance with the English language. All correspondence, communication and documents exchanged between the Grantor and the Holder in connection herewith, whether oral or written, shall be in the English language.
1.2.5	Except as otherwise provided herein, reference to any statute, statutory provision or regulation shall include a reference to that statute, statutory provision or regulation as amended, extended or re-enacted from time to time.
1.2.6	Unless the context otherwise requires, words denoting the singular include the plural and vice versa.
1.2.7	Unless the context otherwise requires, references to persons shall include natural persons, bodies corporate, unincorporated associations and partnerships.
1.2.8	In the event of any conflict or inconsistency between the provision of this Production Right and the Act, the provisions of the Act shall govern. In the event of any conflict or inconsistency between the provisions of the Production Right and any Regulations, the Regulations shall govern.
1.2.9	In the event of any conflict between the provision of the main body of this Production Right and its Annexures the provisions of the main body and this Production Right shall govern.

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2. Granting of the Production Right

- 2.1 Subject to the Act, the Regulations and the terms and conditions set forth herein, the Grantor hereby grants to the Holder and the Holder hereby accepts this Production Right.
- 2.2 As of the Effective Date, the Participating Interest of the Holder is 100 (one hundred) percent.

3. Production Area

The Production Area shall comprise the farms/Area set out on **Annexure "A"** hereto situated in the district/s of Ventersburg, Welkom, Odendaalsrus in the Free State Province measuring 187427,2189 (one hundred and eighty seven thousand four hundred and twenty seven comma two one eight nine) hectares in extent.

4. Exclusive Right to Apply for Separate Production Rights in Respect of Discoveries

- 4.1 Subject to the provisions of Section 83 of the Act read together with Regulation 34, the Holder has the exclusive right to sever from this Production Right, apply for and be granted a separate production right in respect of each Commercial Discovery within the Production Area, provided that any such application for a separate production right has been applied for prior to the expiry date of this Production Right. Any production right granted to the Holder shall cover an area which is no less than the area fully covering each Commercial Discovery and in the event that a Commercial Discovery extends beyond the boundary of the Production Area into acreage over which no other person has an outstanding application for a production right, the Holder shall have the right to apply for a separate production right to include the full extent of the Commercial Discovery that falls outside the boundary of the Production Area.
- Any area falling within the Production Area in respect of which a separate production right has been granted to the Holder shall, as from the date such separate production right comes into effect in accordance with the Act, be severed from and no longer form part of the Production Area in respect of this Production Right, whereupon this Production Right shall cease to apply in respect of such area.
- 4.3 In the case of the severance referred to in Clause 4.2, the Holder shall, as soon as practicable after the separate production right comes into effect, submit the necessary amended map reflecting the new size and extent of the Production Area, and the necessary endorsements shall be reflected on the Grantor's records.
- Where this Production Right provides for a separate production right to be granted to the Holder, such separate production right shall be granted in a form and on terms

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and conditions which are in all material respects, consistent with the Production Right,

5. Rights and Obligations of the Holder

5.1	Without derogating from the Holder's rights and obligations in terms of this Production Right and Sections 5 and 86 of the Act, the Holder shall have the:
5.1.1	right by itself or via any other member of the Holder Group to enter the Production Area, bring on to the Production Area any plant, machinery and equipment and build, construct and lay down any surface, underground or under sea infrastructure, both inside and outside the Production Area, which may be required for the purpose of conducting Production Operations;
5.1.2	sole and exclusive right to carry out Production Operations, explore for Petroleum and, if applicable, conduct Appraisal Operations, on or under the Production Area for its own account;
5.1.3	exclusive right to own, use, produce, remove, take in kind, lift, transport (via pipelines, tank ships or otherwise), export and dispose of any Petroleum, including by-products, found in the Production Area, whether within or outside of the State, at prices obtained by the Holder;
5.1.4	right to own and dispose of any and all facilities, materials, equipment, supplies and consumables purchased and/or leased by the Holder for the conduct of Production Operations; and
5.1.5	right to carry out any other activity incidental to Production Operations, which activity does not contravene the Act.
5.2	Without derogating from the Holder's other obligations in terms of this Production Right, the Holder shall:
5.2.1	conduct Production Operations in accordance with the Annual Production Work Programme and the Production Work Programme;
5.2.2	comply with the Social and Labour Plan;
5.2.3	comply with the Environmental Management Programme; and
5.2.4	pay all amounts due and payable to the Grantor in terms of the Act, the Regulations, this Production Right and Applicable Laws.

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6. Commencement, Duration and Renewal

- This Production Right will commence on the Effective Date and, unless abandoned, cancelled, relinquished, suspended, terminated, extended or renewed in accordance herewith, will continue to be in force and effect until the end of the Initial Period.
- In accordance with Section 86(2) of the Act, the Holder shall, within 1 (one) year from the Effective Date, or such extended period as the Minister may authorise, commence Production Operations in accordance with the Annual Production Work Programme; provided that, if the Holder has exercised its option under Clause 32.1 of the Exploration Right (the 'Gas Market Development Period'), then the Holder shall commence Production Operations within 1 (one) year of the expiry of the Exploration Right Gas Market Development Period.
- Upon application by the Holder prior to the end of the Initial Period, or of any Renewal Period, this Production Right shall be renewed by the Minister in accordance with and subject to the provisions of Section 85 of the Act read together with Regulation 38.

7. Royalties and Other Payments

- 7.1 The Holder shall pay royalties to the State in accordance with the Royalty Legislation read with the Royalty Stability Agreement if entered into between Minister and the Holder.
- 7.2 All amounts due and payable by the Holder to the Grantor under this Production Right, which, for the avoidance of doubt, shall exclude the royalties payable in accordance with the Royalties Legislation, shall be paid into the Agency's nominated bank account, namely:

Bank Name: ABSA Branch: Parow

Branch Code: 502110

Account name: Petroleum Agency SA

Account number: 405 103 0832
Account type: Current Account

or such other bank account as the Grantor may from time to time notify the Holder in writing, but in no event will such notice be less than 30 (thirty) days before the beginning of the applicable payment date.

8. Technical Advisory Committee

8.1 The Parties shall by notice to each other, within 30 (thirty) days from the Effective

Date, establish a committee (herein referred to as the 'Technical Advisory Committee')

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by appointing and identifying in the said notice representatives as follows:

8.1.1	a chairman and one other person appointed by the Grantor; and
8.1.2	two persons appointed by the Holder (one of which shall be a representative of the Operator).
8.2	The Grantor and the Holder may appoint by notice to each other a replacement representative or an alternate to act in place of their representative. When an alternate acts in the place of any representative he or she shall be deemed to have the powers and shall perform the duties of such representative.
8.3	Without prejudice to and without derogating from the rights and obligations of the Holder in terms of this Production Right, the Act and the Regulations, the functions of the Technical Advisory Committee are as follows:
8.3.1	to review the Annual Production Work Programme and the progress of all Production Operations, to monitor the implementation thereof and to provide the Holder with advice and recommendations with regard thereto;
8.3.2	to review any proposed amendments to the Annual Production Work Programme and/or the Production Work Programme and to provide the Holder with advice and recommendations with regard thereto;
8.3.3	to review any Appraisal Programme and to provide the Holder with advice and recommendations with regard thereto;
8.3.4	to review any proposed production work programme to be submitted in support of an application for a separate production right pursuant to Clause 4.1 and provide the Holder with advice and recommendations with regard thereto;
8.3.5	to review the accounting of expenditure and the maintenance of operating records and reports kept in connection with Production Operations and to provide the Holder with advice and recommendations with regard thereto; and
8.3.6	to offer advice to the Holder in order to promote the efficient carrying out of Production Operations.
8.4	The Technical Advisory Committee shall meet once annually within 15 (fifteen) days of the submission of the proposed Annual Production Work Programme pursuant to Clause 15.1. Otherwise, the Technical Advisory Committee shall meet as and when required by its members, in which case 30 (thirty) days' notice must be given by the Party requesting such meeting.

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- 8.5 All meetings shall be held in Cape Town, South Africa or such other place as is unanimously agreed to by the members of the Technical Advisory Committee.
- The Grantor shall propose for the Holder's consideration a meeting agenda. The aforesaid agenda and the copies of all the necessary documentation and presentation materials shall be exchanged between the Parties not less than 7 (seven) days prior to the meeting.
- 8.7 Three representatives of the Technical Advisory Committee shall form a quorum, provided that at least one representative of the Grantor and one representative of the Operator are present.
- Any member of the Technical Advisory Committee shall on no less than 7 (seven) days' notice to the other members of the Technical Advisory Committee prior to the meeting have the right to bring any expert or advisor to a meeting of the Technical Advisory Committee for the purpose of advising on any matter requiring the advice of an expert or advisor. The chairman of the meeting shall cause minutes of each meeting to be kept and circulated to the members of the Technical Advisory Committee within 30 (thirty) days of each meeting.
- The proceedings and processes of the Technical Advisory Committee are without prejudice to the rights and obligations of the Grantor Group or the Holder Group.
- Where a Party has assigned not less than 10% of its Participating Interest to a person other than the other Party, the membership of the Technical Advisory Committee shall, without reduction in the number of representatives of the Grantor and the Holder, be enlarged to include such assignee, who shall appoint and identify in writing to the Parties one representative who shall, subject to the provisions of this Clause 8, be entitled to participate in the proceedings and processes of the Technical Advisory Committee. The Grantor may in such circumstances enlarge its' membership of the Technical Advisory Committee to equal that of the Holder and any such assignee.

9. Cancellation or Suspension of the Production Right

- 9.1 It is recorded that in terms of section 90 of the Act the Minister is empowered to cancel or suspend this Production Right in the circumstances set out in and in accordance with the provisions of Section 47 of the Act.
- 9.2 Should this Production Right be cancelled or suspended in accordance with Section 90 of the Act, the Holder shall not be absolved from those obligations and liabilities that have accrued up to the date of such cancellation or suspension.
- 9.3 Any cancellation or suspension of this Production Right by the Grantor shall be

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without prejudice to the Grantor's or the Holder's other rights under this Production Right or Applicable Laws.

10. Voluntary Abandonment and Voluntary Relinquishment of the Production Area

- Subject to Clause 10.5, the Holder may, at any time, upon giving the Grantor not less than 180 (one hundred and eighty) days' prior notice, abandon this Production Right by relinquishing the entire Production Area to the Grantor.
- 10.2 If the Holder gives notice to abandon this Production Right in terms of Clause 10.1, the Holder shall following the date of such notice have the right to discontinue Production Operations and shall, subject to Section 43 of the Act, from such date have no further cost, liability or obligation in respect of Production Operations, including, for the avoidance of doubt, the Production Work Programme and the Annual Production Work Programme.
- Subject to Clause 10.5, the Holder may, at any time and from time to time, by giving the Grantor not less than 90 (ninety) days' prior notice, relinquish any portion of the Production Area. Such notice shall be accompanied by a map depicting the Production Area still covered by this Production Right.
- 10.4 If the Holder gives notice to relinquish any portion of the Production Area in terms of Clause 10.3, the Holder shall following the date of such notice have the right to discontinue Production Operations in respect of that portion of the Production Area relinquished and shall, subject to Section 43 of the Act, from such date have no further cost, liability or obligation in respect of Production Operations in respect of that portion of the Production Area relinquished, including, for the avoidance of doubt, the Production Work Programme and the Annual Production Work Programme, which shall be modified accordingly.
- Any abandonment in terms of Clause 10.1 or relinquishment in terms of Clause 10.3 shall not absolve the Holder of any cost, liability or obligation incurred by the Holder in respect of this Production Right prior to the date of such abandonment or relinquishment.
- 10.6 From the date that the Holder has abandoned this Production Right in terms of Clause 10.1 or has relinquished a portion of the Production Area in terms of Clause 10.3, the Grantor shall be entitled to grant to any other person any of the rights and permits referred to in the Act in respect of the Production Area so abandoned or relinquished, subject to Section 43 of the Act.
- 10.7 From the date that the Holder has abandoned this Production Right in terms of Clause 10.1, the Holder shall within 6 (six) months furnish the Grantor with a copy of

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all the Acquired Data that has not been previously furnished to the Grantor. The Holder shall thereafter be entitled to freely use, distribute or dispose of such Acquired Data in respect of the Production Area so abandoned.

- 10.8 From the date that the Holder has relinquished any portion of the Production Area in terms of Clause 10.3, the Holder shall within 6 (six) months furnish the Grantor with a copy of all of the Acquired Data that has not been previously furnished to the Grantor in respect of that portion of the Production Area so relinquished. The Holder shall thereafter be entitled to freely use, distribute or dispose of such Acquired Data.
- The Holder shall apply for a closure certificate in terms of Section 43 of the Act in respect of any abandonment or relinquishment in terms of this Clause 10.

11. Rights to Minerals and Petroleum

- 11.1 Except as provided for herein in respect of Petroleum and its by-products, this Production Right confers no rights on the Holder in respect of any mineral (as defined in the Act) discovered in the Production Area. Should the Holder discover any mineral of potential value during Production Operations, the Holder shall, as soon as reasonably practicable after discovery of the same, report such discovery to the Grantor.
- The Holder may thereafter, subject to any prior third party rights, apply for a reconnaissance permission, prospecting right or mining right in respect of such mineral.

12. Examination of the Production Area

The Minister or any person duly authorised by the Minister in accordance with Section 91 of the Act may, in accordance with Sections 91 and 92 of the Act, enter upon the Production Area and conduct routine inspections and exercise such related powers as are set out in the Act at all reasonable times and at their own risk and expense.

13. Records and Samples

- 13.1 Without derogating from the Holder's responsibilities in terms of Section 88(1) of the Act read together with Regulation 37, the Holder shall keep current and accurate records of all Acquired Data acquired during Production Operations and such Acquired Data shall be kept in such form as is agreed between the Parties, acting reasonably.
- 13.2 Samples shall be taken by the Holder in accordance with Applicable Laws, Good International Petroleum Industry Practices and the Grantor's reporting and sampling guidelines. The Holder shall, at its own cost, save, correctly label and, as soon as

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reasonably practicable after taking the same, deliver to the Grantor a representative portion of all Samples in such form as is agreed by the Parties, acting reasonably.

- 13.3 Subject to Clause 13.5, the Grantor shall be entitled to inspect any Samples kept by the Holder at all reasonable times on reasonable notice.
- Prior to the Holder discarding any Samples, the Holder shall notify the Grantor. Should the Grantor require such Samples, the Holder shall, at its cost, deliver to the Grantor the Samples so requested in writing by the Grantor. Notwithstanding anything to the contrary in this Production Right or otherwise, if the Grantor does not respond within 30 (thirty) days of receipt of such notice from the Holder, the Holder is free to discard such Samples.
- The Holder may export Existing Data and Acquired Data (including Samples) for processing or laboratory examination or analysis by the Holder or by third parties or for storage outside of the State, provided that representative Samples (reasonably equivalent in quality) and copies of the Acquired Data (reasonably equivalent in quality) have first been delivered to the Grantor. In the case of Acquired Data or Samples which cannot be copied or sub-sampled prior to export (e.g. core), the Holder shall retain such Acquired Data or Samples, provided that the Grantor is informed that such Acquired Data or Samples cannot be copied or sub-sampled prior to the export thereof.
- Subject to Clause 13.5, the Holder shall deliver to the Grantor, at the Holder's expense, digital and, where appropriate, paper copies of all Acquired Data (other than Samples) as soon as reasonably practicable after such Acquired Data is acquired or prepared.

14. Reports

- The Holder shall keep the Grantor advised of all material developments taking place during the course of Production Operations and, to the extent the same have not already been supplied by the Holder pursuant to this Production Right or the Exploration Right, shall furnish the Grantor with such other further reports and information as the Grantor may reasonably require.
- Without derogating from the generality of Clause 14.1 or the Holder's reporting obligations in terms of Section 88 of the Act, during the term of this Production Right the Holder shall within 21 (twenty one) days after the end of (a) the First Reporting Period, (b) each Quarter after the First Reporting Period and (c) the Final Reporting Period, and within 60 (sixty) days from the end of each completed Year, submit to the Grantor a written report reflecting, for the relevant period, the progress of Production Operations, including a summary of:

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14.2.1	the numbers of local persons (classified by race and gender) and expatriate persons employed;
14.2.2	the work done and expenditure on Production Operations;
14.2.3	the site and depth of every well drilled or being drilled and the formations penetrated and particulars regarding any occurrence of Petroleum encountered;
14.2.4	a statement of compliance with the Environmental Management Programme; and
14.2.5	a statement of compliance with the Social and Labour Plan.
14.3	The Grantor and the Holder shall each own the Acquired Data in its possession and, after the termination, cancellation or abandonment of this Production Right or relinquishment of any portion of the Production Area, each Party may freely use, sell, distribute, trade, license or otherwise disclose or dispose of such data relating to the areas no longer included in the Production Area; provided, however, in the case of a separate production right granted pursuant to Clause 4.1, Acquired Data in respect of the area covered by such production right will be subject to the terms and conditions set forth in such production right.
14.4	None of the terms of this Production Right shall be construed as requiring the Holder to disclose any of its or its Affiliates' proprietary technology or proprietary technology that is licensed or otherwise acquired by the Holder or its Affiliates from third parties.
14.5	Within 6 (six) months, from the termination and/or cancellation of this Production Right, the Holder shall furnish the Grantor with a copy of all the Acquired Data not already in the possession of the Grantor.
15.	Production Work Programme and Annual Production Work Programme
15.1	Not later than 60 (sixty) days from the Effective Date, the Holder shall submit to the Grantor an Annual Production Work Programme for the remainder of the current Year. Thereafter, at least 90 (ninety) days prior to the commencement of each succeeding Year, the Holder shall submit to the Grantor its Annual Production Work Programme

15.2 Each Annual Production Work Programme shall set forth the Production Operations to be carried out during the subject Year or part thereof, as the case may be. The Production Operations to be carried out under the Annual Production Work Programme shall be consistent with the Production Work Programme.

for such succeeding Year or part thereof, as the case may be.

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- Should the Holder have exercised its option under Clause 32.1 of the Exploration Right in respect of this Production Right, then the provisions of Clauses 15.1 and 15.2 shall not apply until such time as the Holder has given notice to the Grantor pursuant to Clause 32.2.1 of the Exploration Right; provided, however, if such notice is given less than 90 (ninety) days prior to the commencement of a Year, then the 90 (ninety) day period required by Clause 15.1 for submission of the Annual Production Work Programme for the succeeding Year shall be deemed to have been satisfied in respect of such Annual Production Work Programme.
- 15.4 If the Holder gives notice to the Grantor pursuant to Clause 32.2.2 of the Exploration Right, then the provisions of Clauses 15.1 and 15.2 shall be of no further force or effect from the date of such notice and the Holder shall have no liability or obligation in respect thereof.
- 15.5 Any approval of the Minister required pursuant to Section 102 of the Act in connection with any amendment to the Production Work Programme proposed from time to time by the Holder shall not be unreasonably withheld, conditioned or delayed.

16. Discoveries and Testing

- 16.1 If from time to time during the course of Production Operations under this Production Right a Discovery is made by the Holder in the Production Area, the Holder shall:
- 16.1.1 promptly notify the Grantor of the fact that a Discovery has been made;
- 16.1.2 cause tests to be made on the Discovery within a reasonable period of time consistent with Good International Petroleum Industry Practices, in order to determine whether the Discovery is or could be a Commercial Discovery and worthy of appraisal. Prior to testing the Discovery, the Holder shall give notice to the Grantor of the tests the Holder intends to conduct and the Grantor shall have the right to witness such tests.
- 16.1.3 within 60 (sixty) days (or such longer period as may be agreed between the Parties in writing) after having completed and received the results of the tests under Clause 16.1.3, furnish the Grantor with a copy of the test results report containing a summary of the Holder's interpretation of such tests (the 'Discovery Report')
- All tests and measurements conducted by the Holder for the purpose of establishing the potential existence of a Commercial Discovery shall be carried out in accordance with Good International Petroleum Industry Practices.
- 16.3 If the Holder considers, after providing the Grantor with the Discovery Report, that the

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Discovery could be a Commercial Discovery, then the Holder must take reasonable steps to appraise the Discovery and submit an Appraisal Programme to the Grantor for approval.

16.4

Within 180 (one hundred and eighty) days from the date of completion of Appraisal Operations, or such further period as agreed between the Parties in writing, the Holder shall deliver to the Grantor (a) a full report containing particulars of the results of such Appraisal Operations, including particulars and preliminary estimates relating to the location and depth of Petroleum reservoirs, the composition of Petroleum, the estimated recoverable reserves of Petroleum, and the estimated daily production potential of Petroleum, and (b) a declaration by the Holder as to whether or not the Discovery is a Commercial Discovery (the 'Appraisal Report').

16.5

If the Holder (a) considers, after providing the Grantor with the Discovery Report, that the Discovery is a Commercial Discovery, or (b) declares in the Appraisal Report that the Discovery is a Commercial Discovery, then the Holder may either (i) submit a proposal to amend the Production Work Programme to provide for the development of, production from and exploitation of, the Discovery; or (ii) apply for and be granted a separate production right in respect of the Discovery in accordance with Clause 4.

16.6

If (i) the Holder submits a proposal to amend the Production Work Programme to provide for the development of, production from and exploitation of, the Discovery and (ii) Production Operations are significantly expanded (including by extension of the production area as contemplated in Clause 16.9) as a result of the Discovery, the holder shall make an application in terms of section 102 of the Act to amend the Production Work Programme, the Environmental Management Programme and Social and Labour Plan to take account of the Discovery and the Minister shall not unreasonably withhold, condition or delay approval of any such amended Production Work Programme, Environmental Management Programme and Social and Labour Plan.

16.7

The Holder shall have the exclusive right to develop, produce and exploit any Discovery that is the subject of an amended Production Work Programme, which Discovery shall be deemed to be included in this Production Right, which shall apply *mutatis mutandis* thereto.

16.8

Following any approval of the amended Production Work Programme, the next proposed Annual Production Work Programme shall be prepared according to the amended Production Work Programme.

16.9

In the event that the Discovery extends beyond the Production Area into other area(s) which geologically form part of the same Petroleum reservoir within the State which

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are subject to permits or rights held entirely by the Holder or the Holder and any other party(ies) to this Production Right, then the Holder shall have the right to give notice to the Grantor of the same and shall include with such notice a map in similar format to Annexure A depicting the size and extent of the Production Area and the size and extent of the Discovery. Upon receipt by the Grantor of such notice and map, the Production Area shall be deemed to be enlarged to include the size and extent of the Discovery, the Holder shall present the original copy of this Production Right to the Grantor, complete with such map, for an endorsement reflecting such enlarged Production Area, the Grantor shall make such endorsement and shall make the same endorsement on its original copy of the Production Right and shall reflect the same on its records and the Production Area, as enlarged, shall for all purposes be deemed to be included in this Production Right, which shall apply mutatis mutandis thereto.

17. Manner of Conducting Production Operations

17.1	Without derogating from the provisions of Applicable Laws and the Environmental
	Management Programme, the Holder shall:

17.1.1	execute all Production Operations in a proper and	workmanl	like manner in
	accordance with Good International Petroleum Industr	y Practice	es and, without
	prejudice to the generality of the foregoing, the	Holder	shall take all
	reasonable and practical steps in order to prevent:		

17.1.1.1	the escape or waste of Petroleum discovered in the Production Area;
17.1.1.2	damage to any Petroleum reservoir;
17.1.1.3	the entrance of uncontrolled water through wells to any Petroleum reservoir;
17.1.1.4	the escape of Petroleum into any waters or aquifer in the vicinity of the Production Area; and
17.1.1.5	pollution of the terrestrial or marine environment;

17.1.2	promptly inform the Grantor of the occurrence of any	event described	in
	Clauses 17 1 1 1 to 17 1 1 5 inclusive:		

take all actions required under the Environmental Management Programme and all Applicable Laws with respect to any of the incidents referred to Clauses 17.1.1.1 to 17.1.1.5 inclusive;

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17.1.4	upon the completion of any operation or activity within the Production A	∖rea,
	promptly notify the Grantor of any obstruction, including the location, na	ature
	and extent thereof, that remains in the Production Area;	

- 17.1.5 not flare any Petroleum, except in the case of flaring for safety reasons, without the Grantor's prior written approval, which approval shall not be unreasonably refused, conditioned or delayed; and
- 17.1.6 promptly give notice to the Grantor of all Production Operations which may be reasonably expected to interfere with the rights of other users of the Production Area and take all reasonable steps to minimise interference with the rights of other users.

18. **Existing Data**

- 18.1 It is recorded that no Existing Data has been available to the Holder. Any data or information relating to the Production Area that the Grantor has available at the Effective Date independent of the Holder, or which the Grantor subsequently acquires independent of the Holder, will be made available for inspection, copying and use by the Holder. The Holder shall pay the Grantor for the reasonable and customary costs incurred in copying and preparing such data or information. Should such further data or information be provided to the Holder, such data and information shall be deemed to form part of the Existing Data and Annexure F will be amended accordingly.
- 18.2 Upon terms and conditions to be agreed, the Grantor may assist the Holder in resolving technical problems relating to the Existing Data. Such assistance shall not include interpretation of the Existing Data.
- 18.3 Ownership in all Existing Data vests in the Grantor. On expiry, cancellation, termination or abandonment of this Production Right, all Existing Data in the Holder's possession shall as soon as reasonably practicable, at the Holder's cost, be returned to the Grantor. Alternatively, the Holder shall submit to the Grantor a certificate to the effect that all such copies have been destroyed.
- 18.4 While every effort has been made to verify the quality and accuracy of the Existing Data, the Grantor Group shall not be liable for any error or inaccuracy contained within the Existing Data or any damages of whatsoever nature suffered by the Holder arising from any such error or inaccuracy in the Existing Data.

19. **Environmental Protection and Financial Provision**

19.1 The Holder shall conduct all Production Operations in accordance with the Environmental Management Programme. Page 25 of 25

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19.2

The Holder must annually assess its environmental liability in accordance with Section 41(3) of the Act and, if appropriate, increase–such financial provision to the satisfaction of the Minister.

20. Social and Labour Matters

20.1

The Grantor and the Holder are desirous of encouraging black investment and employment in the upstream sector of the oil and gas industry in the State. To this end:

20.1.1

the Holder shall, within 90 days from the effective date, offer to sell, at a fair market value, on terms to be agreed and approved by the Agency, up to 10% (ten percent) of its Participating Interest or in its equity (the 'Divestment Participating Interest') to either:

20.1.1.1

a suitable historically disadvantaged person ('HDP'); or

20.1.1.2

where no HDP has been identified or the Agency has not approved the proposed offer because it does not advance the attainment of the object referred to in section 2(d) of the Act, any State Owned Company;

(with the HDP or State Owned Company, as the case may be, being referred to herein as the 'Prospective Buyer');

provided, however, that, notwithstanding the foregoing provisions of this Clause 20, if the Holder shall have divested part of its Participating Interest prior to offering to sell the Divestment Participating Interest to the Prospective Buyer pursuant to this Clause 20, then the Divestment Participating Interest shall be divided pro-rata among all of the holder(s) of a Participating Interest and the provisions of this Clause 20 shall apply pari passu with respect thereto; and further provided, always, that neither the Prospective Buyer nor any other person shall have any right pursuant to the provisions of this Clause 20 or Applicable Laws (irrespective of any change in Applicable Laws following the date of execution of the Exploration Right) to acquire more than a 10 (ten) percent Participating Interest;

20.1.2

the Holder shall require the Prospective Buyer to become a party to this Production Right upon execution of a written agreement in respect of the purchase by the Prospective Buyer of the Divestment Participating Interest;

20.1.3

the Holder shall employ South Africans having appropriate qualifications and experience (giving preference to historically disadvantaged persons), taking into account the Holder's operational requirements under this Production

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Right and provided, always, that the Holder may employ a person who has necessary qualifications and experience and who is not a South African if the required skills are not available in the South African labour market. Wages and salaries of the Holder's South African personnel will be determined in accordance with prevailing local labour market conditions;

20.1.4

in the normal course of the Holder's operations, the Holder shall subject to the conditions set out in Clause 20.1.3 give preference, in procuring for purposes of use in Production Operations, to the equipment, machinery, materials, instruments, supplies and accessories manufactured or produced by or otherwise available in the State (and particularly from historically disadvantaged persons) and which are competitive with those available outside the State in terms of price, quality, reliability and availability;

20.1.5

the Holder shall subject to the conditions in Clause 20.1.3 use contractors and/or sub-contractors who are South Africans (giving preference to historically disadvantaged persons) whose services and standards are competitive with those available outside the State in terms of price, quality, reliability, expertise and availability; and

20.1.6

the Holder shall pay the amounts set out and specified in the attached Annexure E to the Upstream Training Trust, to be used by the Upstream Training Trust for the training, education, and obtaining of practical experience for historically disadvantaged persons and other South Africans in the manner determined by the trustees.

20.2

The Holder must, in consultation with the Grantor, make revisions to the Social and Labour Plan attached hereto as Annexure D in accordance with Regulation 46 to ensure compliance with section 2(d) and(f) of the Act.

20.3

The Holder must submit the revised Social and Labour Plan, prepared in accordance with Clause 20.2, 18 months from the effective date and the revised Social and Labour Plan will become effective upon approval of the Minister, but not before 24 months from the effective date.

20.4

Failure by the Holder to submit the revised Social and Labour Plan in accordance with Clauses 20.2 and 20.3 and to obtain the approval of the Minister for the revised Social and Labour Plan after 24 months from the effective date shall constitute breach of the terms and conditions of the right as contemplated by section 47(1) (b) of the Act.

21. Financial Records and Audits

21.1 The Holder shall keep in the State financial records and accounts of all transactions

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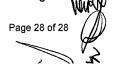
pertaining to this Production Right in accordance with generally accepted accounting principles applicable in the State.

21.2

Upon at least 30 (thirty) days' advance notice, the Grantor or its duly appointed representative may audit, at its own cost, any such financial records and accounts pertaining to this Production Right or copies thereof.

22. Indemnity and Insurance

- The Holder shall for the duration of this Production Right conduct Production Operations in a manner that safeguards and protects persons from injury or death and prevents damage or destruction of property and the environment in accordance with Good International Petroleum Industry Practices.
- The Holder hereby undertakes to defend, hold harmless and indemnify the Grantor Group from and against any and all claims, costs, charges, liabilities and expenses, including reasonable legal costs (hereinafter referred to as 'Claims'), that may be instituted against or suffered by any member of the Grantor Group as a result of injury or death to any person or damage or destruction to any property and/or the environment arising from the negligent and/or unlawful acts and/or omissions of the Holder Group.
- The Holder shall as soon as reasonably practicable after the Effective Date obtain and maintain sufficient insurance during the term of this Production Right to insure those risks related to Production Operations and support the indemnities given by the Holder under this Production Right which are customary to insure against in the international petroleum industry or in accordance with Good International Petroleum Industry Practices. The Holder, with the prior written approval of the Grantor, not to be unreasonably refused, conditioned or delayed, may implement a policy of self insurance in respect of certain risks related to Production Operations. Without derogating from the generality of the foregoing such insurance shall specifically provide for:
- 22.3.1 all risks in respect of any property or equipment used in connection with Production Operations;
- 22.3.2 pollution liability;
- 22.3.3 third-party liability and public liability;
- 22.3.4 removal of wrecks and cleaning-up operations pursuant to an accident in the course of or as a result of Production Operations; and
- 22.3.5 the Holder's liability to its contractors, employees, consultants and agents,



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engaged in Production Operations.

23. **Health and Safety**

If any emergency or incident arising from Production Operations causes or has the potential to cause death and/or injury to persons or damage to and/or destruction of property and/or the environment, the Holder shall to the extent practicable in the circumstances consult with the responsible Government departments and take such action as may be prescribed under Applicable Laws or where not prescribed take such prudent and necessary action in accordance with Good International Petroleum Industry Practices.

24. **Confidentiality and Public Announcements**

- 24.1 Except as otherwise provided under this Production Right, the Acquired Data and the Existing Data together with all programmes, tests, analyses, results, books, statements, records, returns, plans, information and correspondence between the Parties (hereinafter collectively referred to as 'Confidential Information') shall, subject to Section 88(2) of the Act, be treated as confidential by the Parties during the term of this Production Right and shall not be disclosed by either of the Parties to any person without the prior written consent of the other Party, such consent not to be unreasonably refused, conditioned or delayed, except in the following circumstances:
- 24.1.1 where the Holder is required by law, regulation, decree, rule or order applicable to the Holder or its Affiliates to disclose such Confidential Information;
- 24.1.2 where the Holder discloses Confidential Information to any member of the Holder Group; provided that the Holder informs that member of the Holder Group of the confidential nature of information so disclosed;
- 24.1.3 to the extent that such Confidential Information has to be produced at legal proceedings or because an order from a court of competent jurisdiction has compelled the production of such Confidential Information;
- 24.1.4 where the Holder discloses Confidential Information to prospective or actual contractors, consultants, advisors and attorneys employed by any member of the Holder Group where disclosure of such Confidential Information is necessary to such person's services; provided that, prior to disclosure, the Holder informs such contractor, consultant, advisor and/or attorney of the confidential nature of the information so disclosed and takes reasonable steps

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to ensure the confidentiality thereof;

24.1.5

where the Holder discloses Confidential Information to a bank or other financial institution to the extent appropriate to the Holder arranging for funding; provided that, prior to disclosure, such person provides the Holder with a written undertaking of confidentiality that is not less restrictive than the confidentiality restrictions set out in this Clause 24;

24.1.6

to the extent that such Confidential Information must be disclosed pursuant to any rules or requirements of any recognised stock exchange on which the securities of any member of the Holder Group are or are to be traded;

24.1.7

where the Holder discloses Confidential Information to a bona fide prospective purchaser or purchasers of all or part of the Holder or to whom the Holder's rights and obligations under this Production Right are proposed to be assigned;

24.1.8

to the extent that any Confidential Information, through no fault of the Holder, has become or becomes part of the public domain;

24.1.9

where the Holder discloses Confidential Information as part of an exchange with third parties for the geological, geophysical, geochemical or any other technical or scientific data, reports and information (either raw, processed or interpreted) pertaining to their Petroleum operations in respect of other acreage within the State and subject to the execution of suitable confidentiality arrangements. In this event the Grantor shall be apprised of the extent of the proposed exchange; or

24.1.10

where the Holder discloses Confidential Information to its co-venturers pursuant to the terms of the Joint Operating Agreement.

24.2

Except as may be required by laws, rules, regulations or decrees (including that of a stock exchange) applicable to the Holder or its Affiliates, the Holder shall make no public announcement with regard to this Production Right or any matter related thereto, unless the Holder has furnished the Grantor with a copy of the intended public announcement and the Grantor has given its prior written approval, which approval shall not unreasonably be withheld or delayed. If the Grantor desires to issue any press release, media statement, or interview on any Petroleum Discovery, estimated Petroleum reserves, and/or any well drilling operations, tests, and/or results relating to the Production Operations hereunder, the Grantor shall give written notice thereof to the Holder at least 3 (three) Business Days in advance to enable the Holder to comply with disclosure rules and requirements imposed on any Holder Party or its Affiliates by the laws, regulations or rules of the relevant countries in which such Holder Party is

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incorporated or doing business or in which the securities of such Holder Party or its Affiliates are or are to be listed or traded.

When a public announcement or statement becomes necessary or desirable because of impending danger to, or loss of, life, damage to property or pollution as a result of Production Operations, either Party is authorised to issue and make such announcement or statement without prior notice or prior approval of the other Party where such prior notice and approval is impractical. In such a case the Party making the announcement or statement shall promptly furnish the other Party with a copy of such announcement or statement.

25. Cession and Sub-contracting

- 25.1 This Production Right may not be ceded, transferred, let, sub-let, assigned, alienated or otherwise disposed of without the written consent of the Minister in terms of Section 11 of the Act
- 25.2 The Holder may from time to time appoint one or more contractors and/or subcontractors to carry out any portion of the Annual Production Work Programme and/or Production Work Programme; provided that the Holder shall always remain liable to the Grantor for the compliance with and observance of its obligations in terms of this Production Right.

26. Law and Interpretation

- 26.1 The Holder shall comply with all Applicable Laws.
- 26.2 Without derogating from the provisions of Section 4 of the Act, this Production Right shall be governed, construed and interpreted in accordance with the laws of the State.
- The Grantor and the Holder are not partners, nor is it the intention of the Parties to create a partnership, and Production Operations to be carried out in terms of this Production Right are at the sole cost, risk and expense of the Holder and any person who acquires a Participating Interest hereunder, including, for the avoidance of doubt, the Divestment Participating Interest and the State Option.

27. Obligations of the Grantor

- 27.1 The Grantor undertakes to do and perform all acts and things which are or may be required to be done or performed to give full effect to this Production Right in accordance with its provisions and:
- 27.1.1 shall ensure that the rights and obligations of the Holder under this Production

 Right will not be altered without the prior written consent of the Holder;

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27.1.2

the Grantor guarantees that the stability of the legal terms and the provisions of this Production Right, and any and all separate production rights arising from it, shall be maintained as such terms and provisions exist as of the date of execution of the Exploration Right for the duration of this Production Right and any and all separate production rights arising from it;

27.1.3

if, at any time or from time to time after the date of execution of the Exploration Right, there is any change or changes enacted or prescribed to any national or local legislation, regulations, policies, practices, directives or the like ('Legislative Changes'), which in any way materially limit (directly or indirectly), or adversely affect (directly or indirectly) any rights granted to the Holder under this Production Right and/or any and all separate production rights arising from it, or obligations assumed by the Holder under this Production Right and/or any and all separate production rights arising from it and/or the contractual equilibrium of this Production Right and/or any and all separate production rights arising from it, then the Holder may notify the Grantor of the same, whereupon the Parties shall consult with each other and conduct negotiations in good faith and shall, for such purpose, attend at least one meeting with each other, with a view to agreeing upon and implementing an arrangement to take account of the Legislative Changes and to modify as appropriate this Production Right and/or any and all separate production rights arising from it to restore the contractual equilibrium thereof for the remaining duration of this Production Right and/or any and all separate production rights arising from it;

27.1.4

if the Parties cannot reach agreement pursuant to the provisions of Clause 27.1.3 within 90 (ninety) days of the notice referred to in Clause 27.1.1, then either Party shall be entitled to refer the matter to arbitration, in relation to which arbitration the provisions of Clause 34, shall have effect; and

27.1.5

terms relating to Income Tax and royalty stability will be established through contracts between the Holder and the Minister of Finance of the State as provided for in the Income Tax Act, 1962 (Act No. 58 of 1962) and Royalty Legislation.

28. State Option

Subject always to the obligations of the Grantor contained in Clause 27, the State has an option, exercisable within 90 (ninety) days from the approval by the Agency of the offer by the holder to sell a participating interest to a suitable HDP or any State Owned Company pursuant to the provisions of Clause 20.1.1 or, if the Holder has exercised

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its option with respect to the Gas Market Development Period, within 90 (ninety) days from the expiry of the Gas Market Development Period, to acquire up to 10 (ten) percent of the Holder's Participating Interest in this Production Right ('State Option'). The Holder must furnish the Grantor with all relevant and material information to enable the State to decide whether to acquire 10 (ten) percent of the Holder's Participating interest in this Production Right.

28.2

Should the State elect to exercise the State Option it must notify the Holder, within 90 (ninety) days from the approval by the Agency of the offer by the holder to sell a participating interest to a suitable HDP or any State Owned Company pursuant to the provisions of Clause 20.1.1 or, if the Holder has exercised its option with respect to the Exploration Right Gas Market Development Period, within 90 (ninety) days from the expiry of the Exploration Right Gas Market Development Period:

28.2.1

that it has elected to exercise the State Option; and

28.2.2

the Participating Interest, up to 10 (ten) percent, that it elects to acquire.

28.3

Upon the exercise of the State Option, the State will become a party to the joint operating agreement relating to the Production Area. The terms and conditions contained in the joint operating agreement shall not limit the State in the exercise of any of its rights and obligations as the Grantor hereunder. The rights and obligations of the State under the terms of the Joint Operating Agreement shall be separate from, and without prejudice to, its rights and obligations as the Grantor hereunder.

28.4

The State shall pay its Participating Interest share of all costs and expenses related to any approved Production Work Programme and/or any approved Annual Production Work Programme; provided, however, that the State, or any assignee of all or part of the State's Participating Interest, shall not be liable for any costs and expenses relating to any Exploration Operations conducted within the Production Area prior to the Effective Date.

28.5

If the State does not exercise the State Option within the 90 (ninety) day periods provided for in Clause 28.1, the State Option shall lapse and be of no further effect.

28.6

Notwithstanding the foregoing provisions of this Clause 28, if the Holder shall have divested part of its Participating Interest prior to the exercise by the Grantor of the State Option, then the percentage Participating Interest to be acquired by the Grantor under the State Option shall be divided pro-rata among all of the holder(s) of a Participating Interest and the foregoing provisions of this Clause 28 shall apply pari passu with respect thereto; provided, always, that the Grantor shall have no right pursuant to the State Option to acquire more than a 10% (ten percent) Participating Interest.

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29. Vis Major

- Any act, cause, thing or event outside the control of the Holder, including acts of God, war, insurrection, civil commotion, blockade, strikes, flood, storm, lightning, fire, earthquake or loss of electricity for a sustained period, which prevents the Holder from fulfilling its obligations or enjoying its rights under this Production Right, shall be regarded as vis major and any failure on the part of the Holder to fulfil its obligations as a consequence of vis major shall not constitute a breach hereof.
- 29.2 Financial inability, ordinary hardship and inconvenience on the part of the Holder, howsoever caused or arising, shall not be regarded as vis major.
- 29.3 If the Holder by reason of vis major as contemplated in Clause 29.1 is prevented from fulfilling its obligations or enjoying its rights under this Production Right, the Holder shall promptly notify the Grantor thereof and the Holder shall take all reasonable steps to investigate and remove the cause thereof. During the period of time such vis major continues (the 'Vis Major Period'), the Holder's obligation to perform Production Operations will be suspended. The Holder shall promptly notify the Grantor as soon as such Vis Major Period ends and the Holder shall as soon as is reasonably practicable thereafter resume Production Operations.
- Upon the Holder notifying the Grantor of the end of the Vis Major Period, the period of suspension contemplated in Clause 29.3 shall come to an end. The Holder's notice referred to in the third sentence of Clause 29.3 shall state the length of the Vis Major Period, which shall be calculated from the date that the Holder first notified the Grantor of such vis major until the date that such vis major has ended. The duration of this Production Right shall be extended, *pari passu*, by an amount equivalent to the Vis Major Period.
- In the event of the amendment of the duration of this Production Right envisaged in Clause 29.4, the Holder shall present the original copy of this Production Right to the Grantor who shall make an endorsement reflecting such amendment of the duration of this Production Right and the Grantor shall make the same endorsement on its copy.

30. Amendments

Any amendment or variation to this Production Right shall be agreed in writing between the Parties and submitted to the Minister for consent pursuant to Section 102 of the Act. Only once the Minister has consented to the amendment or variation will such amendment or variation be effective.

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31. Unitisation

- In the event that a Commercial Discovery within the Production Area forms part of a Petroleum reservoir to which third party exploration or production rights exist within the State (the 'Petroleum Bearing Area'), then the Grantor may by notice require the Holder to prepare a proposal for the unitisation of the Petroleum Bearing Area (the 'Unitisation Proposal'). The Grantor shall require the holder(s) of the adjacent exploration or production areas forming part of the Petroleum Bearing Area to provide the Holder with all such technical information and data as the Holder may reasonably require in order to assist in the preparation of the Unitisation Proposal. The Unitisation Proposal shall be submitted to the Grantor within the period specified in the said notice, which shall not be less than 180 (one hundred and eighty) days, or such longer period as the Parties, acting reasonably, may agree in writing.
- The Unitisation Proposal shall be prepared in accordance with Good International Petroleum Industry Practices and shall be objectively practical, fair and equitable to all holders of interests in the Petroleum Bearing Area.
- 31.3 If the Unitisation Proposal is not submitted within the period specified or agreed in Clause 31.1, or if the Unitisation Proposal submitted is not acceptable to the Grantor because it is not objectively practical, fair and equitable to all parties concerned, then the Grantor may appoint a committee of independent experts to prepare the Unitisation Proposal in accordance with Good International Petroleum Industry Practices.
- The committee so appointed shall, after having given full consideration to any representations made by the Holder, submit a Unitisation Proposal to the Grantor, copied to the Holder, as soon as is practicable after being appointed.
- The Grantor may, if satisfied that the Unitisation Proposal submitted by the Holder pursuant to Clause 31.11 or the independent committee pursuant to Clause 31.4 is objectively practical, fair and equitable to all parties concerned, confirm such proposal, and it shall be binding upon the Holder.
- If the Holder fails to carry out any provision of the Unitisation Proposal the Minister may by notice giving reasons for the intention to suspend or cancel the PR and affording the Holder an opportunity to show why such action should not be considered require the Holder to do so within a reasonable period and if the Holder fails to comply with such notice the Minister may, in terms of Section 90 of the Act, suspend or cancel this Production Right in respect of that part of the Production Area which falls within the Petroleum Bearing Area.

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32. Special Provisions Relating to Discoveries of Gas

32.1 If the Holder makes a Discovery, the economic development of which the Holder believes can only be accomplished if Gas produced as the primary or secondary product is sold commercially, then the Holder shall have the option, exercisable upon notice to the Grantor at the time that the Holder submits a proposal to amend the Production Work Programme or makes an application to the Grantor for a separate production right in respect of such Discovery pursuant to Clause 16.5, to have the Holder's obligations under the amended Production Work Programme or the proposed production work programme submitted in support of the application for a separate production right suspended for a period of up to 5 (five) years (hereinafter referred to as the 'Gas Market Development Period') commencing from the date on which the proposal to amend the Production Work Programme is approved or the separate production right applied for pursuant to Clause 16.5 becomes effective, as the case may be, during which period the Holder shall conduct studies to determine whether the Gas can be commercially produced. In such circumstances, the Production Work Programme in respect of such Discovery shall be deemed to be provisional and the Holder shall not be required to submit an Annual Production Work Programme in respect of such Discovery during the Gas Market Development Period.

Not less than 90 (ninety) days prior to the expiry of the Gas Market Development Period, the Holder shall notify the Grantor either that:

the Gas can be commercially developed and produced, in which case the Holder shall proceed with implementation of the amended Production Work Programme or the proposed production work programme, as the case may be, duly amended if necessary; or

the Gas cannot be commercially developed and produced, in which case the Holder shall be deemed to have abandoned any relevant separate production right with effect from the expiry date of the Gas Market Development Period, the amended Production Work Programme or the proposed production work programme, as the case may be, shall no longer be of any effect, the Holder shall have no liability or obligation in respect thereof and the Holder shall continue Production Operations in accordance with the Production Work Programme.

The grant of any extension to the Gas Market Development Period shall be at the sole discretion of the Grantor, which discretion shall be exercised reasonably.

33. Waiver or Lenience

32.2

32.2.1

32.2.2

Any failure by either the Grantor or the Holder to exercise any of the rights that they

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have, whether in terms of this Production Right, the Act or the Regulations, or any lenience granted by them in terms thereof shall not constitute a waiver of such rights or a variation to the terms and conditions of this Production Right.

34. Dispute Resolution

34.1.4

34.3

34.4

34.1	Should any difference or dispute arise between the Parties to this Production Right
	concerning;

34.1.1 the conclusion, interpretation, application and execution of this Right;

34.1.2 the authority of any signatory to the Right to conclude the Right on behalf of the party that he or she purports to represent;

34.1.3 any alleged breach or repudiation of the Right;

whether the Right is void or voidable at the instance of any party;

34.1.5 any rectification of the Right, and/or;

34.1.6 any other matter arising from this Right,

(each, a "Dispute"), then either Party shall be entitled to deliver to the other a written notice recording the existence and, in brief, the nature of the Dispute ("the Dispute Notice"). The Dispute shall be deemed to have arisen on the date when a Dispute Notice is delivered to either Party. The Parties shall make every reasonable effort to resolve the Dispute on its merits by negotiation in good faith and shall, for that purpose, attend at least one meeting with each other. Such negotiations shall take place within 21 (twenty one) days of the Dispute arising, unless the Parties otherwise agree in writing, and shall endure for no longer than 7 (seven) days from the date of commencement thereof or such extended period as the Parties may agree in writing.

34.2 If the Parties are unable to resolve the Dispute despite compliance with Clause 34.1, then the Dispute may at the instance of either Party be referred to and fully, finally and exclusively settled by arbitration, in terms of the provisions hereof.

The proceedings, records and the award of the arbitration shall be in the English language. The venue for and seat of the arbitration shall be Cape Town, Republic of South Africa or such other place in the Republic of South Africa as may be agreed between the Parties. The Parties hereby waive irrevocably their right to institute any form of appeal, review or recourse to any court of competent jurisdiction insofar as such waiver may be validly made.

Notwithstanding the referral of such Dispute to arbitration, the Parties shall, to the

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extent possible, proceed with the carrying out of their respective obligations under this Production Right, unless such obligations are directly in dispute: Provided that the foregoing undertaking shall be without prejudice to other rights and remedies available to either Party at law or in equity.

34.5 The provisions of this Clause 34 shall survive the termination of this Production Right.

The arbitration shall commence by a written notice ("the Arbitration Notice") to that effect delivered by the Party demanding the arbitration ("the Plaintiff") to the other ("the Respondent"). No Arbitration Notice shall be delivered after the lapse of 90 (ninety) days after the terminations of any negotiations set out in Clause 34.1 above. Any Dispute, if not resolved and not thereafter made subject to arbitration, may at any time be raised again, commencing with the procedure set out in Clause 34.1 above. In the Arbitration Notice, the Plaintiff shall set out:

34.6.1 a short summary of the nature of the Dispute;

34.6.2 the relief claimed by the Plaintiff;

34.6

34.8

34.9

34.10

34.6.3 the identity and curriculum vitae of an independent arbitrator proposed by the Plaintiff.

Within 21 (twenty one) days after delivery of the Arbitration Notice, the Respondent shall deliver a written reply to the Plaintiff setting out the identity and particulars of an independent arbitrator proposed by it. If the Respondent shall not deliver such reply, the Plaintiff shall nevertheless be entitled to proceed with the arbitration as set out herein.

There shall be 3 (three) arbitrators, appointed as set out herein, and all decisions, rulings and/or awards of the arbitrators shall be by majority decision amongst them. No person who has any pecuniary or any other interest, directly or indirectly, in either of the Parties, shall serve as arbitrator.

The third arbitrator (or the second and third arbitrators if the Respondent shall not have delivered a reply as provided for in Clause 34.7), shall be appointed by the Secretariat of the ICC International Court of Arbitration (or its successor in title).

The arbitrators shall determine the practical measures necessary to conduct the arbitration and shall issue directives in that regard to the Parties and/or their representatives, from time to time, as may be required. The arbitrators shall be entitled to award costs against any party on any scale as otherwise provided for in the Rules of the High Court of the Republic of South Africa and shall, in the case of any disagreement between the Parties about the amount of such costs, be entitled to

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retain the services of an independent legal costs consultant to determine the amount of any such costs. The costs, fees and charges of the arbitrators shall be borne by the Parties in equal proportion and shall be payable by them on presentation of invoices in that regard. Any order as to costs which may be made by the arbitrators shall operate as between the Parties only and shall not affect their obligation to the arbitrators as set out herein.

34.11 Save as set out above and as may be otherwise agreed between the parties, the proceedings shall be conducted subject to and in accordance with the rules of the Arbitration Foundation of Southern Africa ("AFSA").

35. Costs and Value Added Tax

- All taxes, levies, stamp duties, transfer costs, transfer duties and registration costs arising directly or indirectly out of or related to the Holder's Participating Interest shall be for the account of and promptly paid by the Holder.
- All amounts due and payable by the Holder in terms of this Production Right, the Act and the Regulations are exclusive of statutory value added tax. Where applicable, statutory value added tax at the prevailing rate in accordance with the Value Added Tax Act 1991 (Act No. 89 of 1991) shall be added to all relevant amounts due and payable by the Holder.

36. Entire Agreement

Subject to the Act and the Regulations, this Production Right and the Annexures attached hereto (those Annexures being and forming an integral part of this Production Right) and the Fiscal Stability Agreement contain the entire and sole agreement between the Parties and supersedes all prior negotiations, representations, understandings, agreements and communications of whatsoever nature between the Parties with respect to such Production Area, whether oral or written, express or implied.

37. Severability

Any provision within this Production Right which is not enforceable or which contravenes Applicable Laws shall be severed from this Production Right and be of no force or effect without prejudice to the other provisions of this Production Right which shall remain in force and effect.

38. Domicilia Citandi et Executandi

All notices, requests and reports provided for herein shall be in writing and shall be delivered either by hand to an authorised representative of the receiving Party, or sent

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by courier or telefax to the addresses below in the State; provided that if given by telefax a copy thereof shall then be sent immediately by prepaid registered mail:

If to the Grantor:

Minister of Mineral Resources

Physical address:

Postal address:

Trevenna Campus

Private Bag X59

Building 2C

ARCADIA

Cnr Meintje & Schoeman Street

0007

SUNNYSIDE

Tel number: +27 (0)12 444 3000

Fax number: +27 (0)12 444 3145

And copy to the Agency:

South African Agency for the Promotion of Petroleum Exploration and Exploitation (Proprietary) Limited

Attention: Chief Executive Officer

Physical address:

Postal address:

Tygerspoort Building

P O Box 5111

7 Mispel Street

TYGERVALLEY

BELLVILLE 7530

7536

Western Cape

Tel number: +27 (0)21 938 3500

Fax number: +27 (0)21 938 3520

If to the Holder:

Physical address:

Postal address:

1st Floor, Block C, 65 Central Street

PostNet SOUTH 126

Houghton

Box 92418

2198

Norwood

2117

Tel number: +27 11 483 0677

Fax number: +27 11 483 2686

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- Each Party and the Agency may change its address to a different address in the State on at least 15 (fifteen) days' prior notice.
- All notices, requests and reports sent by prepaid registered post shall be deemed received by addressee within 5 (five) days of dispatch and all notices, requests and reports sent by telefax during ordinary business hours shall be deemed to have been received within 12 (twelve) hours of transmission or if transmitted outside ordinary business hours, then on the next Business Day. Those delivered by hand or sent by courier shall be deemed to have been received at the time of actual delivery.
- 38.4 Each Party also chooses the physical address specified above as its *domicilium* citandi et executandi for all purposes arising under this Production Right, including service of process.
- The Holder shall within 7 (seven) days of the Effective Date give notice to the Grantor of the authorised representative with whom the Grantor may deal concerning this Production Right. Such representative shall continue to represent the Holder until the Holder notifies the Grantor of a change of representative.
- 38.6 The Chief Executive Officer is hereby appointed as the authorised representative of the Grantor for all matters relating to this Production Right.

39. Registration

The Holder must lodge this Production Right for registration at the Mining and Petroleum Titles Registration Office within 30 (thirty) days from the Effective Date and, in the event of each renewal of this Production Right, within 30 (thirty) days of such renewal

40. Successors and Assigns

This Production Right shall inure to the benefit of and be binding upon the permitted successors and assigns of the Parties.

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Thus done and signed at Bellville on the 20thday of September in the year 2012 in the presence of the undersigned witnesses:

AS WITNESS:

AS WITNESS:

For and on behalf of the Holder

For and on behalf of the Grantor

Quod Attestor

The <u>Notary</u>

Certified a true sepy in terms of Regulation 60:al, Chapter VI of the Mining Titles Registrations, 2004
To serve in the place of the original.

2017 -10- 0 3

ppDirector-General: Mineral Resources

Certified a true sapy in terms of Regulation 80 a), Chapter VI of the Mining Titles Registrations, 2004
To serve in the place of the original.

Production Right - Execution version

Annexure A

Diagram of the Production Area

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Annexure B

Production Work Programme

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Annexure C

Environmental Management Programme

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Annexure D

Social and Labour Plan

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Annexure E

Schedule of Contributions to the Upstream Training Trust

1. Onshore: R 1 per hectare of the current extent of the Production Area, minimum R10 000.

Payments shall be made within 30 (thirty) days of the Effective Date and annually thereafter during the currency of the Initial Period and any Renewal Period.

On granting or renewal	R 187 427.00
On the first anniversary of granting or renewal	R 187 427.00
On the second anniversary of granting	R 187 427.00

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SCHEDULE "A1"

SECTION D: LICENCE CONDITIONS

State your desired licence conditions in terms of section 21(1) of the Act.

No.	Licence Condition	Desired (Yes/No)	If no, provide a reason
(a)	a licensee must carry out the construction, operation or	Yes	
	trading activities for which the licence is granted;		
(b)	licensees must provide information to the Gas Regulator of	Yes	
	the commercial arrangements regarding the participation		
	of historically disadvantaged South Africans in the		
	licensees' activities as prescribed by regulation and other		
	relevant legislation;		
(c)	the gas¹ transmission², storage³, distribution⁴, trading⁵,	No	This is not applicable to the Applicant's operations.
	liquefaction ⁶ and re-gasification ⁷ activities of vertically		
	integrated companies must be managed separately with		
	separate accounts and data and with no cross-		
	subsidisation;		
(d)	third parties must in the prescribed manner have access on	No	The Applicant does not have transmission pipelines.
	commercially reasonable terms to uncommitted capacity in		
	transmission ⁸ pipelines;		

¹ **Gas** means all hydrocarbon gases transported by pipeline, including natural gas, artificial gas, hydrogen rich gas, methane rich gas, synthetic gas, coal bed methane gas, liquefied natural gas, compressed natural gas, re-gasified liquefied natural gas, liquefied petroleum gas or any combination thereof;

² **transmission** means the bulk transportation of gas by pipeline supplied between a source of supply and a distributor, reticulator, storage company or eligible customer, or any other activity incidental thereto, and **"transmit"** and **"transmitting"** have corresponding meanings;

³ storage means the holding of gas as a service and any other activity incidental thereto, but excludes storage of gas in pipelines which are used primarily for the transmission and distribution of gas;

⁴ **distribution** means the distribution of bulk gas supplies and the transportation thereof by pipelines with a general operating pressure of more than 2 bar gauge and less than 15 bar gauge or by pipelines with such other operating pressure as the National Energy Regulator may permit according to criteria prescribed by regulation to points of ultimate consumption or to reticulation systems, or to both points of ultimate consumption and to reticulation systems, and any other activity incidental thereto, and **"distribute" and "distributing"** have corresponding meanings;

⁵ **trading** means the purchase and sale of gas as a commodity by any person and any services associated therewith, excluding the construction and operation of transmission, storage and distribution systems, and **"trading services"** has a corresponding meaning;

⁶ liquefaction means converting natural gas from a gaseous state to a liquid state

⁷ re-gasification means converting liquefied natural gas to a gaseous state at a re-gasification plant;

⁸ Refer to footnote 2

No.	Licence Condition	Desired (Yes/No)	If no, provide a reason
(e)	interested parties must be allowed to negotiate changes with transmission companies ⁹ in the routing, size and capacity of proposed pipelines;	No	The Applicant is not a transmission company.
(f)	interested parties must be allowed to negotiate with transmission companies for increases in compression of existing transmission pipelines and all pipeline customers must benefit equitably from reduced costs resulting from the increased volume;	No	The Applicant is not a transmission company.
(g)	transmission companies are not obliged to incur any additional expenditure to provide the changes referred to in paragraphs (e) and (f) and the total cost for the pipeline must be shared equitably between the transmission company and the parties requesting the change;	No	The Applicant is not a transmission company.
(h)	licensees must allow interconnections with the facilities of suppliers of gas, transmitters, storage companies, distributors, reticulators and eligible customers, as long as the interconnection is technically feasible and the person requesting the interconnection bears the increased costs occasioned thereby, which must be taken into account when setting their tariffs;	No	The liquefaction facility is designed to process gas of a specific specification and significant changes to that specification may endanger the liquefaction facility. The Applicant is also not a transmission company.
(i)	third parties must in the prescribed manner have access on commercially reasonable terms to uncommitted capacity in storage facilities;	No	The Applicant has limited storage facilities which will be utilised by the Applicant's product. Compromising the Applicant's storage presents a significant risk to the upstream operations.
(j)	interested parties may negotiate with storage companies ¹⁰ for changes in the capacity of storage facilities;	No	The Applicant does not conduct the business of storing gas on behalf of other companies.
(k)	storage companies are not obliged to incur any additional expenditure to provide the changes contemplated in paragraph (j) and the total cost for the storage facility	No	The Applicant does not conduct the business of storing gas on behalf of other companies.

⁹ "transmission company" means any person transmitting gas

^{10 &}quot;storage company" means any person storing gas;

No.	Licence Condition	Desired (Yes/No)	If no, provide a reason
	must be shared equitably between the storage company and the party requesting the change;		
(1)	apart from direct sales via physical by-passes to eligible customers who may alternatively have access to the distribution network at the distributor's ¹¹ discretion, a distributor will be granted an exclusive geographic area, but only for a particular range of specifications of gas determined by the Gas Regulator;	No	The Applicant is not a distributor.
(m)	a distributor will be granted the construction, operation and trading licences for its exclusive geographic area. The construction and operation licences will be exclusive for the period of validity of such licences, and the trading licence will be exclusive for a period determined by the Gas Regulator;	No	The Applicant is not a distributor.
(n)	an exclusive geographic area must be based on the distributor's ability to supply present and future potential consumers at competitive prices and conditions;	No	The Applicant is not a distributor.
(o)	gas must be supplied by a licensed distributor within its exclusive geographic area to any person on request, if such service is economically viable;	No	The Applicant is not a distributor.
(p)	maximum prices for distributors, reticulators and all classes of consumers must be approved by the Gas Regulator where there is inadequate competition as contemplated in Chapters 2 and 3 of the Competition Act, 1998 (Act No. 89 of 1998);	No	The Applicant does not fall within the categories mentioned.
(q)	an advisory service with regard to the safe and efficient use, handling and storage of gas must be provided to customers other than eligible customers, by the trading licensee;	No	It is not reasonably practicable to place a general obligation to provide an advisory service on the Applicant as the Applicant has different delivery methods which attract different customers.

¹¹ Distributor is not defined. Distribution Company is defined as any person distributing the Gas. For the definition of distributing refer to footnote 4.

No.	Licence Condition	Desired (Yes/No)	If no, provide a reason
			As part of the Phase 1 project (to which this licence relates), the Applicant will deliver gas in two ways: (i) ex works collection from the liquefaction facility; or (ii) delivered to the end-user at designated filling station.
			All customers obtaining gas (LNG or LHe) (ex-works) have great experience in the product and its safe uses and capabilities, and such a customer would find no need for an advisory service.
			All customers receiving gas (at a filling station) have limited interaction with the gas as the relevant employee dispensing the gas (either an employee of the applicant or an employee of filling station) would have been trained as to the safe use and dispensing of the gas and would not require additional advisory service.
(r)	licensees must maintain their facilities in a fully operative condition	Yes	
(s)	all customers in a licensed distribution area, except eligible customers and reticulators, must purchase their gas from the distribution company licensed for that area;	No	The Applicant is not a distributor
(t)	the time period within which gas facilities will become operational must be fixed	No	The impact of the corona virus pandemic has not been fully quantified and accordingly may delay the operation of the facility.
(u)	licensees must provide information necessary for the Gas Regulator to perform its functions	Yes	

SCHEDULE "B"

ITEN#	ADDITON	INFORMATION
ITEM NO.	APPLICATION REFERENCE	INFORMATION
1.	Chapter 2 – item 4. (a)	 i. Companies Act 71 of 2008 (Previously the Companies Act 61 of 1973) ii. 2005/012157/07 iii. Directors: a. Stefano Marani b. Nicholas Michael Mitchell c. Fulufhedzani Ravele d. Khalid Pated. Shareholders e. Renergen Limited (owns 100% of the shareholding in Tetra4 Proprietary Limited)
2.	Chapter 2 – item 4 (b) and (c)	Certified copy of the identity document of Stefano Marani and the appropriate board resolution is attached as Schedule " B 1 "
3.	Chapter 2 – item 6	The Applicant was registered in 2005. On 10 September 2012, it was issued with a production right by the Department of Mineral Resources and Energy to produce petroleum (which includes natural gas). The Applicant is a wholly owned subsidiary of Renergen Limited (which is dual listed on the JSE and the ASX). The Applicant is in the process of constructing its phase 1 project which includes the construction of a gas gathering pipeline and the importing of a modular liquefaction plant. A copy of the Curriculum Vitae's of the key employees of the Applicant is attached as Schedule "B 2". Also please refer to the integrated annual report of Renergen Limited, specifically pages 44 – 75 which can be obtained at https://www.renergen.co.za/integrated-annual-report-2020/ outlining details of the leadership of Renergen Limited.
4.	Chapter 2 – item 7	Please refer to Chapter 3: Details of Application - section 5 of the licence to operate containing the financial information together with the associated annexures.
5.	Chapter 2 – item 8	Please refer to Chapter 3: Details of Application - sections 2, 6 and 8.
6.	Chapter 2 – item 10	A copy of the Environmental Authorisation is attached as Schedule "B 4"
7.	Chapter 2 – item 13 (a) and (b)	 National Environmental Management Act, Act 107 of 1998 (NEMA) and Regulations as amended National Water Act 36 of 1998 and Regulations Occupational Health and Safety Act (OHS Act no 85 of 1993) and Regulations as amended Pressure Equipment Regulations – PER – 15 July 2009 issued in terms of the Occupational Health and Safety Act (Act No 85 of 1993).

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		Gas		le of Federal Regulations Part 193 for Liquefied Natural es: Federal Safety Standards (CAS Registration Number
8.	Chapter 2 – item 13 (c)	Code / Standa rd	Revi sion	Description
		ANSI/IS A 5.1	2009	Instrumentation Symbols and Identification
		ASME B31.3	2016	Process Piping
		ASME B31.8	2016	Gas Transmission and Distribution Piping Systems
		ASME BPVC-	2015	ASME Boiler and Pressure Vessel Code, Section V: Non-destructive Examination
		ASME BPVC- IX	2015	ASME Boiler and Pressure Vessel Code, Section IX: Welding and Brazing Qualifications

ASME PCC-1	2013	Guidelines for Pressure Boundary Bolted Flange Joint Assembly						
ASME B16.47	2017	Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24						
ASME B 16.5	2009	Pipe Flanges and Flanges Fittings						
API 520	2014	Sizing, Selection, and Installation of Pressure- relieving Devices						
API 521	2014	Pressure-relieving and Depressurising Systems						
API 671	2007	Special Purpose Couplings for Petroleum, Chemical and Gas Industry Services						
API 1104	1 (20° 2 (20°	Edition, welding of Pipelines and Related es Errata Facilities 13), Errata 14), Errata 17), and andum 1						
API RP 2003	2015	Protection against ignition arising out of static, lightning and stray currents						
API 4589	1993	Fugitive Hydrocarbon Emissions from Oil and Gas Production Operations						
BS EN 12068		Cathodic protection. External organic coatings for the corrosion protection of buried or immersed steel pipelines used in conjunction with cathodic protection. Tapes and shrinkable materials						
EN 1473	2016	Installation and Equipment for Liquefied Natural Gas						
EN 1160	2005	Installation and Equipment for Liquefied Natural Gas — General characteristics of liquefied natural gas						
EN 12066	1997	Installation and Equipment for Liquefied Natural Gas — Testing of insulating lining for liquefied natural gas compounding areas.						
NFPA 10	2018	Portable fire extinguishers						
NFPA 11/11A	2016	Standard for low, medium and high expansion foam/foam systems						
NFPA 11C	1995	Standard for mobile foam apparatus						
NFPA 13	2016	Standard for the installation of sprinkler systems						
NFPA 15	2017	Standard for water spray fixed systems for fire protection						
NFPA 30	2018	Flammable and combustible liquids code						
NFPA 52	2006	Vehicular Fuel Systems Code						
NFPA 55	2016	Compressed gases and cryogenic fluids code						
NFPA 56	2017	Standard for fire and explosion prevention during cleaning & purging of flammable gas piping systems						

	NFPA	2016	Standard for the production, storage	
I	59A		and handling of LNG	
	NFPA	2015	Recommended practice for handling of	
I I—	329		flammable and combustible liquids and gases	
	NACE		Control of external corrosion on underground	
	SP		or submerged, metallic piping systems	
	0169			
	NACE		Electrical isolation of cathodically protected	
1 1	SP		pipelines	
I I—	0286			
	NACE		Measurement of protective coating	
1 1	TM		electrical conductance on underground pipelines	
l 	0102			
	SANS	2012	Categorization and conformity	
 -	347		assessment criteria for all pressure equipment	
1 1	SANS	2012	National colour standard	
I I—	1091	0044	Manager of the selection of the selectio	
	SANS	2014	Materials of insulated electric cables and flexible	
 	1411	0007	cords	
1 1	SANS	2007	Electric cables with extruded solid dielectric	
I H-	1507	1 -4-	insulation for fixed installations	
	SANS	Late	Construction works	
	2001 all section	st Editi		
<u> </u>	s SANS	on 2008	Plastics piping systems – Polyethylene (PE)	
1 1	4427-1	2000	pipes and fittings for water supply – Part 1:	
	4421-1		General	
	SANS	2008	Plastics piping systems – Polyethylene (PE)	
	4427-2	2000	pipes and fittings for water supply – Part 2:	
			Pipes	
	SANS	2008	Plastics piping systems – Polyethylene (PE)	
	4427-3		pipes and fittings for water supply – Part 3:	
			Fittings	
	SANS	2008	Plastics piping systems – Polyethylene (PE)	
	4427-5		pipes and fittings for water supply –	
			Part 5: Fitness for purpose of the system	
	SANS	2014	Plastics piping systems for the supply of	
	4437-1		gaseous fuels — Polyethylene (PE) – Part 1:	
	(ISO		General	
	4437-1)	0011		
	SANS	2014	Plastics piping systems for the supply of	
	4437-2		gaseous fuels — Polyethylene (PE) – Part 2:	
1 1	(ISO		Pipes	
	4437-2)	2044	Disation minima systems for the second of	
	SANS	2014	Plastics piping systems for the supply of	
1 1	4437-3		gaseous fuels — Polyethylene (PE) – Part 3:	
1 1	(ISO		Fittings	
	4437-3)	2014	Diactics nining systems for the symply of	
	SANS 4437-4	2014	Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) – Part 4:	
	(ISO		Valves	
1 1	4437-4)		vaives	
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4437	-5	gaseous fuels — Polyethylene (PE) – Part 5:	
(ISO		Fitness for purpose of the system	
4437	-5)	i initiate for purpose or the eyelenn	
SAN		Installation, inspection and	
1008		maintenance of equipment used	
	Editi	in explosive atmospheres	
		in explosive authospheres	
SAN	on S 2008	The netroloum industry Dort 1:	
		The petroleum industry - Part 1:	
1008	9-1	Storage and distribution of petroleum products	
CAN	2017	in above-ground bulk installations	
SAN		Electrical and other installations in	
1008		the distribution and marketing sector	
SAN		The Structural Use of Concrete Part 1: Design	
1010		TI 01 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
SAN		The Structural Use of Concrete Part 2:	
1010		Materials and execution of work	
SAN		Artificial lighting of interiors	
1011			
SAN		The wiring of premises; Part 1:	
1014		Low voltage installations	
SAN	_	Basis of structural design	
1016			
SAN		Self-weight and imposed loads	
1016			
SAN		Wind action	
1016			
SAN		Seismic actions and general requirements	
1016			
SAN		Basis for geotechnical design and actions	
1016			
SAN		Actions induced by cranes and machinery	
1016			
SAN		Thermal actions	
1016			
SAN		Actions during execution	
1016			
SAN		The structural use of steel – Part 1:	
1016		Limit-states design of hot-rolled steelwork	
SAN		The structural use of steel – Part 2:	
1016		Limit-states design of cold-formed steelwork	
SAN		The Structural use of Masonry – Part 1:	
1016		Unreinforced masonry walling	
SAN		The Structural use of Masonry – Part 2:	
1016	4-2	Structural design and requirements for	
	0040	reinforced and prestressed masonry.	
SAN		The Application of the National Building	
1040	U	Regulations	
all			
secti	on		
S	0010		
SAN		Design and installation of earth electrodes	
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SANS 10268 10269 10269 SANS 2015 10269 SANS 2015 10270 SANS 2015 10270 SANS 2013 Earthing of Low Voltage Distribution System 10292 SANS 600791 EC 60079 SANS 2004 Frofile of blast cleaned surfaces for painting (Determined by a micro meter profile gauge). Cathodic protection measurement techniques 53509 SANS 2008 SANS 2008 Cathodic protection measurement techniques 63502-3 SANS 2017 Classification of hazardous locations and selection of electrical apparatus use in such location sans selection of electrical apparatus use in such location for equipments for explosion protected apparatus 918 SANS 2013 Cathodic protection provided by enclosures (IP Code). SANS 2017 Classification of hazardous locations and selection of electrical apparatus use in such location selection of electrical apparatus use in such location selection of electrical apparatus use in such location for electrical paparatus selection of electrical apparatus selection electrical apparat				
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SANS 2015 Welding of thermoplastics — Testing and approval of welders SANS 2015 Welding of thermoplastics — Approval of welding procedures and welds SANS 2013 Earthing of Low Voltage Distribution System 10292 SANS 2018 Explosive atmospheres 600791 EC 60079 SANS 2004 Profile of blast cleaned surfaces for painting (Determined by a micro meter profile gauge). SANS 2010 Cathodic protection measurement techniques 253509 SANS 2017 Classification of hazardous locations and selection of electrical apparatus use in such location SANS 2017 Classification of hazardous locations and selection of electrical apparatus use in such location SANS 2018 Recommended practise: Regulatory requirements for explosion protected apparatus 260529/ EC 60529 SABS 2013 Degrees of protection provided by enclosures (IP Code). EC 60529 SABS 2007 Paints and varnishes — determination of film thickness. 2008 Quality requirements for fusion welding of metallic materials ISO 2007 Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness. ISO 2000 Preparation of steel substrates before application of paint and related products — Surface preparation methods. ISO 2000 Preparation of steel substrates before application of paints and related products — Surface preparation methods. ISO 2001 Pipins and varnishes — Paint and related products — Surface preparation methods. ISO 2000 Preparation of steel substrates before application of paints and related products — Surface preparation methods. ISO 2016 Preparation of steel substrates before application of paints and related products — Surface preparation methods. ISO 2016 Preparation of steel substrates before application of paints and related products — Surface preparation methods — Part 3: Hand-and power-loot cleaning. ISO 2016 Environmental Management	all			
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		17637		Visual testing of fusion-welded joints	
		ISO129	Late	Paint and Varnishes – Corrosion	
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			Editi	by protective paint systems. Parts 1 to 8.	
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		9712	2005	Qualification and certification of NDT personnel	┢
		ISO 17025	2005	General requirements for the competence of testing and calibration laboratories	
			: <i>c</i> : .	· ·	_
9.	Chapter 2 – item 14 (a) – (c)	recnnical	specific	ation for gas is attached as Schedule " B 5 "	
10.	Chapter 2 – item 15	Mechanisr	ns to pr	omote historically disadvantaged South African's:	
				the Applicant has a level 4 Broad-Based Black	
				Empowerment status. A copy of the certificate is	
		atta	ached a	s Schedule " B 6 ".	
				ed on Schedule B 6, the Applicant has 38.28%	
				torically disadvantaged South African) ownership	
		,	_	ts holding company Renergen Limited) including	
				lack woman (historically disadvantaged female)	
		ow	nersnip	(through its holding company Renergen Limited).	
		his Apponduthe Sjo Ms Appdis Re	torically plicant e Applic bberg (a Sjober plicant pose o nergen	cant's production right required it to have 10% disadvantaged South African shareholding in the (without an obligation on the Applicant to top up – owered always empowered). As a result, thereof, ant concluded a transaction with Cheryl Danielle historically disadvantaged South African female). g held 10% of the total issued share capital of the On 17 December 2019, Ms Sjoberg elected to of her 10% shareholding in the Applicant to Limited.	
			June 20 a. Ra	f the Applicant's employment equity numbers (as 120): cial breakdown (as a % of 100) i. African: 56% ii. Indian: 11% iii. Coloured: 0% iv. White: 33% ender breakdown (as a % of 100) i. Woman: 42% ii. Men: 58%	
			have th	f the Applicant's preferential procurement policies, ne following targets: fer to Schedule " B 7 ".	

Resolution no. 14 of 2020

TETRA4 PRORPIETARY LIMITED

(Registration Number: 2005/012157/07)

(the "Company")

RESOLUTION OF THE BOARD OF DIRECTORS (THE "BOARD") OF THE COMPANY PASSED IN TERMS OF SECTION 74 OF THE COMPANIES ACT, 2008 (THE "COMPANIES ACT")

We, the undersigned, being the authorised Board, hereby consent and agree that the following written resolution is passed in accordance with section 74 of the Companies Act and the Company's memorandum of incorporation ("MOI"). It is recorded that each director of the Company has received notice of the matters referred to below.

NOTED THAT:

- a. Without conceding that the Company is regulated by the National Energy Regulator of South Africa ("NERSA"), the Company has elected to proceed with an application for a licence to Operate a Liquefaction Facility ("Application").
- b. A copy of the Application is attached to this Resolution.

RESOLVED THAT:

- 1. The Company is hereby authorised to draft, complete and submit the Application to NERSA.
- 2. Stefano Marani in his capacity as chief executive officer is hereby authorised on behalf of the Company ("Authorised Individual") to (i) sign any and all documents necessary to give effect to resolution no.1 above, including but not limited to the Application and any sworn declarations that may be required; and (ii) perform any other action that may be necessary or incidental to give effect to resolution no.1 above.
- 3. To the extent that the Authorised Individual has already signed any other documents or done any act or thing so as to give effect to the resolutions contained herein, the actions of such Authorised Individuals in this regard be and are hereby retrospectively approved and are ratified and adopted in their entirety.

Resolution no. 14 of 2020

DIRECTOR

Name: Nicholas Michael Mitchell

Date: 2 September 2020

DIRECTOR

Name: Stefano Marani

Date: 2 September 2020

DIRECTOR

Name: Khalid Patel

Date: 2 September 2020

DIRECTOR

Name: Fulufhedzani Harriet Ravele

Date: 2 September 2020



I certify that the DEPONENT has acknowledged that he she knows and understands the contents of this affidevit, that he she does not have any objection to taking the oath, and that he/she considers it to be binding on his/her conscience, and which was sworn to and signed before me

at Dunke of on this the LO day of Sockhood 2020.

and that the administering cath complied with the regulations contained in Government Gazette No. R1258 of 21 July 1972, as amended.

COMMISSIONER OF CATHS (RSA)

SAIT MEMBER: T. ROSS

EX Officio TT (SA)

1 BOMPAS ROAD, DUNKELD WEST

TEL: 011 502 2800 at Dunkeld

TEL: 011 502 2800 PRACTICE NO: 59229369



SCHEDULE "B 2"

KEY EMPLOYEES OF THE APPLICANT

1. Mr Stefano Marani

Designation: Managing Director and Chief Executive Officer

Qualifications: BSc Actuarial Science; BSc Hons in Advanced Mathematics of Finance

Stefano is the Chief Executive Officer of Renergen and its subsidiary Tetra4. He was part of the team which acquired Tetra4 from Molopo Energy Limited in October 2013 and has been involved with the company in a management role since October 2013.

Stefano has significant experience in the areas of structured finance and advisory. After completing his formative training with Deutsche Bank, Stefano was recruited by Morgan Stanley in London, where he was ultimately charged with building their sub-Saharan African fixed income capital markets business, before starting his own business in 2009.

2. Ms Fulufhedzani (Fulu) Ravele

Designation: Executive Director and Chief Financial Officer

Qualifications: B Comm Financial Accounting; Postgraduate Diploma in Accounting; CA(SA), Applied Financial Management (Wits Business School), CIMA Adv Dip MA (CIMA advanced diploma in management accounting)

Fulu obtained her CA(SA) qualification with Deloitte South Africa in 2012. She has experience in financial accounting, internal and external audit. After qualifying as a CA(SA), she was seconded to Deloitte LLP Los Angeles office as an audit senior. Fulu was appointed as a management accountant at Barclays Capital South Africa in June 2013, where she focused on reporting financial results for Corporate and Investment Banking (CIB) South Africa and the rest of Africa.

Fulu joined Tetra4 as Financial Director in July 2015 and was appointed to the Board of Renergen as Renergen's full time financial director in November 2015 following the acquisition of Tetra4 by Renergen.

3. Mr Nick Mitchell

Designation: Executive Director and Chief Operating Officer

Qualifications: Microsoft Certified Systems Engineer (MCSE), A+ Certified

Nick was instrumental in the acquisition of Tetra4 from Molopo Energy Limited in October 2013. He was appointed to the Board of Renergen in November 2015 following the acquisition of Tetra4 by Renergen.

Since Renergen's acquisition of Tetra4 Nick has served as COO for Renergen and Tetra4 and has worked closely with Stefano Marani (CEO) to establish the business plan, raise the requisite funding from both the equity and debt markets. He is an experienced Director with a demonstrated history of working in the energy and infrastructure sectors across Sub-

Saharan Africa. He is focused on early stage company and project development and strong in operations, sales and has proficiency in IT systems.

Nick is also the current Chairman for the Onshore Petroleum Association of South Africa (ONPASA) which represents the upstream onshore petroleum industry in South Africa.

4. Mr Khalid Patel

Designation: Environmental Manager

Qualifications: Honours degree in Geography and Environmental Science (University of Wits), Certificate of competence in project management (GIBS). Obtained his Masters Degree in Environmental Science (Wits).

Khalid has extensive experience with Environmental Assessments for the mining and energy industry, including managing large projects on behalf of clients such as Exxaro KZN Sands, Xstrata Alloys Samancor Chrome, Kumba Iron Ore and Sylvania Metals. In addition to Environmental Assessments, Khalid also has significant experience with Mineral Tenure Component, specialist review, IFC, World Bank and Equator Principles audits, Enviro-Legal Gap Analysis and the undertaking of due diligence work. Khalid acted as the environmental advisor to the Royal Bafokeng Nation for 5 years. Khalid managed the mining and energy unit at EIMS for 6 years and acted as supervising principle for all work done by the unit.

He joined Tetra4 in August2016 as its Environmental Director. Khalid's responsibilities include ensuring environmental compliance, ongoing environmental management and detailed environmental monitoring.

5. Ms Mandy Stuart

Designation: Business Services Manager

Qualifications: Certificate in Project Management (Damelin), Certified Process Professional (CPP) (IQ Business Group), currently studying towards her BBA (Milpark Business School)

Mandy is a skilled Business Services Manager with over 20 years' experience in the financial services industry. Mandy was a National Brand Manager for Investec Private Bank (SA), as well as Investec Private Bank (UK). Mandy then moved to Computershare Investor Services South Africa where she was a Project Manager, implementing upgrades, enhancements and migrations for major projects across the Computershare Investor Services Group.

Mandy subsequently was responsible for Computershare Investor Services South Africa's Employee Share Plans division, managing employee share schemes for numerous listed companies on the JSE and AltX. Mandy was also responsible for Corporate Responsibility for Computershare Investor Services South Africa. Mandy joined Renergen on 1 June 2016.

6. Mr Johann Weideman

Designation: Project Manager

Qualifications: Higher National Diploma (Mechanical Engineering), Wits Technikon Government Certificate of Competency (Mechanical/Factory) Management Development Programme (UNISA).

Johann has more than 30 years' experience in the Management of a multi-Disciplinary Engineering teams, on projects including Hydrocarbons, Power and Infrastructure (for example coal, lignite, gas turbines, coal gasification, co-generation projects, turbines, common plant, control and instrumentation and electrical). He established the Pangaea Academy that specializes in developing and presenting of training material and courses aimed at project managers, engineers, cost engineers, project controls, procurement and other project support personnel.

Johann has valuable experience in management of multi-product pipe-lines as project director of pipelines, pumping stations, controls, electrical, valves, construction, procurement and contracts management. Johann has served on the board of control for numerous projects.

7. Mr Muhammed Khan

Designation: Legal Counsel

Qualification: LLB Law, University of Pretoria, 2011

Muhammed has more than 8 years' experience gained at a major international law firm, Hogan Lovells South Africa Inc. as a practising attorney and thereafter as an internal legal advisor at Vedanta Zinc International. Muhammed is highly skilled in various areas of the law.

8. Ms Nalanie Naidu

Designation: Head of Human Resources

Qualifications: B Proc and Certified Career and High-Performance Coach

Nalanie has more than 20 years' experience working within the Human Resources space and has provided human resource services to companies such as Air Products, Rentworks, Diversey and Europear.

Engineering and Operations Managers

9. Mrs Nompumelelo Msimang

Engineering Process Manager

Qualification: B Sci Chemical Engineering, Cert. Business Process Management, Program in Project Management (PPM)

Highly qualified technical expert, Nompumelelo (Mpumi) Msimang offers 15 years' experience in Process Engineering and Management at large multinational corporates within the South African Fuel industry.

Past experience includes working at companies such as Sasol Technology, Afrox and BP Southern Africa.

10. Mr Robert Katzke

Operations Manager

Qualifications: NTC5 (Technical College PTA West), Instrument Mechanician (Eskom / Iscor)

Robert has over 35 years work experience working at Power generation plants, Water treatment plants and Engine Plants. Robert was the Mechanical/Electrical Engineering Foreman, SHEQ coordinator, and later the acting Mine Manager for Rusten burg Minerals. He then moved onto Caspian Mining as a project manager, coordinating the daily activities of the site. Robert joined Molopo SA in 2009 and has vast experience in liaising with Petroleum Agency of South Africa, the Democratic Republic of Congo, and Renergen's other stakeholders. Robert is responsible for the daily plant operations and staff at the plant.

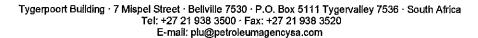
Robert spent 5 years under mentorship of Australian Geologists and Geophysicists to understand methane gas behaviour and occurrence, and spent a month in Australia doing directional CBM drilling and pipe design. Robert joined Renergen on 1 October 2009.

SCHEDULE "B3"

INFORMATION MARKED CONFIDENTIAL

SCHEDULE "B 4"

Petroleum Agency SA





29 September 2017

Ref: 12/4/007

Enquiries: A M Thovhakale +2721 938 3579

E-mail: nobuhle@eims.co.za
Cc: khalidp@tetra4.com

Ms. Nobuhle Hughes Environmental Impact Management Services (Pty) Ltd PO Box 2083 Pinegowrie Gauteng 2123

Dear Ms. Nobuhle Hughes

APPLICATION FOR ENVIRONMENTAL AUTHORISATION IN TERMS OF REGULATION 16 OF THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 ("EIA REGULATIONS") UNDER THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 ("NEMA")

I refer to the above application and wish to advise you that your application for environmental authorization has been granted.

A letter of authorisation, environmental authorization and the Reasons for Decision are attached hereto as **Annexures A, B & C** respectively.

If you need further assistance do not hesitate to contact us.

Yours sincerely,

T MOTLOUNG

ACTING GENERAL MANAGER: REGULATION

Directors: MP Fusi (Chairperson)

B Luthuli R Nkambule T Ramuedzisi L Nengovhela L Mekwe (Acting Executive)

Company Secretary:Adv E Hendricks

Subsidiary of CEF SOC Ltd.

ANNEXURE A



Attention: Mr Stefano Marani

Tetra4 (Pty) Ltd Postnet Suite 610 Private Bag X10030 Randburg 2125

APPLICATION FOR INTEGRATED ENVIRONMENTAL AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 AND THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 FOR THE PROPOSED TETRA 4 CLUSTER 1 GAS PRODUCTION PROJECT LOCATED IN MATJHABENG AND MASILONYANA LOCAL MUNICIPALITIES IN THE FREE STATE PROVINCE.

I, Seipati Silvia Dhlamini, in terms of the powers delegated to me, have in terms of Section 24L of the National Environmental Management Act, 1998 (Act 107 of 1998) decided to grant an integrated environmental authorisation (hereafter referred to as authorisation) in respect of the application lodged on 20 October 2016. Herewith attached is the copy of the authorisation and reasons for the decision to grant.

You are instructed in terms of Regulation 4(2) of the EIA Regulations to notify all registered interested and affected parties (I&APs) in writing and within fourteen days of the date of the decision, of the outcomes of your application. You are also required to inform registered I&APs of the procedure to submit appeals against the decision as contained in the National Environmental Management Act, 1998 (Act 107 of 1998): National Appeals Regulations, 2014 (hereafter referred to as 'Appeals Regulations').

Should you wish to appeal the decision or any aspect thereof, you must submit an appeal in the prescribed form and in accordance with Chapter 2 of the Appeals Regulation, within twenty days from the date of notification of the decision. The

said must be submitted to the Minister of Environmental Affairs, and copies sent to the Department of Mineral Resources (Head Office) and the Petroleum Agency SA by one of the following means:

1) Department of Environmental Affairs

Appeals and Legal Review Directorate

Attention:

Director: Appeals and Legal Review

Email:

appealsdirectorate@environment.gov.za

Post:

Private Bag x 447, PRETORIA, 0001

By Hand:

Environmental House, Corner Steve Biko and Soutspansberg Street, Acardia, Pretoria, 0083

2) The Petroleum Agency SA

Attention:

The Chief Executive Officer

Email:

plu@petroleumagencysa.com

Post:

Private Bag x 5111, TYGERVALLEY, 7536

By Hand:

Tygerpoort Building, 7 Mispel Road, BELLVILLE, 7530

3) Department of Mineral Resources

Legal Services Directorate

Attention:

Director - Legal Services

Facsimile:

086 710 0877

Post:

Private Bag x 59, ARCADIA, 0007

By Hand:

Trevenna Campus, Building 2C, c/o Meintjes and Francis Baard Street, SUNNYSIDE, 0007

The authorised activities shall not commence within twenty days of the date of signature of this authorisation. Please also note that should the Minister of Environmental Affairs receive appeals against this authorisation or conditions thereof, this authorisation will be suspended in accordance with section 43(7) of NEMA, pending the decision on such appeals.

Yours sincerely,

SEIPATI SILVIA DHLAMINI

ACTING DEPUTY DIRECTOR-GENERAL: MINERAL REGULATION

DATE: 31/09/2017

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ANNEXURE B



INTEGRATED ENVIRONMENTAL AUTHORISATION

IN RESPECT OF

CLUSTER 1 GAS PRODUCTION PROJECT WHICH INCLUDES WELL DRILLING, GAS EXTRACTION, LAYING OF GAS PIPELINES TO TRANSPORT COMPRESSED GAS FROM NEW AND EXISTING WELLS TO THE PROPOSED COMBINED HELIUM AND COMPRESSED NATURAL GAS (CNG) PLANT FOR PROCESSING.

APPLICATION DETAILS

Application Reference Number	12/04/07
Holder of Environmental Authorisation	Tetra4 (Pty) Ltd
Location of the Activity	Various farms in the Matjhabeng and Masilonyana Local Municipalities (Lejweleputswa District Municipality) in Free State Province.
Size of the Application Area	14 316 ha

This authorization does not negate the holder of the authorization responsibility to comply with any other statutory requirements that may be applicable to the undertaking of the activity.

DECISION ON THE INTEGRATED ENVIRONMENTAL AUTHORISATION

The Department is satisfied, on the basis of the information made available to it, and subject to compliance with the

conditions of this Integrated Environmental Authorisation ('authorisation'), and the requirements of the Environmental

Impact Report, that the applicant should be authorised to undertake proposed activities as specified below.

ACTIVITIES AUTHORISED

By virtue of the powers conferred on it by the National Environmental Management Act, 1998 (Act No. 107 of 1998) and

the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), the Department hereby grants the

authorisation to Tetra4 (Pty) Ltd to undertake activities specified in Section 3 below and as described in the Environmental

Impact Report and Environmental Management Programme (EIR&EMPR).

The granting of this authorisation is subject to compliance with conditions specified under section 5 of this authorisation.

DETAILS OF THE HOLDER OF THIS AUTHORISATION

Tetra4 (Pty) Ltd

Postnet Suite 610

Private Bag X10030

Randburg

2125

Contact Person: Mr Stefano Marani

Tel:

+27 11792 4601

Fax:

+27 11 792 4599

Email:

stefano@renergen.co.za

2. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Environmental Impact Management Services (Pty) Ltd

P O Box 2083

Pinegowrie

2123

Contact Person:

Ms Nobuhle Hughes

Tel:

+27 11 789 7170

Fax:

+27 11 787 3059

Email:

nobuhle@eims.co.za

3. LIST OF ACTIVITIES AUTHORISED

The listed activities under NEMA EIA Regulations, 2014 - Government Notices R983, R984 and R985, and National Environmental Management: Waste Act (NEMWA): GN 921 as prescribed in the table below are authorised:

Activity	Listed Activity Description NEMA EIA REGULATIONS, 2014	Associated Proposed Activity
	- HEIM EIN REGULATION OF ASSA	
	Listed Activities - GN R983 - Listing No	
12 (x) (xii)	The development of- (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; (xii) infrastructure or structures with a physical footprint of 100 square metres or more where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) development setback exists, within 32 metres of a watercourse, measured the edge of a watercourse; - excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the	Numerous watercourses (rivers, wetlands, etc.) are present in the vicinity of the study area within which some of the proposed infrastructure may be located including possible river crossings.

Activity	Listed Activity Description	Associated Proposed Activity
	development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.	
19 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from— (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity	Numerous watercourses (rivers, wetlands, etc.) are present in the vicinity of the study area within which some of the proposed infrastructure may be located, and thus require infilling as well as dredging, excavation, or removal of soil or pebbles from a watercourse (e.g. trenching and infilling or depositing of material at river crossings for pipelines).
24(ii)	The development of- (i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding- (a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or (b) roads where the entire road falls within an urban area.	Access roads will be required at the combined helium and CNG plant and these will need to be wide enough to accommodate tankers and/or trailers for product removal. Further smaller access roads will be required to access the individual exploration and production wells and associated infrastructure.
30	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	There are currently no gazetted listed threatening processes as per Section 53(1) of the National Environmental Management Biodiversity Act, 2004. However, should such a list be gazetted during the EIA process or prior to the commencement of construction, this activity may apply.
	The expansion or changes to existing facilities for any process or activity where such expansion or changes will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions or pollution, excluding- (i) where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (ii) the expansion of or changes to existing facilities for the treatment of effluent, wastewater or sewage where the capacity will be increased by less than 15 000 cubic metres per day.	Venting of raw feed gas will be at approximately 1 cubic meter (0.97) per second for a maximum of 20 seconds, as and when, required for safety purposes. However, the venting will not trigger the requirement for an atmospheric emissions license (AEL). There will be a requirement for the storage and handling of petroleum products (helium and CNG) which at full production capacity, will be processing approximately 170 cubic metres of raw feed gas per day and storing approximately 685 cubic meters of combined helium and CNG being potentially stored. The exact volumes to be processed and stored will be finalised during the EIA phase at which stage should the listed activity be deemed not applicable, this will be excluded from the EA application.
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8	The well sites will not require access roads of this size but the combined helium and CNG plant may require widening of existing roads to accommodate the tankers and/or trailers

Activity	Listed Activity Description	Associated Proposed Activity
	metres; excluding where widening or lengthening occur inside	transporting the product.
59	urban areas. The expansion and related operation of facilities or infrastructure for the refining, extraction or processing of gas, oil or petroleum products where the installed capacity of the facility will be increased by 50 cubic metres or more per day, excluding facilities for the refining, extraction or processing of gas from landfill sites.	Existing operations may need to be expanded/ altered to align with the proposed Cluster 1 project, not necessarily at Cluster 1 but at full gas production capacity.
67	Phased activities for all activities- (i) listed in this Notice, which commenced on or after the effective date of this Notice; or (ii) similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices; where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed specified threshold; excluding the following activities listed in this Notice-17(i)(a-d); 17(ii)(a-d); 17(iii)(a-d); 17(iv)(a-d); 17(v)(a-d); 20; 21; 22; 24(i); 29; 30; 31; 32; 34; 54(i)(a-d); 54(ii)(a-d); 54(iii)(a-d); 54(iv)(a-d); 54(v)(a-d); 55; 61; 62; 64; and 65.	The proposed Cluster 1 study area contains 13 existing gas producing wells of which 6 more are proposed to be drilled thereby increasing throughput and gas production.
	Listed Activities – GN R984 – Listing Notic	e 2
4	The development of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	Development of Cluster 1 will allow for approximately 685 cubic meters of combined helium and CNG being potentially stored. Product stored will be transported to consumers at weekly (5 days) intervals or sooner.
5	The development and related operation of facilities or infrastructure for the refining, extraction or processing of gas, oil or petroleum products with an installed capacity of 50 cubic metres or more per day, excluding- (i) facilities for the refining, extraction or processing of gas from landfill sites; or (ii) the primary processing of a petroleum resource in which case activity 22 in this Notice applies.	Cluster 1 will allow for the processing of approximately 23 cubic meters of feed gas per day. However, the processing capacity of the combined helium and CNG plant is 170 cubic metres of raw feed gas per day which will be reached when other well clusters are connected to the plant. It is envisaged that when operating at full capacity and with more than Cluster 1 operational, the combined helium and CNG plant can process and refine 2000 cubic meters of CNG and 13.6 cubic meters of helium per day.
7(1)	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding- (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less. The development and related operation of facilities or infrastructure for the	Venting of raw feed gas will be at approximately 1 cubic meter (0.97) per second for a maximum of 20 seconds as and when required for safety purposes. However, the venting will not trigger the requirement for an atmospheric emissions license (AEL). There will be storage and handling of petroleum products (helium and CNG) which may trigger this listing. It is anticipated that Cluster 1 will allow for approximately 685 cubic meters of combined helium and CNG being potentially stored.
	bulk transportation of dangerous goods- (i) in gas form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more	cubic metres of raw feed gas for processing which amounts to approximately 243.6 tons per month or 8.12 tons per day. However,

Activity	Listed Activity Description	Associated Proposed Activity
	than 700 tons perday; (ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 50 cubic metres per day; or (iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.	the capacity of the combined helium and CNG plant is 170 cubic metres of raw feed gas per day which will be reached when other well clusters are connected to the plant. It is envisaged that when operating at full capacity and with more than Cluster 1 operational, the combined helium and CNG plant can process and refine 2000 cubic meters of CNG and 13.6 cubic meters of helium per day.
15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	A total of approximately 42 hectares of possible natural vegetation may need to be cleared for the placement of infrastructure including access roads with a 4 m servitude.
18	Any activity including the operation of that activity which requires an exploration right as contemplated in section 79 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002),including associated infrastructure, structures and earthworks.	Cluster 1 will require the drilling of additional wells (in close proximity, where possible) to existing wells to increase gas yields.
22	Any activity including the operation of that activity associated with the primary processing of a petroleum resource including winning, extraction, classifying, concentrating, water removal, but excluding the refining of gas, oil or petroleum products in which case activity 5 in this Notice applies.	Water in the form of condensate will be removed at various intervals during the gas processing. Also to be removed during processing are hydrocarbons and mercury. The combine Helium and CNG plant will also involve processing towards the separation of helium from the CNG, and storage of the helium and CNG prior to collection.
28	Commencing of an activity, which requires an atmospheric emission license in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), excluding — (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published on terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.	Venting of raw feed gas will be at approximately 1 cubic meter (0.97) per second for a maximum of 20 seconds as and when required for safety purposes. However, the venting will not trigger the requirement for an atmospheric emissions license (AEL). However, there will be storage and handling of petroleum products (helium and CNG) which may trigger this listing. It is anticipated that Cluster 1 will allow for approximately 685 cubic meters of combined helium and CNG being potentially stored. The exact volumes of helium and CNG to be stored will be finalised during the EIA phase at which stage should the listed activity be deemed not applicable, this will be excluded from the EA application.
E.	NEMA listed activities - Government Notice R985 – Li	sting Notice 3
	The development of a road wider than 4 meters with a reserve less than 13.5 meters	The well sites will not require access roads of this size but the combined helium and CNG plant may require new wide access roads to accommodate the tankers and / or trailers transporting the product. The study area, including the proposed combined helium and CNG plant location alternatives, is within or in close proximity to an endangered ecosystem of Vaal Vet Sandy Grassland.
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Activity	Listed Activity Description	Associated Proposed Activity
10	The development of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic meters.	Development of Cluster 1 will allow for approximately 685 cubic meters of combined helium and CNG being potentially stored. Product stored will be transported to consumers at weekly (5 days) intervals or sooner. The exact volumes to be processed and stored will be finalised during the EIA phase at which stage should the listed activity be deemed not applicable, this will be excluded from the EA application.
12	The clearance of an area of 300 square meters or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance managementplan.	The proposed development footprint is within an area with an ecosystem classified as Endangered and in the vicinity of an ecosystem classified as Vulnerable within which a protected Nature Reserve (H.J. Joel Private Nature Reserve) occurs. Although
14 (x) (xii)	The development of - (i) canals exceeding 10 square meters in size; (ii) channels exceeding 10 square meters in size; (iii) bridges exceeding 10 square meters in size; (iv) dams, where the dam, including infrastructure and water surface area exceeds 10 square meters in size; (v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square meters in size; (vi) bulk storm water outlet structure exceeding 10 square metres in size (vii) marinas exceeding 10 square meters in size; (viii) jetties exceeding 10 square meters in size; (ix) slipways exceeding 10 square meters in size; (xi) boardwalks exceeding 10 square meters in size; (xi) boardwalks exceeding 10 square meters in size; (xii) infrastructure with a physical footprint of 10 square meters or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.	the definitive final development footprint is not yet confirmed, it is likely that this activity may be triggered.
15	The transformation of land bigger than 1000 square meters in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010.	The zoning within the proposed study area and the definitive final development footprint is not yet confirmed, but it is likely that this activity may be triggered.
16	The widening of a road by more than 4 meters; or the lengthening of a road by more than 1 kilometre.	Access roads will be required at the combined helium and CNG plant and these will need to be wide enough to accommodate tankers and / or trailers for product removal. The study area, including the proposed combined helium and CNG plant location alternatives, is within or in close proximity to an endangered ecosystem of Vaal Vet

Activity	Listed Activity Description	Associated Proposed Activity
		Sandy Grassland.
	NEMWA – GN 921: Listed Activities	
Category B: 4(2)	The reuse or recycling of hazardous waste in excess of 1 ton per day, excluding reuse or recycling that takes place as an integral part of an internal manufacturing process within the same premises.	For the unconventional wells, waste water in the form of condensate will be knocked out through dehydration at the knockout drum/
Category B: 4 (4)	The treatment of hazardous waste in excess of 1 ton per day calculated as a monthly average; using any form of treatment excluding the treatment of effluent, wastewater or sewage.	coalescer, the waste water goes to oil/ water separators prior to being fed through to a Jojo tank where it will be remediated with microbes. Once remediated water will be decanted into another Jojo tank to be tested for compliance with livestock watering and irrigation standards prior to being discharged or reused.
Category C: 5(2)	The storage of hazardous waste at a facility that has the capacity to store in excess of 80m3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.	For the unconventional wells, waste water in the form of condensate will be knocked out through dehydration at the knockout drum/ coalescer, the waste water goes to oil/ water separators prior to being fed through to a Jojo tank where it will be remediated with microbes. Once remediated water will be decanted into another Jojo tank to be tested for compliance with livestock watering and irrigation standards prior to being discharged or reused.
		For conventional wells however, the substantial volumes of formation water will be piped (approximately 1000 litres per hour) from the wells to the licensed slimes dam at Harmony Gold mine.

Under the listed activities, the holder of the authorisation is authorised to conduct the following activities within the area described in section 4.

3.1 Drilling

Drilling (percussion or diamond drilling) of up to 6 new exploration wells, and if successful, their conversion into production wells for inclusion to the cluster 1 gas production network. The surface footprint of each well is approximately 30m x 30m in extent.

3.2 Well site connection

Each of the thirteen existing wells and six (6) exploration wells will have a wellhead to boost gas recovery, and the well will be connected via a pipeline to an inline gas booster or centralized infield reciprocating compressor. Pipeline to be used will be a combination of high pressure steel and low pressure high density

polyethylene (HDPE) which will be installed at a minimum depth of 1.1m below ground or plough line. The footprint of each production site would be approximately 10m x 10m with wellhead. Where, a localized booster compressor is required the footprint per well will be approximately 30m x 20m. Furthermore, the footprint for the proposed centralized reciprocating compressor including the gas drier will be approximately 60m x 60m.

3.3 Combined Helium and CNG plant

The feed gas from either the booster or centralized reciprocating infield compressors will be sent to the proposed combined helium and CNG plant with a processing capacity of 3 million standard cubic feet per day of natural gas with a helium content of 2.36 Vol %. The footprint of the combined Helium and CNG plant will be approximately 100m X 100m.

3.4 Surface Infrastructure

Infrastructure associated with the aforementioned activities include: access roads, pipe markers, gas driers, fencing, helium storage and dispensing units, CNG storage and dispensing units, chemical storage, temporary hazardous and general waste storage, mobile offices and ablution facilities.

4. LOCATION OF THE APPLICATION AREA

The proposed cluster 1 project is located approximately 20 km south west of Virginia Town, within the Matjhabeng and Masilonyana Local Municipalities in Free State Province. The application area is approximately 14 316 ha in extent, constituting 59 farms and farm portions (see appendix 2 concerning the affected farm properties and associated SG codes).

5. CONDITIONS OF THE ENVIRONMENTAL AUTHORISATION

5.1 SCOPE OF THE AUTHORISATION

- This authorisation authorises the holder to undertake all the activities prescribed under section 3 above. The location alternatives HP1 located next to the HDR1 well and HP2 located at Sibanye Shaft 1 for the combined helium and CNG plant are approved. Furthermore, the preferred pipeline route alternatives P2 and P4 which connect all the existing and new wells to HP1 and HP2 respectively (as described in the EIR) are also approved.
- 5.1.2 The authorised activities must only be carried within the application area specified in section 4 above and appendix 2.

- 5.1.3 The holder of this authorisation (hereafter referred to as the holder) is responsible for ensuring compliance with the conditions of this authorisation, and recommendations made in the Environmental Impact Assessment Report (EIR) and Environmental Management Programme Report (EMPR) dated 03rd of May 2017.
- 5.1.4 Any person(s) acting on behalf of the holder, inclusive of contractor(s), subcontractor(s), consultant, and employee are also subject to the conditions of this authorisation. This condition however does not exonerate the holder from its accountability and responsibility to ensure compliance with the conditions of this environmental authorization.
- 5.1.5 Any changes to, or deviations from, and amendments to the proposed activities, conditions of this authorisation, and recommendations in the S&EIR and EMPR must be approved, in writing, by the Department before such changes or deviations are effected. The Department reserves the right to request the submission of information deemed necessary to assess and evaluate the significance and impacts such changes, deviations and amendments before such changes, deviations and amendments are authorized or not. Any changes, deviations and amendments may be subject to the provisions of Chapter 5 of the EIA Regulations, 2014 pertaining to the amendments of the authorisation and EMPR.
- 5.1.6 This authorisation does not absolve the holder from complying with any other statutory obligations that may be applicable to the proposed activities.
- 5.1.7 The holder of this authorisation must apply for an amendment of this authorisation in the case of a change of ownership or transfer of rights and/or obligations.

5.2 NOTIFICATION AND APPEAL OF AUTHORISATION

- 5.2.1 The holder must, in writing, within fourteen days of the date of this amended authorisation, notify all registered interested and affected parties (I&APs) of the outcome of the application.
- 5.2.2 The notification contemplated above must amongst other issues:
 - 5.2.2.1 Stipulate the date of the decision, and the date of issue of the amended authorisation.
 - 5.2.2.2 Provide reasons for the decision, included in Appendix 1 of this amended authorisation.
 - 5.2.2.3 Inform registered I&APs of the Appeals Procedure provided for in terms of the National Environmental Management Act, 1998: National Appeals Regulations (GN R 993 of 08 December 2014).
 - 5.2.2.4 Draw the attention of the I&APs to the manner in which they may access the decision, including obtaining the copy of the authorisation.

5.3 COMMENCEMENT OF THE ACTIVITY(S)

- 5.3.1 The authorised activities shall not commence within 20 days of the date of this authorisation, pending potential lodgement of appeal(s).
- 5.3.2 Where an appeal is lodged against the decision by any party, the amended authorisation or any provision or condition of the amended authorisation will be suspended in accordance with section 43(7) of the National Environmental Management Act, 1998; and as such you may not commence with any activity, unless authorised in writing by the competent authority and/or the decision on the appeal has been taken.
- 5.3.3 A thirty (30) day written notice must be given to the Petroleum Agency SA prior to the commencement of any of the authorised production activities.
- 5.3.4 The authorized activities must commence within a period of 5 years from the date of issue of this authorisation. If commencement of the authorized activities does not occur within the said period, the authorisation lapses, and where the holder still intends undertaking the authorized activity(s), a new application for authorisation in terms of the EIA Regulations, 2014 must be obtained.
- 5.3.5 Any requests for extension of the commencement period of this authorisation should be lodged with the competent authority before the expiry of the environmental authorisation in accordance with amendments to Regulation 28 (1) of EIA Regulations, 2014.

5.4 MANAGEMENT, MONITORING AND AUDITING OF OPERATIONS INCLUDING REPORTING REQUIREMENTS

- 5.4.1 The Environmental Management Programme (EMPR) submitted with the Environmental Impact Assessment Report (EIR) is hereby approved. It is hence mandatory for the holder to implement all recommendations and management measures stipulated in the EMPR throughout all the phases of the proposed production activities.
- Any non-compliance with the EMPR constitutes non-compliance with this authorisation, and any non-compliance with this authorisation may result in its suspension and may render the holder guilty of offence in terms of section 49A of NEMA, and may, if convicted, liable for penalties contemplated in section 49B (1) of NEMA.
- 5.4.3 Should there be changes in the operation and management of the authorized activities, the EMPR must be amended to accommodate those changes and submitted to the competent authority for approval before

- implementation takes place. The amendment(s) to the EMPR must be done in accordance with Regulations 36 and 37 of the EIA Regulations: 2014.
- 5.4.4 The holder of the authorisation must implement necessary measures to ensure that operators, contractors and subcontractors have full awareness of the recommendations on the EMPR before commencing with any authorised activity.
- 5.4.5 The EMPR must be included in all contractual documentation entered thereto between the holder and contractor(s). Furthermore, a copy of the EMPR must be kept onboard the survey aircraft at all times.
- 5.4.6 The holder must before the commencement of the authorised activities, appoint an independent and experienced Environmental Control Officer (ECO) who will ensure that the conditions of this authorisation and provisions of the EMPR are implemented and adhered to.
- 5.4.7 The appointed ECO must, at drilling and construction stages (trenching and laying of pipelines and construction of the helium and CNG plant and associated infrastructure) submit monthly reports to the Petroleum Agency SA. Submission of quarterly environmental monitoring reports is also mandatory during production operations.
- 5.4.8 The holder must submit an environmental audit report to the Petroleum Agency SA biennially (twice a year) carried out by an independent and qualified environmental practitioner in accordance with Appendix 7 of the EIA Regulations, 2014. At a minimum, the audit report must evaluate compliance with the conditions of this authorisation and provisions of the EMPR; identify and assess any new impacts and risks from undertaking the authorised activities; identify shortcomings in the EMPR; and identify if findings of the previous audit were addressed including an opinion on the effectiveness of preventive and corrective actions implemented.
- 5.4.9 Where shortcomings in terms of Regulation 34(4) are identified, the holder must submit recommendations to amend the EMPR in order to rectify any shortcomings that may have been identified in the audit report contemplated in 5.4.8 above.
- 5.4.10 The holder of this authorisation must keep all records relating to monitoring and auditing and make them available for inspection to any relevant and competent authority in respect of this development.

5.5 SPECIFIC CONDITIONS

5.5.1 The holder or the appointed ECO must within 30 days prior to the commencement of the authorised production activities, distribute notifications to all affected land owners informing them of the operational plans. The said notification must amongst other issues include the commencement and anticipated completion date(s) of each of the proposed activities, details of the contractors including subcontractors,

- sketch plan showing the operational areas, and procedure to lodge complaints and report any environmental and safety matters arising from the operations.
- 5.5.2 If the final positions of the new wells and compressor site(s) as described in the EIR are altered, the new and final positions must be placed within the assessed 1 km buffer area, and must avoid environmentally sensitive areas, including areas of historical/cultural/heritage significance.
- 5.5.3 Drilling fluids and muds must strictly be water-based and biodegradable. In this regard, the holder is required to submit Material Safety Data Sheets for drilling fluids to the Petroleum Agency SA at least 60 days before drilling operations commence.
- 5.5.4 Any excavations exceeding a depth of 3 meters, traversing the potentially sensitive alluvial deposits at Bosluispruit and Sand Rivers and unweathered sedimentary bedrock, must be done under the supervision of an independent and gualified Paleontologist.
- 5.5.5 The holder must obtain land use and access agreements prior to the commencement of the proposed activities, and submit copies of such to the Petroleum Agency SA at least 30 days before the commencement of the authorised activities. Furthermore, in order to avoid conflict of interests with the current land-use activities, the applicant must consult on an ongoing basis with the affected surface landowners and keep them informed of the project development.
- 5.5.6 The holder must develop a grievance mechanism and claims procedure and share the contents thereof with affected landowners before the authorised operations commence. A copy of the grievance mechanism and claims procedure, including proof of communication with affected landowners must be submitted to the Petroleum Agency SA at least 30 days before the commencement of the authorised activities.
- 5.5.7 The holder must undertake an asset and infrastructure baseline study, in consultation with all affected landowners, before the authorised activities commence, and submit the report in question to the Petroleum Agency SA at least 30 days before authorised activities commence.
- 5.5.8 The holder must convene a special meeting with landowners and communities before operations commence to ensure that they understand the technical and safety aspects of the proposed operations. Periodic feedback meetings with affected landowners and relevant regulatory authorities on the progress of operations, compliance status and to address stakeholders' issues concerning the project must take place.
- 5.5.9 The holder must develop a traffic safety plan especially for the turn- offs from the R30 in consultation with the relevant Roads Authority in order to ensure that the safety of road users is not compromised.
- 5.5.10 Appropriate notification signs, warning the communities about the hazards around sites including the presence of heavy vehicles, must be erected at construction and operational sites.

- 5.5.11 Wastewater produced during drilling operations and gas processing operations must be stored in above ground storage containers or tanks, and must be tested and, where necessary, treated before disposal at an appropriate or licensed disposal facility.
- 5.5.12 An integrated waste management approach based on waste minimization must be implemented and must incorporate waste avoidance, reduction, recycling, treatment, re-use and disposal where appropriate. The holder must therefore develop an integrated waste management plan for implementation during operations. The said must be submitted to the Petroleum Agency SA at least 60 days before authorised activities commence.
- 5.5.13 Waste storage sites must have impermeable and chemical resistant floors and must be covered or roofed to prevent direct sunlight or rain water from getting in contact with the waste.
- 5.5.14 The storage of hydrocarbons and/or chemicals and any operating equipment with hydrocarbons and/chemicals must have bund walls with adequate capacity to contain maximum volume that is stored or contained.
- 5.5.15 The holder must develop a storm water management plan for the combined helium and CNG plant, and must submit such to the Petroleum Agency SA at least 60 days before the operation of the plant commences.
- 5.5.16 Potentially occurring protected plant species such as *Merwilla plumbea* and *Crinum bulbispermum* and protected tree species such as *Acacia Erioloba* must not be removed or disturbed unless necessary permission is granted by the relevant departments i.e. Department of Environmental Affairs and Department of Agriculture, Fisheries and Forestry.
- 5.5.17 The holder must develop and implement sound groundwater monitoring programme(s) that will ensure that potential impacts of gas production on ground water levels and quantity are prevented and/or managed. The programme to be developed must be submitted to the Agency at least 60 days before authorised activities commence.
- 5.5.18 The integrity of the pipelines is crucial in preventing gas leakages or explosions. The holder must develop inspection mechanisms for the proposed production pipelines and submit such to the Petroleum Agency SA at least 30 days before production operations (gas extraction and transportation to the production plant) commence.
- 5.5.19 Emergency incidents must be addressed and reported to the Petroleum Agency SA in accordance with section 30 of NEMA. In addition, the holder is required to notify the Petroleum Agency SA within 24 hours of the occurrence of an emergency incident.

5.5.20 The holder must develop emergency preparedness and response plans for responding to potential

emergency incidents and submit such to the Petroleum Agency SA, at least 60 days before commencement

of the authorised activities.

5.5.21 All recommended mitigation measures included in the EIR dated 03rd of May 2017 are deemed to be the

conditions of the EA and must therefore be adhered to.

5.6 GENERAL

A copy of the authorisation and the EMPR must be kept onsite to ensure appropriate implementation of the 5.6.1

mitigation measures.

The Department shall not be responsible for any damages or losses suffered by the holder in an instance 5.6.2

where the operation is temporarily stopped for reasons of non-compliance with the conditions as set out

herein.

In view of the above, and having taken into consideration environmental management principles as set out 5.6.3

in section 2 of NEMA, and information presented in the EIR and EMPR, and subject to compliance with

conditions of the EA and recommendations of the EMPR, the Department is satisfied that the proposed

activities will not be in conflict with the objectives of the Integrated Environmental Management set out in

Chapter 5 of NEMA and will not result in any detrimental risks to the environment and public. The

authorisation is accordingly granted.

SEIPATI SILVIA DHLAMINI

DEPUTY DIRECTOR-GENERAL: MINERAL REGULATION

DATE OF THE AUTHORISATION: 31 09 10017

ANNEXURE C

APPENDIX 1

REASONS FOR DECISION

1. Information considered in making the decision

All the information presented to the Petroleum Agency SA was taken into account in reaching the decision.

The information considered include amongst others —

- 1.1 The provisions of Chapter 5 of the NEMA which relates to the Integrated Environmental Management and section 2 NEMA principles, the EIA Regulations, 2014, the provisions of NEMWA and relevant NEMA regulations and guidelines.
- 1.2 The information contained in the application for authorisation received by the Petroleum Agency dated 20 October 2016 and its amendment date 24 November 2016.
- 1.3 The information contained in the Scoping Report dated 08 December 2016.
- 1.4 The information contained in the EIR and EMPR dated 03 May 2017.
- 1.5 Comments received from the National Department of Water & Sanitation, South African Heritage Resources Agency, National Department of Environmental Affairs, and South African National Roads Agency Limited included in the EIR dated 03 May 2017.
- 1.6 The results of the Public Participation Process submitted with EIR dated 03 May 2017.
- 1.7 The information contained in the following specialist reports included in the EIR dated 03 May 2017:
 - 1.7.1 Air Quality Impact Assessment Report prepared by Airshed Planning Professionals;
 - 1.7.2 Aquatic Ecology & Wetland Impact Assessment Report prepared by Imperata Consulting cc;
 - 1.7.3 Ecology Impact Assessment Report prepared by David Hoare Consulting cc;
 - 1.7.4 Economics Impact Assessment Report prepared by Strategy4Good;
 - 1.7.5 Heritage Impact Assessment Report prepared by PGS Heritage;
 - 1.7.6 Surface Water Impact Assessment Report prepared by GCS Water and Environmental Consultants;
 - 1.7.7 Noise Impact Assessment Report prepared by Enviro-Acoustic Research;
 - 1.7.8 Hydrogeology Study prepared by Irene Lea Environmental and Hydrologeology cc;
 - 1.7.9 Social Impact Assessment Report prepared by Equispectives Research & Consulting Services;
 - 1.7.10 Soils and Agricultural Potential Report prepared by Agricultural Research Council Institute for Soil, Climate and Water; and
 - 1.7.11 Closure and Rehabilitation Report prepared by BEAL Consulting Engineers.

2. Submission and Consideration of the Scoping Report

In line with Regulation 21(1) of the EIA Regulations, 2014, the applicant submitted a scoping report within 44 days from the date of receipt of an application for an integrated environmental authorisation i.e. on the 08 December 2016. The scoping report was considered and evaluated in accordance with the requirements of Regulations 21 and 22, and appendix 2 of the EIA Regulations, 2014, was duly accepted (with conditions) on the 15th of February 2017 based on the following:

- 2.1 The scoping report was subjected to a public consultation process for a 30-day period and incorporated comments received from interested and affected parties, the competent authority (Petroleum Agency SA in this regard), and state departments administering laws relating matters affecting the environment and organs of states.
- 2.2 In addition, the public consultation process carried out adhered to the requirements of Regulations 41 and 44 of the EIA Regulations. In this regard, interested and affected parties were notified of the application through various means such as onsite notices, newspaper advertisements, and correspondences (letters/emails).
- 2.3 The scoping report contained information set out in Appendix 2 of the EIA Regulations and in this regard, relevant policies and legislation were identified; the need and desirability of the proposed project motivated and asserted, alternatives considered, baseline environment identified and assessed, preliminary impacts identified and assessed and suitable mitigation measures proposed; and key issues to be addressed in EIA phase identified.

3. Submission of the Environmental Impact Assessment Report (EIR) and Environmental Management Programme (EMPR)

- 3.1 Regulation 23(1) (a) and (b) requires the applicant to submit:
 - (a) an environmental impact report (EIR) inclusive of any specialist reports, and an EMPR within 106 days, which must have been subjected to a public consultation process of at least 30 days and reflects incorporation of comments received;
- 3.2 The EIR, inclusive of specialist reports, and an EMPR were received by the Petroleum Agency SA within the prescribed submission date i.e. the 3rd of May 2017. The said reports were subjected to a public consultation process of 30 days and included comments received from interested and affected parties.

4. Consideration of the EIR and EMPR

Regulation 18 requires the competent authority to take into consideration section 24O and 24(4) of the Act when considering the application for EA, the need for desirability of undertaking the proposed activity, any guideline published in terms of section 24J of the Act. Regulation 23(3) further provides that the EIR must contain all information set out in Appendix 3 and must address the requirements as determined in the regulations pertaining to the financial provisions for rehabilitation, closure and post closure of operations; and Regulation 23(4) requires the EMPR to contain all information set out in Appendix 4 of the EIA Regulations.

The EIR and EMPR were assessed taking into consideration the aforementioned requirements, and the key significant issues that resulted in the Department's decision are set out as follows:

- 4.1 In terms of the need and desirability of the project, where the proposed production activities become successful, CNG as a cleaner fossil fuel energy source would contribute in reducing greenhouse gas effects; opportunities for business ventures to local companies provided; contribution to South Africa's energy independence and security, and ultimately SA's GDP realized; and local community developed and empowered.
- 4.2 The public consultation process undertaken by the EAP which includes notifying and registering interested and affected parties, advertising the proposed project, subjecting Scoping and EIR reports to a 30 day commenting period, consulting with affected landowners, notifying various states departments and organs of states, and addressing comments received from all interested and affected parties was in line with the requirements of EIA Regulations, 2014 and related guidelines.
- 4.3 The Environmental Impact Assessment process as prescribed by the EIA Regulations, 2014 was adhered to by the EAP and this includes identification and assessment of the applicability of relevant legislation, guidelines and policies. The undertaken process is deemed satisfactory.
- 4.4 The environmental attributes associated with the development alternatives were thoroughly identified and assessed by the specialists; and the potential impact on cultural and heritage, social, economic, hydrology, hydrogeology, wetland and aquatic ecology, ecology, soil and agricultural potential, noise, and air quality were addressed.
- 4.5 The methodology used to assess and evaluate potential impacts has provided a comprehensive impact assessment and provided clarity on potential impacts before and after mitigation.

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- 4.6 The environmental impacts associated with the proposed activities will be addressed by the implementation of the recommended mitigation measures and the recommended mitigation measures are aligned with identified impacts.
- 4.7 The majority of the proposed production activities i.e. drilling, connection of well sites, installation of gas booster and reciprocating infield compressors and construction of combined Helium and CNG plant are an extension of the existing right and the majority of the associated impacts on the environment are classified to be of low significance post mitigation. However, the majority of potential social and economic impacts (both positive and negative impacts) were assessed to range from medium to high significance. The proposed management measures are however assessed to be effective in addressing the identified potential negative impacts.
- 4.8 The profile and details of the EAP with respect to the qualifications and experience in environmental impact assessments and related projects has given confidence in the EAP's ability and competence to carry out the EIA process.
- 4.9 The EIR dated 03rd May 2017 identified all legislation and guidelines that have been considered in the preparation of the EIR.

5. Key Findings

Careful consideration of information and factors listed above have thus resulted in the following conclusions:

- 5.1 All fundamental and procedural requirements prescribed in the NEMA and its regulations have been satisfied.
- 5.2 The identification and assessment of potential impacts of the proposed activities was adequately undertaken, and the proposed mitigation and management measures are aligned with potential impacts.
- 5.3 The implementation of mitigation measures during the operation will ensure that the activities to be carried out will not result to any detrimental impacts to the environment.
- 5.4 The public consultation process undertaken by the EAP adhered to the minimum requirements as prescribed under Chapter 6 'Public Participation' of the EIA Regulations, 2014 and related guidelines.
- 5.5 The findings of the site visit and verification carried out by the Petroleum Agency Representatives on the 13th of April 2017 revealed the following:

5.3 The implementation of mitigation measures during the operation will ensure that the activities to be carried

out will not result to any detrimental impacts to the environment.

5.4 The public consultation process undertaken by the EAP adhered to the minimum requirements as

prescribed under Chapter 6 'Public Participation' of the EIA Regulations, 2014 and related guidelines.

5.5 The findings of the site visit and verification carried out by the Petroleum Agency Representatives on the

13th of April 2017 revealed the following:

5.5.1 The proposed activities are within the boundaries of the production right area (production

right bearing reference 12/4/07).

5.5.2 The dominant land use activities in the area include mining and agriculture, particularly crop

cultivation and stock farming.

5.5.3 The area is characterized by sensitive environmental features but the proposed operations

including the combined Helium and CNG plant will be located in areas with low environmental

sensitivity.

5.5.4 The preferred sites for the combined Helium and CNG plant and pipeline routes pose minimal

impact to the environment.

6. Conclusion

In view of the above, and having taken into consideration environmental management principles as set out in section

2 of NEMA, and information presented in the EIR and EMPR, and subject to compliance with conditions of the

amended authorisation and recommendations of the EMPR, the Department is satisfied that the proposed activities

will not be in conflict with the objectives of the Integrated Environmental Management set out in Chapter 5 of NEMA

and will not result in any detrimental risks to the environment and public. The authorisation is accordingly granted.

SEIPATI SILVIA DHLAMINI

DEPUTY DIRECTOR-GENERAL: MINERAL REGULATION

DATE OF THE AUTHORISATION: 21 /00/2017

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APPENDIX 2

Table 1: Affected Farm Properties

Farm Name	Portion	SG Codes
1. Brakspruit 121	RE 0	F03300000000012100000
2. Enkeldoorn 360	0	F0330000000036000000
3. Boschluis Spruit 278	RE 0	F0330000000027800000
4. Boschluis Spruit 278	1	F03300000000027800001
5. Boschluis Spruit 278	2	F0330000000027800002
6. Retreat 118	RE 0	F0330000000011800000
7. Nortier 361	1	F03300000000036100001
8. Jordaan 1	1	F0330000000000100001
9. Driekoppies 322	0	F03300000000042200000
10. Frisgewaag 550	Re 0	F0330000000055000000
11. Frisgewaag 550	1	F03300000000055000001
12. Frisgewaag 550	2	F03300000000055000002
13. Kleinpan 320	0	F03300000000032000000
14. Hendriena 563	0	F03300000000056300000
15. Glen Ross 562	Re 0	F03300000000056200000
16. Glen Ross 562	1	F03300000000056200001
17. Glen Ross 562	2	F03300000000056200002
18. Glen Ross 562	3	F03300000000056200003
19. Glen Ross 562	4	F03300000000056200004
20. Glen Ross 562	5	F03300000000056200005
21. Glen Ross 562	6	F03300000000056200006
22, Glen Ross 562	7	F03300000000056200007
23. Glen Ross 562	8	F03300000000056200008
24. Glen Ross 562	9	F03300000000056200009
25. Glen Ross 562	10	F03300000000056200010
26. Palmietkuil 328	RE 0	F03300000000032800000
27. Palmietkuil 328	RE 1	F03300000000032800001
28. Palmietkuil 328	4	F03300000000032800004
29. Palmietkuil 328	5	F03300000000032800005
30. Palmietkuil 328	6	F03300000000032800006
31. Kalkoenkrans 225	RE 1	F03300000000022500001

Farm Name	Portion	SG Codes
32, Kalkoenkrans 225	2	F03300000000022500002
33, Kalkoenkrans 225	4	F03300000000022500004
34. Damplaats 341	RE 0	F03300000000034100000
35. Zonderzorg 342	RE 0	F03300000000034200000
36. Zonderzorg 342	1	F03300000000034200001
37. Zoetendal 243	1	F03300000000024300001
38, Doornrivier 330	RE 1	F03300000000033000001
39. Doornrivier 330	2	F03300000000033000002
40. Excelsior 147	RE 0	F03300000000014700000
41. Excelsior 147	1	F03300000000014700001
42. Terra Blanda 155	0	F0330000000015500000
43. Blaauwdrift 188	3	F03300000000018800003
44. De Wilger 544	RE 0	F03300000000054400000
45. Helpmekaar 47	RE 0	F03300000000004700000
46. Helpmekaar 47	RE 1	F03300000000004700001
47. Helpmekaar 47	3	F03300000000004700003
48. Mond van Doornrivier 38	RE 0	F03300000000003800000
49. Mond van Doornrivier 38	2	F03300000000003800002
50. Middelplaas 583	0	F03300000000058300000
51. Grottkau 410	RE 0	F03300000000041000000
52. Goedemoed 143	RE 0	F03300000000014300000
53. Goedemoed 143	2	F03300000000014300002
54. Deeldam 106	RE 0	F03300000000010600000
55. Deeldam 106	4	F0330000000010600004
56. Leeuwbult 52	0	F03300000000005200000
57. Harmonie 579	0	F03300000000057900000
58. Erfdeel 188	2	.F0350000000018800002
59. Tarka 656	RE 0	F03500000000065600000



Petroleum Agency SA

South African Agency for Promotion of Petroleum Exploration and Exploitation (Pty) Ltd.
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APPROVAL OF AN ENVIRONMENTAL MANAGEMENT PROGRAMME IN TERMS OF THE REQUIREMENTS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT NO. 28 OF 2002).

	Application Details
Details of Applicant	Molopo South Africa Exploration and Production (Pty) Ltd Postnet Suite 126, P O Box 92418, Norwood, 2117 Contact Person: Mr Peter Price Tel: 011 483 0677 Fax: 011 483 2686 Email: pdpcon@icon.co.za
Environmental Consultant	Environmental Impact Management Services (Pty) Ltd P O Box 2083, Pinegowrie, 2123 Contact Person: Mr Liam Whitlow Tel: 011 789 7170 Fax: 011 787 3059 Email: liam@eims.co.za
Project Name	Production Right Application in Welkom, Theunissen and Virginia Areas
File Ref Number	12/4/1/07/2/2
Magisterial Districts	Welkom, Virginia and Theunissen
Province	Free State
Affected farm property	Various farm properties and portions within Lejweleputswa District Municipality
Application Area	200 000 ha (certified gas reserves 104 659 ha)
Mineral	Natural Gas
Duration of Production Right	±30 years

21 JUNE 2011

Directors: J dos Santos Rocha (Chairperson)

MOLOPO EXPLORATION & PRODUCTION - 12/4/07/2/2

EXECUTIVE SUMMARY

This Record of Decision (RoD) is for the approval of an Environmental Management Programme (EMPR) in terms of the requirements of the Mineral and Petroleum Resources Development Act (MPRDA) of 2002, Act No. 28 of 2002 ('the Act'). The review of the EMPR is done to assess and verify the fulfilment of the environmental requirements in order to support the granting of the production right in terms of Section 84 of the Act.

Molopo South Africa Exploration and Production (Pty) Ltd (hereafter referred to as the 'applicant') conducted the Environmental Impact Assessment (EIA) and submitted the EIA report and EMPR in support of their production right application for natural gas within Virginia, Welkom and Theunissen magisterial districts of Free State Province on 09 December 2010. The applicant holds various exploration rights for natural gas issued in 2007 and have since established the presence of gas reserves in an area of approximately 104 659 ha in extent. The production right application area stretches from Welkom and Virginia in the north-east, to the west of Theunissen in the south.

The applicant proposes to adopt a phased production approach where natural gas will be extracted from various existing and planned gas wells within the production field, and sent via pipelines to the compressors for compression and distribution; and the phased approach will span over a period of approximately 25 years. Although the application area is extensively disturbed by various land use activities such as crop cultivation, mining and urban development, sensitive sites which amongst others include pockets of pristine vegetation, ridges that may have high ecological value and significant drainage lines occur. Planning of production operations such as drilling of boreholes, laying of pipelines and any other infrastructure associated with proposed production will take into cognisance existing sensitive sites and potential environmental impacts identified to be of low to medium significance such as ground and surface water pollution, visual intrusion, explosion and blowout risks, changes in land use, etc.

Given the nature and extent of the proposed production activities and the identified potential environmental impacts and risks, the envisaged negative impacts on the environment shall be of low to medium significance provided that the proposed mitigation measures on the EMPR and conditions of this Record of Decision are implemented.

The approval of the EMPR shall be limited to the production activities which involve the extraction and collection of gas via trenched pipeline networks for compression within the certified gas reserves.

The information provided meets the minimum requirements of the Act and it is therefore recommended that the Chief Executive Officer (CEO) should approve the EMPR.

1. COMPLIANCE WITH THE STATUTORY REQUIREMENTS

1.1 Submission

Section 83(4)(b) requires the applicant to conduct an EIA and submit an EMPR within 180 days from the date of the notice in terms of section 39. Following the approval of the scoping report submitted in terms of MPRD Regulation 49, the EMPR was therefore submitted within the legislated timeframe.

1.2 Approval/Non-approval

Section 39(4)(a) of the Act makes provision for the Minister to approve the EMPR submitted in support of the production right application provided that:

- (a) it complies with the requirements of subsection 39(3).
- (b) the applicant has complied with section 41(1) with regard to the prescribed financial provision for rehabilitation.
- (c) the applicant has the capacity or has provided for the capacity to rehabilitate and manage negative impacts on the environment.

Furthermore, section 39(b) states that the Minister may not approve the EMPR without considering the recommendations of the Regional Mining Development Committee and comments of any state department charged with administrating any law which relates to matters affecting the environment.

Section 84(2) provides for the refusal to grant a production right if the application does not meet the requirements of section 84(1) which amongst others include justification that production operations will not result in unacceptable pollution, ecological degradation or damage to the environment based on the submitted EMPR.

1.3 Compliance with other Environmental Regulatory Requirements

Although the MPRDA is the primary legislation that regulates production right application and related operational requirements, this does not exonerate and exempt the applicant to adhere to other applicable environmental legal requirements. In this regard the applicant has identified statutes which may affect the proposed production operations and amongst others include: The National Environmental Management Act, 1998 (Act No 107 of 1998), The National Environmental Management: Air Quality Act, 2004 (Act No 39 of 2004), The Gas Act, 2001 (Act No 48 of 2001), The National Water Act, 1998 (Act No 36 of 1998), The National Environmental Management: Waste Act, 2008 (Act 59 of 2008), etc.

During the EIA and development of the EMPR, the applicant consulted with various state departments such as the Free State Department of Economic Development, Tourism & Environmental Affairs, National

MOLOPO EXPLORATION & PRODUCTION - 12/4/07/2/2

Energy Regulator of South Africa, South African National Roads Agency Limited, Provincial Department of Transport, etc. to determine legal requirements to be adhered to prior to and during production operations.

It is highly emphasized that the requirements of other laws regulating environmental matters are observed and adhered to, provided the production right is granted to the applicant and no activity affected by such laws shall commence without the submission of necessary approvals and permits to the Agency.

2. BASIS OF REVIEW AND DECISION MAKING

2.1 Site Inspection

Site inspection to verify the provided baseline environmental information and pipeline routes for phase 1A of the proposed production operations was undertaken on 02 August 2010 by Petroleum Agency SA' representative Ms Phumla Ngesi, applicant's representatives Mr Peter Price and Robert Katzke, and EIMS' representative Mr Liam Whitlow.

2.2 EMPR Review

The EIA & EMPR were thoroughly reviewed based on the following:

2.2.1 Baseline Information

The following issues were noted:

- The production right application area is found in Virginia, Theunissen and Welkom areas located within the Lejweleputswa District Municipality of the Free State Province. The total application area covers approximately 200 000 ha in extent, and the area with proven gas reserves is approximately 104 659 ha in extent.
- The applicant proposes to adopt a phased production approach over 25 years and is therefore anticipated that at full scale production, the following infrastructure will be required: 260 production wells with associated well heads, 500km of intra-field pipelines, 4 main high-pressure gas compressors, 18-20 pipeline booster compressors and a gas processing or treatment plant. Since operations will be undertaken in phases, the outcomes of each phase will define the scope and extent of subsequent phases including the requirement for a processing plant and establishment of a gas market.
- The phased approach will therefore follow the following sequence: phase 1A will involve testing and compression of gas from 4 emitting wells; phase 1B drilling of approximately 6 new wells and extending phase 1A activities to approximately 12 wells; phase 2A development of wells for the entire area where there are certified reserves; and phase 2B expansion of 2A to include areas where no certified reserves are established yet.
- The primary land use activities are farming i.e. crop cultivation, and mining activities located to the north-eastern part of the application area.

- The topography of the area is gently undulating and characterised by slopes less than 5%.
- The application area occurs within the Sand-vet catchment and the main river systems include the Sand and Vet Rivers. Other drainage systems include several tributaries draining into the two rivers, dams, wetlands and pans.
- Two main water aquifers comprised of shallow aquifer within the Karoo sediments and deeper aquifer within Ventersdorp and Witwatersrand formations occur. Groundwater within the Karoo sediment has a high concentration of sodium chloride whereas deeper aquifer has high conductivity, sodium and chloride and therefore not appropriate for domestic use.
- Approximately 9 land types occur within the application area however land type Bd20 characterized by yellow, structure-less, high base status soils with mottled plinthic subsoil dominates the application area and has soil depths ranging from 450 – 750mm; and this soil type is suitable for arable agriculture.
- The application area occurs within vaal-vet sandy grassland, an endangered ecosystem though it has been highly transformed by extensive agriculture, mining and urban development. Regardless of such transformation, small pockets of pristine vegetation along the drainage lines, ridges, etc occur. Species of special concern such as Boophone disticha, Bowiea volubilis, etc. and a protected tree species, Acacia erioloba may also occur.
- Faunal and avi-faunal species of conversation concern such as Brown Hyena, South African Hedgehog, Martial Eagle, Lesser Kestrel, etc. occur within the application area. Ridges and drainage lines are considered sensitive sites due their high ecological value.
- In terms of cultural heritage, a number of late Iron Age sites dating back to the period after 1600s and historic battles occur to the east of the application area; and Stone tools and rock arts may occur near rivers and streambeds.
- The existing road networks in the area include R30 from Theunissen to Welkom, R708 from Theunissen to Bultfontein, numerous secondary roads and gravel farm roads/tracks.
- Mining and agriculture are the key main sectors which contribute to the economy of the region and in terms of the socio-economic conditions the area is characterised by high unemployment rate, low education levels and poor access to basic services.

The established baseline information concerning the affected environment is considered satisfactory and therefore in accordance with the requirements of section 39(3)(a) of the Act.

2.2.2 Environmental Assessment

Issues identified were assessed to determine if proper remedial measures have been provided and are discussed as follows:

• During the planning and design phase, it's predicted that the establishment of production infrastructure i.e. well sites and pipeline routes will result to the loss of productive agricultural land and although the impact would be low it is proposed that underground pipelines will be laid at depths of

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between 1.5 - 2m below plough level and well sites positioned such that they avoid irrigation pivot systems.

- Generally, the application area is not highly interrupted as it is dominated by grassland and it is therefore anticipated that production infrastructure would result to visual intrusions thereby altering the sense of place and impacting negatively on property values. Due to long-term duration of the production right, the envisaged impact will be of medium significance though such impacts will be reduced by laying pipelines underground, and locating bulk compressors next to road networks.
- It is identified that some parts of the application area have high biodiversity value especially along drainage lines, ridges, etc. and siting of infrastructure within these sensitive areas could result to habitat destruction, fragmentation of species population, loss of genetic variation within affected species. In this regard, the applicant has mapped all ecological sensitive areas to guide the positioning of wells and pipeline routes and therefore recommended that areas of highly ecological sensitivity are avoided during the establishment of infrastructure and production operations.
- It is anticipated that further impacts to biodiversity of the area may include destruction of the protected 'acacia erioloba' tree species, destruction of wetland vegetation thereby impacting negatively on the functioning of the wetland and establishment/spread of declared weeds and alien invader plants. It is recommended that no protected species are removed without obtaining necessary permits in terms of the National Forests Act of 1998, and minimise area of disturbance including avoiding translocating top soil from areas with invaders plant. Furthermore sensitive sites shall be avoided and/or not be altered without necessary permits in terms of the National Water Act of 1998 and National Environmental Management of 1998.
- It is anticipated that soil erosion from pipeline trenching and drill site establishment, soil compaction from vehicle movement and soil contamination from potential chemical spillages may occur. Although the impacts are anticipated to be low, the recommended remedial measures such as separate stockpiling of top and subsoil, install effective storm water management measures, maximise use of existing roads, contain spillages, minimise area of disturbance, etc. are deemed adequate.
- The applicant predicts that approximately 40 000 litres of water will be used in any given day for dust control, concrete making, potable use, drilling holes and saline water will be source from deep aquifer for this purpose. Although it is improbable that shallow aquifer, streams, wetlands, and pans will be affected as a result of water withdrawals, the applicant proposes to monitor withdrawal effects on a continuous basis. Furthermore, necessary water withdrawal permits shall be obtained from the Department of Water Affairs in terms of the National Water Act of 1998.
- The applicant anticipates that ground water contamination could occur from the migration of saline water from deep to shallow aquifer and disposal of waste water through an injection well where karoo formations are not properly sealed off and the envisaged impact is of medium significance. The applicant's proposal to seal off karoo formations through borehole casing and cementing, and implementing ground water monitoring programme to prevent the identified impact is deemed adequate. No wastewater disposal wells shall be constructed without obtaining an integrated water use licence in terms of the National Water Act of 1998.

- Surface water resources such as Sand and Vet Rivers with their tributaries, wetlands and pans may be polluted from indirect contamination with waste water, saline/produced water, hydrocarbon spillages, etc. The applicant proposes to minimise the impact by channelling contaminated water to primary and secondary lined sumps and keeping drill water in closed circuit on the drilling machine.
- It's predicted that explosion and gas leaks may occur from the accidental intersection of existing gold
 and mining shafts. The recommended mitigation measures such as proper geological investigation to
 detect cavities, consultation with mines and Council of Geosciences, etc. must be undertaken.
 Furthermore, an appropriate well head and blow out preventer system designed to prevent blow out
 risks must be installed in each well and a hazard installation risk assessment undertaken.
- It is anticipated that air quality of the application area can be compromised as a result of gaseous emissions from vehicles, wells, flaring activities, etc. and increased dust emissions from vehicle movement and drilling operations. It is thus recommended that at completion boreholes will be sealed off, continuous leak detection systems for pipelines and well heads including shut down procedures applied. The applicant shall also minimise dust by spraying gravel roads with water and reducing traffic movement on site.
- Stone Age, Iron Age and cultural heritage such as rock art, shelters, battle sites, etc. may be affected by the proposed activities and although the impact is regarded as low, it is proposed that these resources and sites are avoided during the establishment of infrastructure on site.
- It is anticipated that changes in local population levels could result to an increased demand for services and facilities such as housing, however, since the production process in automated, minimal labour would be required and commitments made under the social and labour plan implemented.
- It is anticipated that general and hazardous wastes will be generated during production activities and will be effectively managed to prevent land and water pollution by providing appropriate storage containers before disposal at licensed waste disposal facilities. The requirements of the National Environmental Management: Waste Act of 2008 must be observed and adhered to.
- At the end of life of production operations, the applicant anticipates that wells will be sealed off, production infrastructure such as pipelines and compressors removed on site and all affected areas rehabilitated. In this regard, issues relating to vegetation removal, water contamination, air pollution, fire risk should be observed and mitigated against.

2.2.3 Environmental Awareness Plan

An environmental awareness training framework for all personnel on site during production operations has been provided as part of the EMPR. An environmental induction training will be undertaken prior to commencement of work and regularly during production operations and will include general environmental awareness, job specific training guided by an on-job identification of environmental risks, regular toolbox talks and execution of emergency procedures. The contractor and applicant will be responsible for the implementation of the environmental awareness plan and will also ensure that a copy of the EMPR is available onsite including training records. The provided awareness plan is considered satisfactory and therefore complies with the requirements of section 39(3)(c).

2.2.4 Monitoring and Performance Assessment

Continuous environmental monitoring and compliance audit will be undertaken to ensure effective implementation of the EMPR and applicable environmental legislative requirements and would include monthly monitoring of construction sites by an Independent Environmental Assessment Practitioner (EAP), quarterly performance audits, continuous monitoring rehabilitation progress, and periodic ground water monitoring. A final close-out audit will be carried out by an EAP at completion of rehabilitation activities. The EMPR performance assessment reports required in accordance with regulation 55(1) will be submitted to the Agency bi-annually. The provided information is considered satisfactory and meets the requirements of MPRD Regulation 55.

2.2.5 Financial Provision for Rehabilitation

Section 41(1) requires the applicant for a production right to make the prescribed financial provision for rehabilitation and management of negative environmental impacts before the Minister approves the EMPR. The applicant has therefore made an allocation of R 2 477 825.91 (two million, four hundred and seventy seven thousand, eight hundred and twenty five rands and ninety one cents) for the rehabilitation of 4 new planned sites, final rehabilitation of 16 well sites and removal of pipelines including rehabilitation of approximately 18 382m of pipeline routes. The allocated provision was deemed inadequate as other crucial rehabilitation factors such as monitoring and maintenance of rehabilitated pipeline routes, remediation of contaminated soil and scarification of compacted soil, etc. were excluded when calculating the financial provision. Furthermore, rates for some rehabilitation activities were below market related rates and necessary adjustments were therefore made. The Agency's review revealed that at least R2 755 407.93 to be an adequate provision for the initial phase of the production operations and this provision shall be reviewed annually to determine its adequacy in meeting current and future rehabilitation activities. Successive rehabilitation is required during production operations.

The applicant proposed to provide the prescribed financial provision through a Parent Company Guarantee and shall therefore be considered depending on the financial health status of the Guarantor.

2.2.6 Applicant's capacity or provision for the capacity to rehabilitate and manage negative impacts on the environment

Section 39(4)(a)(iii) requires the approval of the EMPR if the applicant has the capacity or has provided for the capacity to rehabilitate and manage negative impacts on the environment. The applicant has complied with this requirement by identifying potential environmental impacts and risks associated with production operations and hence provided appropriate mitigation measures. Furthermore the provided financial provision has been reviewed and adequate provision recommended. Therefore, it is considered that the requirements of section 39(4)(a)(iii) have been met.

2.2.7 Consultation

2.2.7.1 Interested and Affected Parties (I&APs)

In terms of section 83(4)(a)-(b) the applicant is required to notify and consult with interested and affected parties; conduct an EIA and submit an EMPR in terms of section 39 of the Act. Furthermore, MPRD Regulations 49(1)(f) and 50(f) require the applicant to provide details of engagement process with interested and affected parties (I&APs) including the manner in which issues and concerns raised have been addressed on the EMPR. The review revealed the following:

- Press advertisements were placed on various local newspapers i.e. The Theunissen Vista, Free State
 Sun and The Volksblad on 23 September 2010; and onsite notices placed at various strategic areas
 within the production right application area (refer appendix 3 of the EMPR).
- Notification letters were distributed to the identified interested and affected parties including all affected landowners (refer appendix 3 of the EMPR).
- Three public meetings were held between 07 November 2010 and 20 January 2011 affording interested and affected parties an opportunity to comment on the proposed production operations.
- Concerns, issues and comments raised during the consultation process relate to the following:
 - Pipelines should installed beyond plough level from 1,5 to 2m deep;
 - Effects of production operations on air quality, archaeology, birdlife, vegetation, geology and water resources of the earmarked area; and management of potential impacts.
 - Compensation to the affected farmers, monetary benefit and profit sharing.
 - Socio economic factors such as economic benefit of the project and effects on other current land-use activities such as mining, job creation for local communities, use of local supplies, effects on property value, safety concerns due to potential explosions and gas leaks, security and access to private property, interference with existing agricultural activities, etc.
 - Impacts on the existing road networks due to trucking activities and building restrictions along and in close proximity to the public roads.
 - Eskom has existing electricity transmission networks in the area and therefore consultation with
 Lines & Servitude Manager during production operations is required.
- On consultation with the Department of Mineral Resources, it was established that the proposed production area overlaps with mining and prospecting rights held by Armgold/Harmony JV Company, Afro Wits Gold & Diamonds (Pty) Ltd and Witwatersrand Consolidated Gold Resources Ltd. The applicant was advised to consult with the aforementioned rights holders in order to identify any issues or conflicting interests during the co-existence of mining/prospecting and production operations (several correspondences between 25 February 2011 and 22 March 2011). Consultation meetings were held with Armgold/Harmony JV Company and Witwatersrand Consolidated Gold Resources and the consented way-forward is to conduct an ongoing consultation with the affected parties especially during the establishment and siting of production infrastructure. Furthermore, applicant's efforts to

consult with Afro Wits Gold and Diamonds (Pty) Ltd are noted (correspondences between 28 February to 31 March 2011), and although no consensus has been reached regarding the proposed production operations, the applicant shall continue consulting with this affected party to ensure that environmental management and safety of personnel on site is not compromised.

- No objections to the proposed production operations were received from the I&APs.
- Issues and concerns raised during public consultation process have been addressed on the EMPR. Furthermore, efforts undertaken by the applicant to identify all I&APs are recognized although there are concerns that not all affected landowners were consulted. In this regard, the applicant is expected not to conduct any physical production operations on any property unless written and signed land use agreements are entered thereto with each and every affected landowner.

The undertaken consultation process is considered satisfactory; however, ongoing consultation must be undertaken with all affected landowners, servitude rights holders and mining rights holders.

2.2.7.2 State Departments consultation

As required by section 40 of the Act and MPRD Regulation 49(3), the scoping report and the final EIR & EMPR reports were circulated to a number of Free State Provincial Departments (Dept) administering laws relating to environmental matters for comments so as to inform the review and decision making. These were: Dept of Agriculture (DoA), Dept of Water Affairs (DWA), Dept of Economic Development, Environment & Tourism (DEDET), South African Heritage Resources Agency (SAHRA), Dept of Mineral Resources (DMR), and Lejweleputswa District Municipality. Information on consultation process is outlined below.

Table 1: Free State Provincial Departments consulted

Institution	Date Sent: Scoping Report	Date sent : EIR & EMPR	Comments/ feedback	Date received	
DEDET	28 & 29 October 2010	14 December 2010	N	 	
	20 d 23 October 2010	14 December 2010	No comments received	N/A	
DWA	28 October 2010	14 December 2010	Comments received outlined below	14 December 2010	
DMR	28 October 2010	14 December 2010	Comments received outlined below	18 February 2011	
DoA	28 October 2010	14 December 2010	No comments received	N/A	
SAHRA 28 October 2010		14 December 2010	Comments received outlined below	07 December 2011	
Lejweleputswa District Municipality	28 October 2010	14 December 2010	No comments received	N/A	

- (a) DWEA Water Directorate comments were in relation to the following:
- No objections to the proposed operations provided the applicant receives consents from the affected landowners prior to the commencement of activities on site;

- Continuous groundwater monitoring to be undertaken and results sent for department's evaluation monthly;
- Effective storm water management measures to be put in place; and
- Compliance with all environmental regulatory requirements pertaining to water management, waste management and water use for mining and related activities such as the National Water Act, 1998 (No 36 of 1998); National Environmental Management: Waste Act, 2008 (Act 59 of 2008), and Regulations on the use of water for mining and related activities (GN 704 of 04 June 1999 gazetted on GG No. 20119) is required.

DWA comments were considered during the review of the EMPR and the applicant is therefore required to implement the aforementioned measures and adhere to the prescribed environmental legislation.

- (b) SAHRA comments were in relation to the following:
- Since the development exceeds 5 000 m² in extent, an assessment of heritage resources as part of EIA requirements should satisfy the provisions of section 38 of the National Heritage Resources Act, 1999 (Act No 25 of 1999) and in this regard a qualified archaeologist or heritage specialist should be appointed to identify and assess archaeological sites and/or heritage resources.
- A copy of the HIA report shall be submitted to SAHRA for consideration.

Stage 1 HIA was undertaken by the applicant and a copy of the final EMPR sent to SAHRA for comments. The applicant is also required to undertake an in-depth HIA throughout the lifespan of the production operations as new infrastructure will be established on site for extended periods.

- (c) DMR comments were in relation to the following:
- No objections to the proposed production operations, however, the application area overlaps with various existing prospecting/mining rights held by Armgold/Harmony JV Company (Pty) Ltd, Afro Wits Gold & Diamonds (Pty) Ltd and Witwatersrand Consolidated Gold Resources.
- The applicant must take responsibility for surface disturbances on the production area including management of cumulative environmental impacts; and where the right applied for is granted working agreements must be entered to with the affected rights holders.

3. KEY DECISION FACTORS AND RECOMMENDATIONS

It is recommended that the EMPR be approved subject to the following conditions:

3.1 Specific Conditions

3.1.1 This environmental authorization is limited to the production activities which involve extraction and collection of gas via trenched pipeline networks for compression within the certified gas reserves.

- Any other activities outside the defined scope such as gas treatment and processing plant shall not take place without necessary environmental approvals.
- 3.1.2 The applicant must ensure that the proposed project is carried out and managed in accordance with the approved EMPR and RoD conditions, and any non-compliance must be reported to the Agency within 24 hours. Deviations from the approved EMPR and RoD conditions may lead to cancellation or suspension of the production right in terms of section 47(1) of the Act.
- 3.1.3 Section 15(1) of Gas Act, 2001 (Act No 48 of 2001) states that no person may without a licence issued by the Gas Regulator construct or operate gas transmission, storage, distribution, liquefaction or re-gasification facilities or convert infrastructure into such facilities; or trade in gas. Compliance with the provisions of the Gas Act is obligatory and the applicant must not commence with production operations without obtaining necessary licence(s) from National Energy Regulator of South Africa (NERSA).
- 3.1.4 Transportation and handling of dangerous goods must comply with the provisions of the National Road Traffic Act, 1998 (Act No 93 of 1996) and its Regulations of 1999 and South African National Standards such as SANS 10228 and SANS 10231.
- 3.1.5 Since the applicant proposes to erect compressors in close proximity to the existing roads, the South African National Roads Agency Limited and National Roads Act of 1998 prohibits any person to erect, construct or lay, or establish any structure on or over, or below the surface of a national road or land in a building restriction area without South African National Roads Agency Limited's written permission. The applicant must obtain necessary permits before production operations commence on site.
- 3.1.6 The applicant must appoint an Environmental Control Officer who will be responsible for ensuring the implementation of the EMPR and RoD conditions and conduct continuous compliance monitoring of site operations.
- 3.1.7 The applicant must undertake a comprehensive baseline assessment of ground and surface water within and adjacent to the proposed production area and results communicated to the Agency before production operations commence on site and continuous monitoring of water chemistry, potential contaminants and static water levels undertaken thereafter.
- 3.1.8 All wells to be drilled must be cased and cemented to prevent contamination of shallow aquifer water by saline water from deep aquifer, leaking natural gas and drilling mud. Well integrity testing and monitoring must be undertaken on a continuous basis.
- 3.1.9 Since the production operations involve use of water up to 40 000 litres a day and disposal of waste water, an integrated Water Use Licence Application (IWULA) must be made in terms of the National Water Act of 1998 before production operations commence on site.
- 3.1.10 Contamination of both surface and ground water must be prevented at all times by implementing a storm water management system separating clean and dirty water channels, lining waste water sumps, providing appropriate waste reception facilities and placing all chemicals and hydrocarbon products on appropriate storage facilities with bund walls with a capacity of 110% of the volumes stored. Compliance with the provisions of Hazardous Substances Act, 15 of 1973 is required.

- 3.1.11 Areas identified as sensitive sites must be treated as no go areas during the positioning of production infrastructure and where these areas are unavoidable, site specific environmental assessment must be undertaken and the addendum to the approved Environmental Management Programme submitted for our consideration and approval.
- 3.1.12 Under no circumstances must the identified archeological arterfacts and resources be disturbed or removed without obtaining permits in terms of National Heritage Resources Act of 1999. Should any archaeological arterfacts and heritage resources be exposed during the excavations all work must cease and such discovery reported to the relevant authorities and expert advice sought.
- 3.1.13 Consultation with mining companies operating within the application area must be undertaken on an ongoing basis to determine areas to be avoided during production operations so as to prevent potential explosion or blow-outs including management of cumulative environmental impacts. Furthermore written working agreements must be concluded so that any potential environmental risks during the co-existence of production and prospecting/mining activities are managed and that includes the responsibilities to rehabilitate disturbed areas.
- 3.1.14 Continuous monitoring of the following must be undertaken and reports submitted to the Agency as part of monthly and quarterly reporting: gas leaks from pipelines and wells, pond's leakage, noise levels, gaseous emissions from flaring activities, etc.
- 3.1.15 Written land use agreements must be obtained from the affected landowners and servitude rights holders before production activities takes place within the affected farm properties and servitudes.
- 3.1.16 An in-depth Safety Health and Environmental risk assessment must be undertaken for all potential drilling fluids and report submitted to the Agency for consideration and approval.
- 3.1.17 Where production operations involve listed activities under NEMA Regulations, necessary environmental authorizations must be obtained from the Provincial Department of Environmental Affairs.
- 3.1.18 Rehabilitation of the disturbed surfaces must take place in conjunction with production activities and an in-depth rehabilitation plan must be submitted to the Agency before rehabilitation activities commence on site.

3.2 Standard Conditions

- 3.2.1 The Agency must be notified a month in advance before production operations commence on site.
- 3.2.2 Monthly and quarterly environmental monitoring and annual EMPR performance assessment reports shall be submitted to the Agency.
- 3.2.3 In terms of section 41(3), the operator shall annually review the allocated financial provision and submit a revised quantum based on environmental liability and risk assessment.
- 3.2.4 The approved EMPR and conditions of the RoD must be communicated to all employees and contractors on site.

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- 3.2.5 In terms of section 43(1), it must be noted that the holder of the right remains responsible for any environmental liability, pollution or ecological degradation and management thereof, until the Minister has issued a closure certificate.
- 3.2.6 Apart from the requirements of the MPRDA, the operator shall adhere to the provision of any other relevant legislation such as Mine Health and Safety Act of 1996 (Act No.29 of 1996), National Environmental Management Act of 1998 (Act No.107 of 1998), National Water Act of 1998 (Act No. 36 of 1998), etc.
- 3.2.7 In case of cancellation, cessation, or completion of exploration works, the applicant shall in terms of section 43(4) make an application for closure certificate within 180 days. The application for such closure certificate must be accompanied by a prescribed environmental risk report as per MPRD Regulation 60.

4. CONCLUSION

Chief Executive Officer

JUNE 2011

The baseline information concerning the affected environment and the proposed mitigation measures are satisfactory for the approval of the EMPR. The anticipated activities will not result in significant negative environmental impacts provided all recommendations on both the EMPR and this RoD are implemented.

In light of the above, it is recommended that the Chief Executive Officer approves the EMPR in terms of section 39(4) of the Act.

Recommendation Submitted By:	
PNORSIN	99/06/3011
Phumla Ngesi	Date
Manager: Environmental Compliance	
Supported By:	,
Millie	29/06/2011
Lindiwe Mekwe	Date
General Manager: Regulation	
Approved By:	
Mthronaum RNy/L	2011-06-30.
M Xiphu	Date

SCHEDULE "B 5"

Coa Specificati	ione						Producti	on Wells						Compressor Station A & B		Liquefaction Plant
Gas Specificati	IOIIS	HDR 1	MDR 5	2057	1307	BEI 02	DBE 1	ST 23	Retreat	HZON 1	SPG 3	EX 1	1400	CSA (inlet)	CSB (inlet)	Plant (inlet)
Carbon Dioxide	Mol %	0,0718%	0,0581%	0,0481%	0,0201%	0,0000%	0,0300%	0,0000%	0,0000%	0,0303%	0,0377%	0,0831%	0,0000%	0,0237%	0,0526%	0,0366%
Ethane	Mol %	0,0610%	0,0642%	0,0712%	0,0450%	0,0490%	0,0919%	0,1845%	0,0579%	0,1512%	0,1648%	0,2859%	0,3280%	0,1754%	0,0606%	0,1243%
Propane	Mol %	0,0043%	0,0044%	0,0290%	0,0031%	0,0000%	0,0059%	0,0099%	0,0037%	0,0070%	0,0088%	0,0195%	0,0130%	0,0097%	0,0108%	0,0102%
Helium	Mol %	1,6005%	1,7988%	11,0922%	1,5991%	2,5020%	3,7009%	2,3003%	2,1977%	2,4990%	3,7006%	1,5005%	2,2996%	2,4066%	4,2330%	3,2188%
Methane	Mol %	91,6266%	92,3391%	75,5470%	93,5477%	91,3736%	89,8218%	90,1133%	90,0051%	89,0659%	85,4150%	90,4289%	91,0830%	89,6568%	87,6851%	88,7799%
Nitrogen	Mol %	6,0017%	5,2965%	12,4912%	4,4975%	5,6045%	5,9014%	6,7010%	7,3922%	7,8970%	9,7017%	7,0022%	5,9989%	7,1364%	7,3939%	7,2509%
Argon/Oxygen	Mol %	0,6281%	0,4330%	0,7084%	0,2815%	0,4649%	0,4420%	0,6720%	0,3373%	0,3436%	0,9654%	0,6739%	0,2715%	0,5811%	0,5561%	0,5700%
Butane	Mol %	0,0000%	0,0000%	0,0070%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0019%	0,0009%
Hydrogen	Mol %	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0130%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0043%	0,0000%	0,0024%
Water Content	mg/Nm3	63321,58	63321,28	63321,28	63321,28	63429,52	63387,15	63310,95	63321,28	63321,28	63321,28	63387,15	63321,28	21200,00	21200,00	114,00
Dynamic Viscosity	cP (mPa.s)	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012
Lower Heating value	MJ/Sm3	31,20182	31,44647	25,75656	31,84564	31,10401	28,45839	30,76957	30,6464	30,38576	29,15133	30,94351	31,18575	30,60556	29,8651	30,27578
Higher Heating value	MJ/Sm3	34.65521	34.92691	28.60634	35.37048	34.54679	33.99296	34.1708	34.03834	33.74782	32.37654	34.36562	34.63437	33.99072	33.17032	33.62586
Wobbe Index	MJ/Sm3	45.54025	46.11549	37.99035	46.87248	45.69684	45.09951	44.89531	44.72499	44.28012	42.20181	44.91691	45.71826	44.62689	43.8151	44.26687

MSNG BVCN02-02



Broad-Based Black Economic Empowerment QSE Verification Certificate

Certificate No: QSE L4/8336/010720/2

Tetra4 (Pty) Ltd

Reg no. 2005/012157/07, VAT no. 4850244486

Head Office, Location: 1 Bompas Road, Dunkeld West, Johannesburg, 2196

Verification Standard Applied: General Codes - (Notice 408 of 2015)

Scorecard Applied: QSE

Element:	Element weighting:	Score
Ownership	25	24.58
Management Control	15	14.41
Skills Development	25	17.70
Enterprise and Supplier Development	30	20.00
Socio-Economic Development	5	5.00
	Total Score: 100	81.69



Broad-based BEE status Level : Level 4
BEE procurement recognition percentage : 100%
Black Ownership percentage : 38.28%
Black Women Ownership percentage : 15.58%
51% Black Designated Group : No
Empowering Supplier : Yes

For: Mosela and SizweNtsalubaGobodo

Re-issue Date: 01/07/2020 Date of issue: 15/06/2020 Expiry Date: 14/06/2021

This certificate is based on information provided to Mosela and SizweNtsalubaGobodo Rating Agency by the management of the measured entity and is an independent opinion based on verification, validation and analysis done by Mosela and SizweNtsalubaGobodo Rating Agency (Mosela and SizweNtsalubaGobodo Rating Agency is not responsible for ensuring completeness of information provided to support the B-BBEE status of a measured entity). The B-BBEE status has been determined in accordance with **the dti's** Amended Codes of Good Practice gazetted on the 6th of May 2015

BVA 080

Non-Confidential File SCHEDULE "B 7"

Procurement Progression Plan at Tetra4

Overview

Tetra4 has recognised that to effectively participate in the transformation of the South African economy, it has instituted preferential procurement practices across its entire supplier base. The objective of Tetra4's preferential procurement policy is to maximise opportunities for HDSAs to supply goods and services to Tetra4. This will contribute to the development of sustainable HDSA business enterprises and will contribute to the purchasing and procurement requirements of the MPRDA Act and Mining Charter.

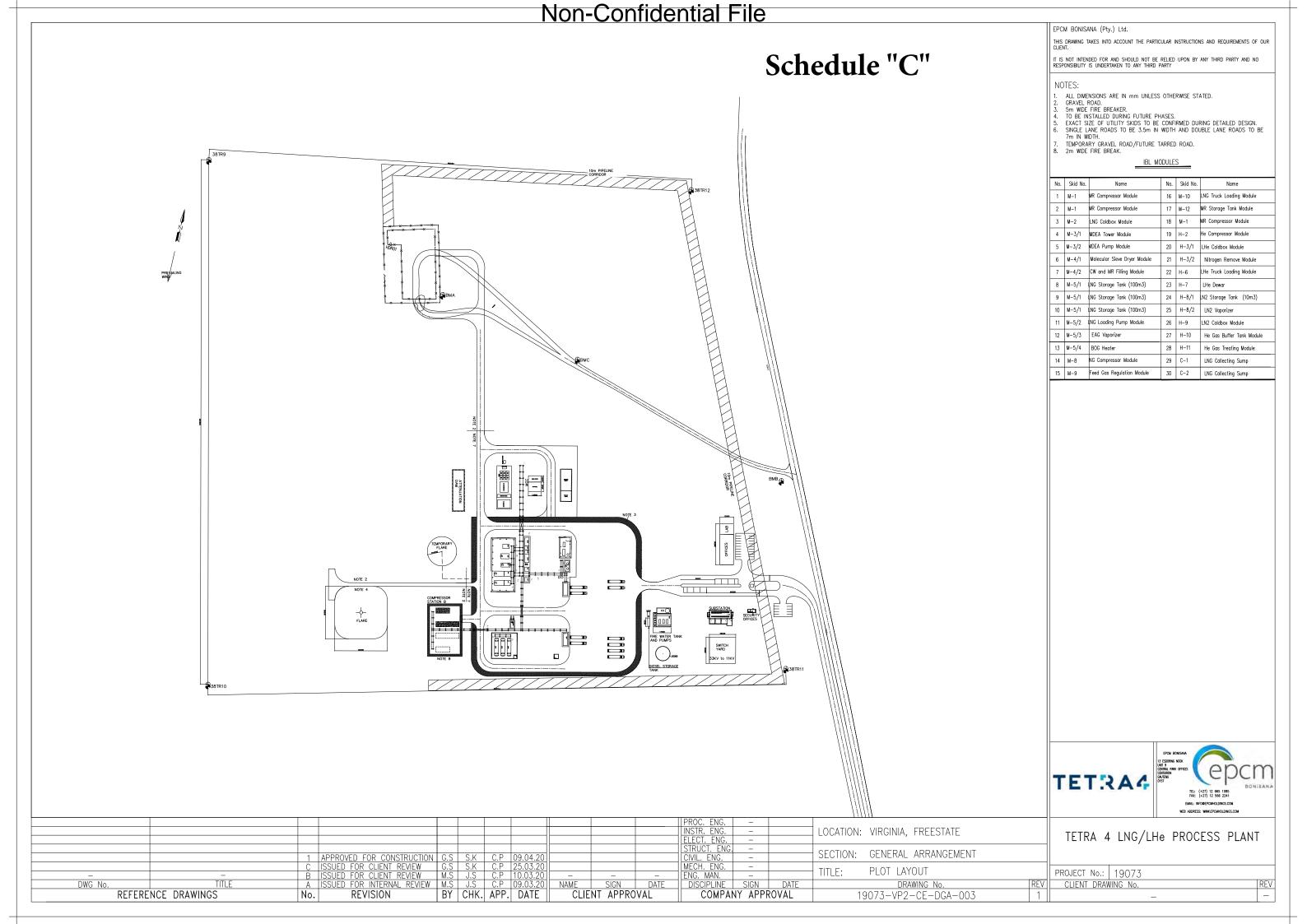
Table 1: Strategic Procurement Plan for Tetra4

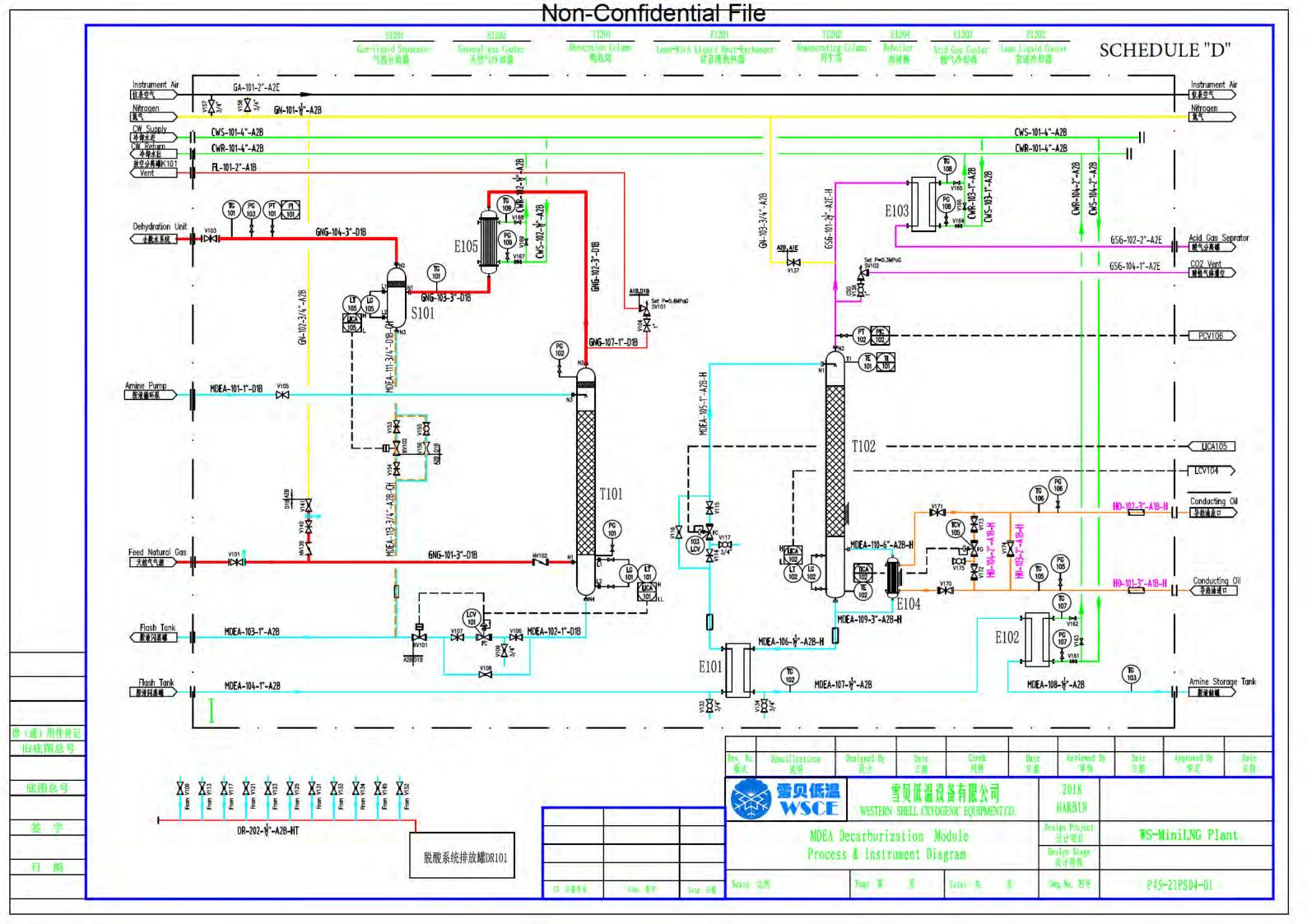
Action	Sub Action Steps	Output	Responsible Person/s	Timeframe Ongoing	
HDSA preferred supplier status to be given by the company wherever possible in all three (3) categories of procurement	The company to give preference to HDSA suppliers where possible within all three (3) categories of procurement	The company will procure, where possible, through HDSA suppliers.	Procurement		
Identify and record the level of procurement from HDSA companies	The company will utilise the procurement management system to capture procurement information within the three (3) categories.	The designed procurement management system	Procurement	Ongoing	
Determine potential areas where JV's can be developed between the company and other suppliers/service providers and HDSA companies and develop strategies and targets to ensure JV's are developed	The company to determine potential suppliers/service providers and local HDSA companies through the supplier database and develop targets	HDSA companies will have the opportunity to supply the company in conjunction with the supplier/service provider to ensure the local SMME companies are offered the opportunity to provide their services to the company	Management/ Head Office / Procurement	Ongoing	
Determine preferential procurement opportunities in the company	The company to determine categories within essential and non-essential services provision which can be granted to HDSA companies only. The production site to develop strategies and action plans to support this undertaking.	The company's procurement within the identified categories from HDSA suppliers only will ensure a significant percentage of procurement from accredited HDSA suppliers	Procurement	Ongoing	
Provide mentoring and capacity building assistance to HDSA suppliers in order to facilitate improvements in their business practices with an aim of facilitating a successful SMME sector operating in conjunction with the company.	The company to identify through procurement from HDSA suppliers the strengths and weaknesses of the HDSA suppliers and provide the necessary mentoring and/or capacity building assistance to ensure sustainability of the HDSA suppliers.	HDSA suppliers will acquire the necessary mentoring and capacity building assistance from the company to ensure the HDSA suppliers will retain their procurement contracts with the production site as well as the development of their business and service provision beyond the company.	Management/ Head Office / Procurement	Ongoing	

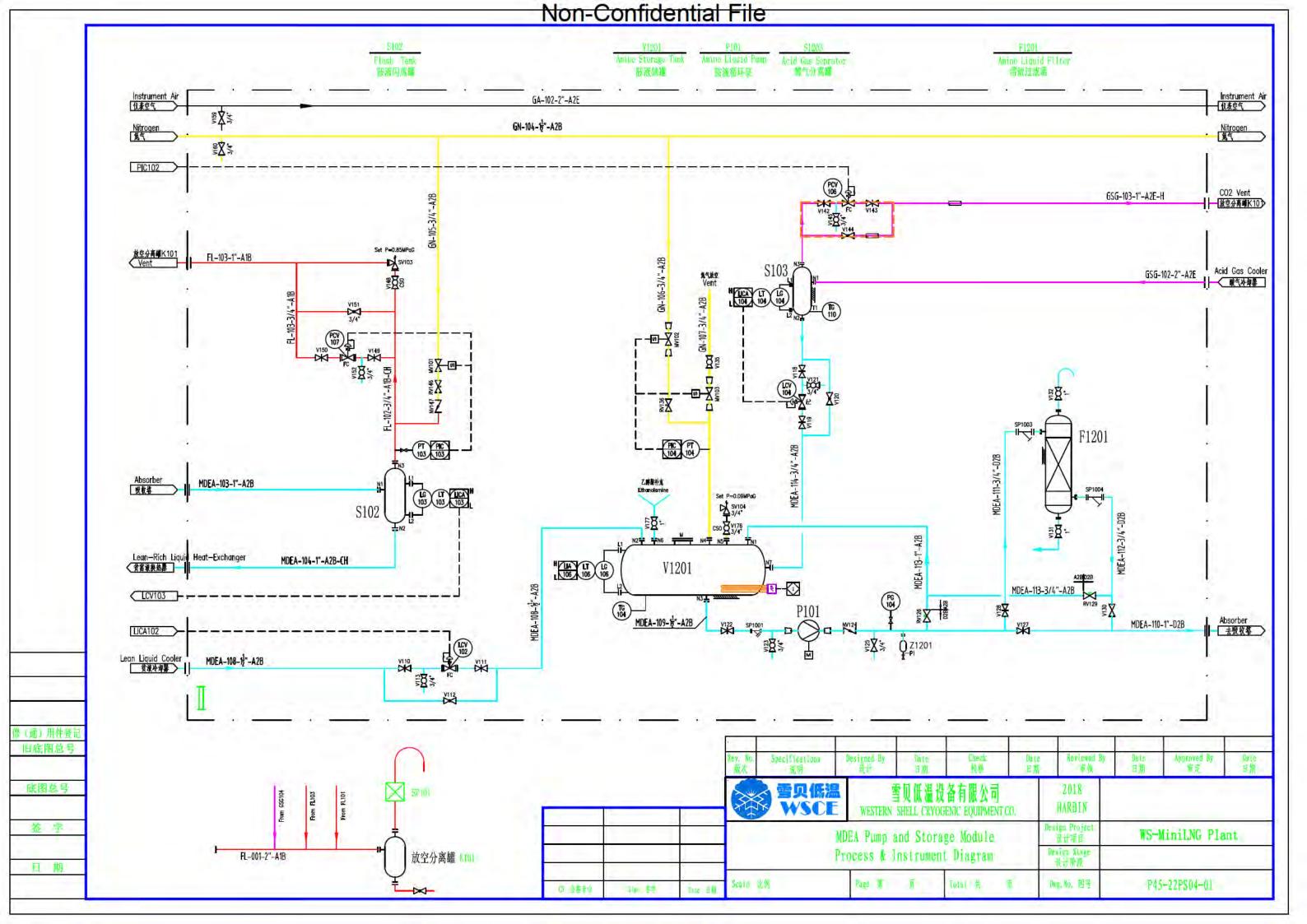
Table 2 sets out the preferential procurement targets for the procurement areas of services, capital and consumables for the next five years at Tetra4.

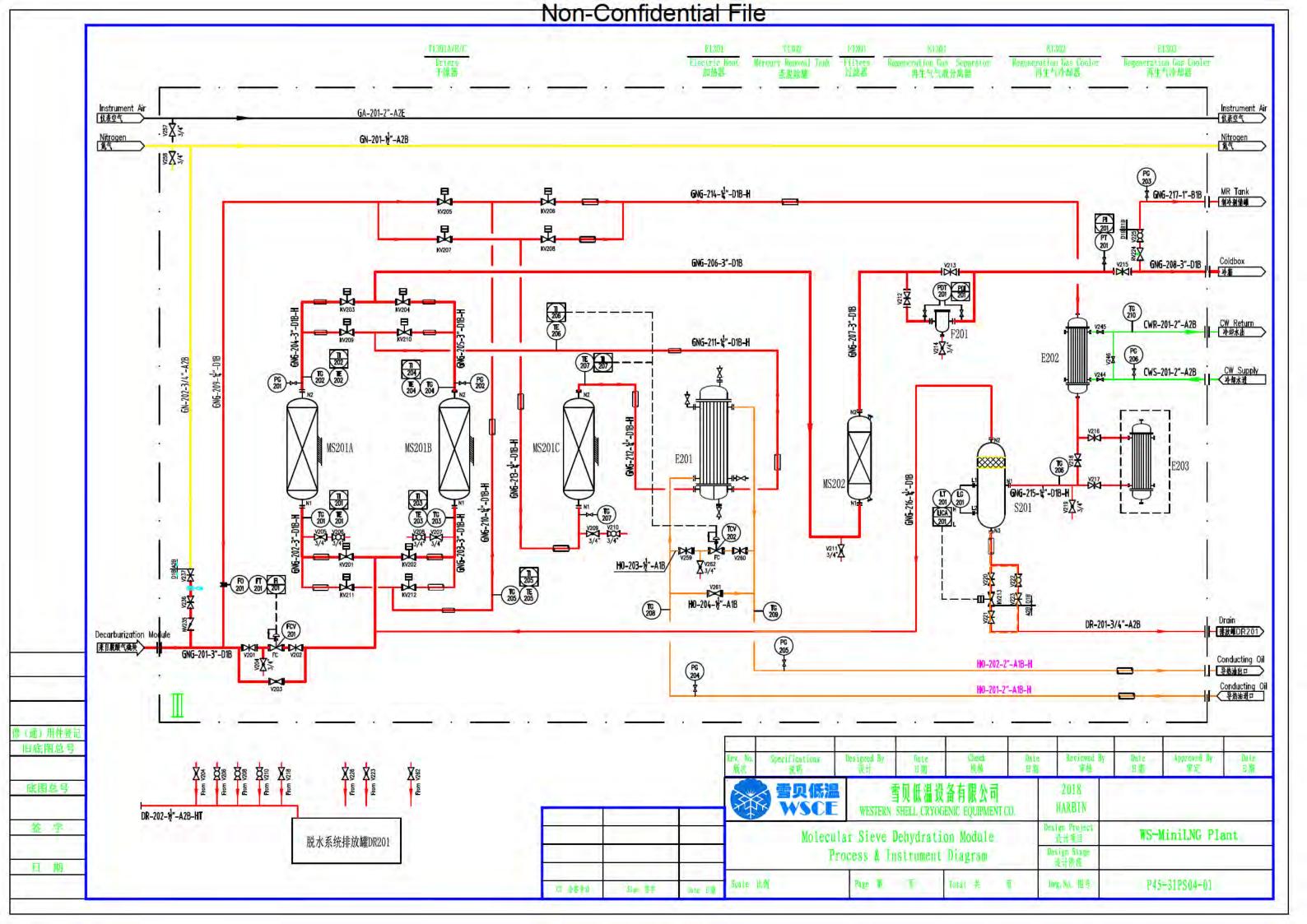
Table 2 : Preferential Procurement Targets at Tetra4

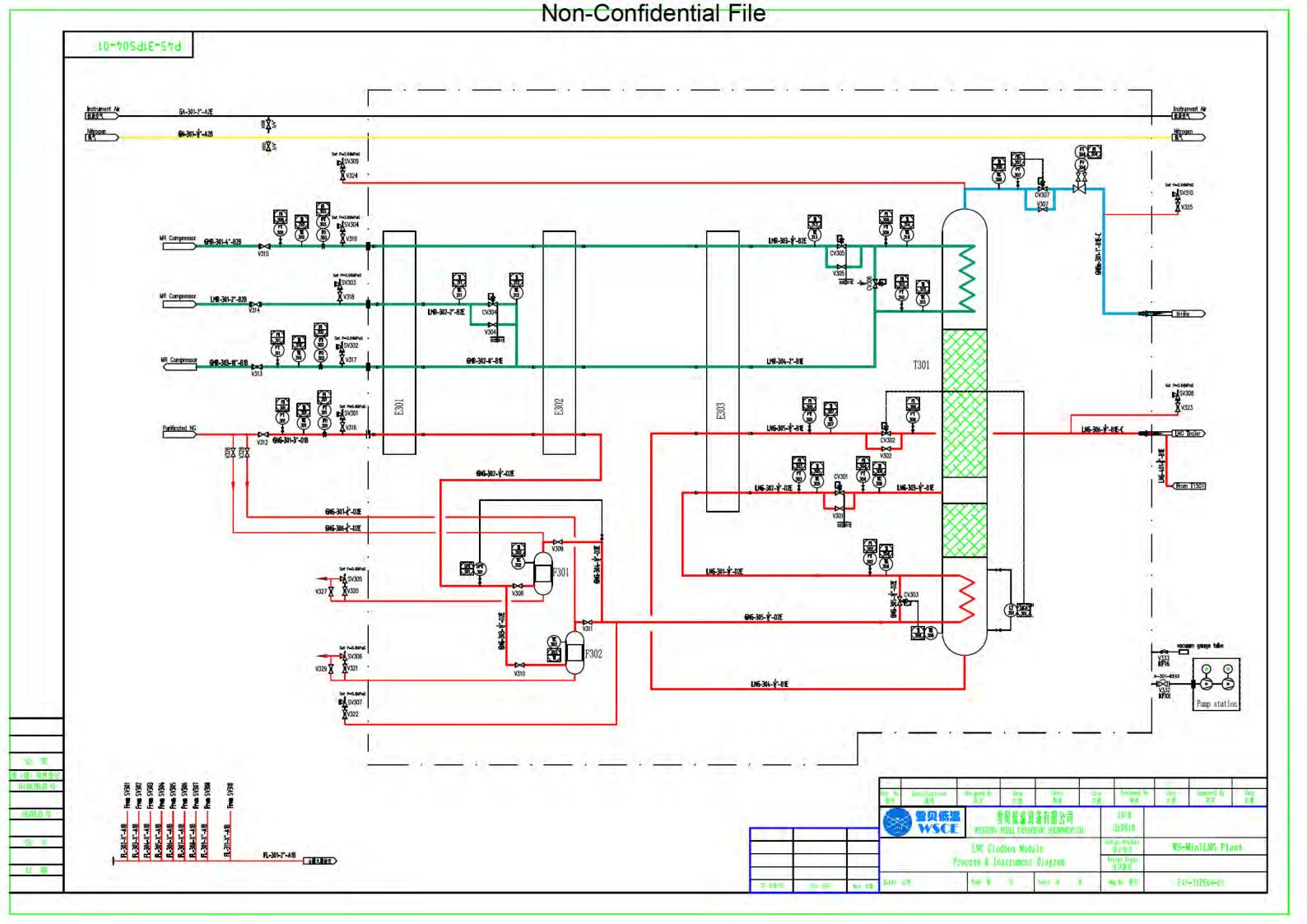
	2020/2021	2021/2022	2022/2023	2023/2024	2024/2025	Target BEE Procurement %
Capital goods	R79,596,000	R 0.00	R 0.00	R 0.00	R 0.00	15
% of total spend	15	15	15	15	15	15
Services	R5,447,000	R5,586,000	R5,901,000	R5,901,000	R5,901,000	91
% of total spend	89.1	91.8	91.8	91.8	91.8	
Consumables	R3,130,000	R331,000	R350,000	R350,000	R350,000	100
% of total spend	100	100	100	100	100	

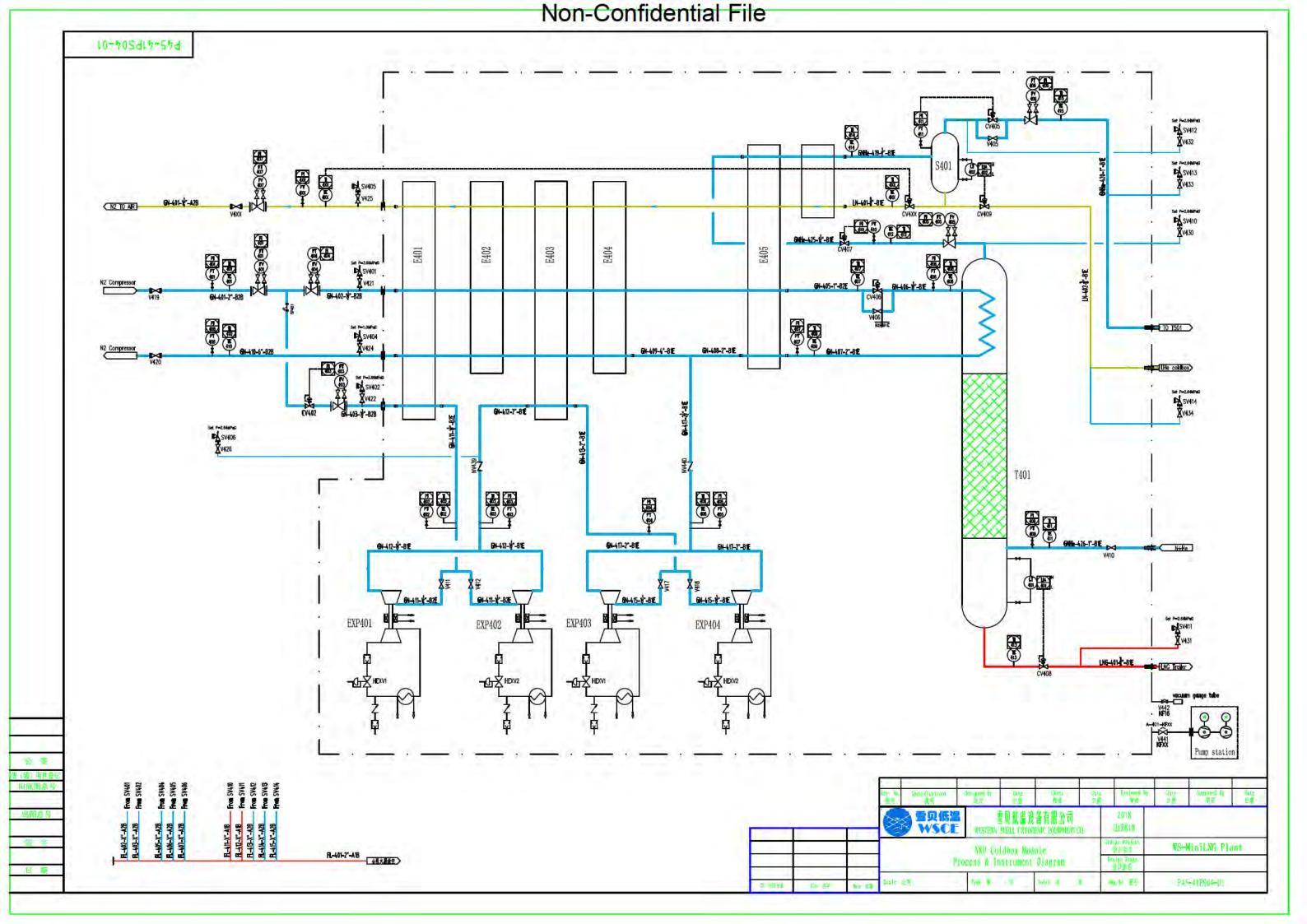


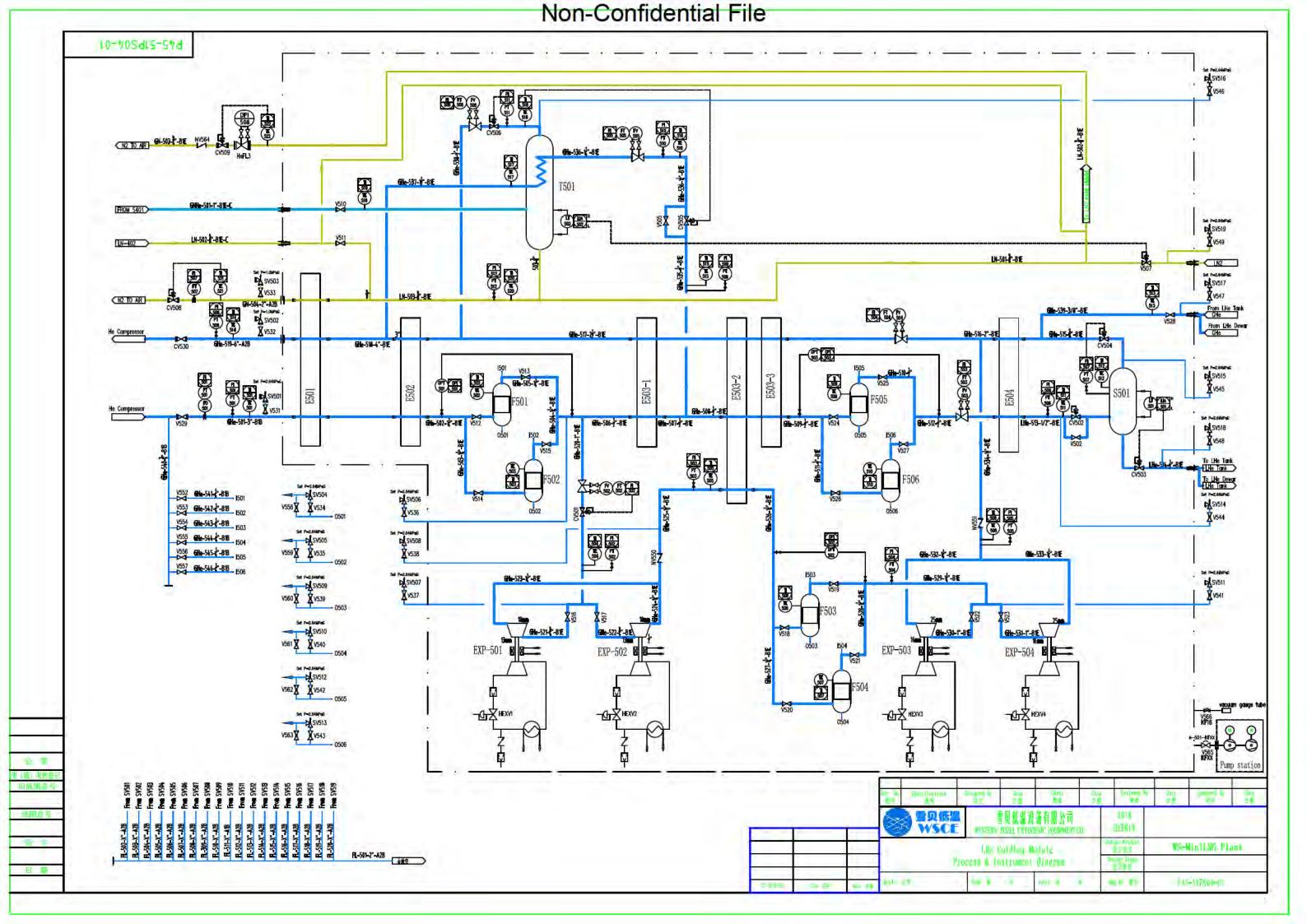












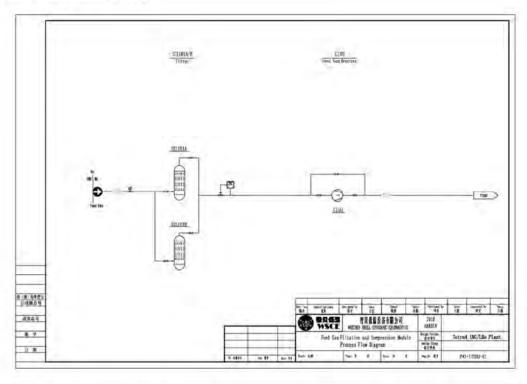
Non-Confidential File SCHEDULE "E"

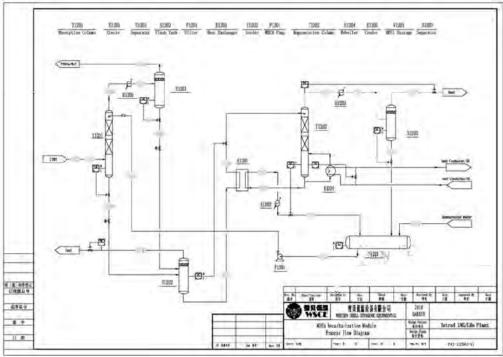


哈爾濱雪貝低溫設備有限公司 Western Shell Chyogenic Equipment, Harbin, Chima

TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT

5.4.2 Process Flow Diagram (PFD)

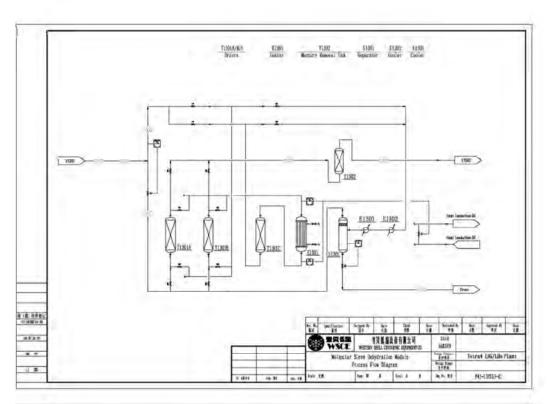


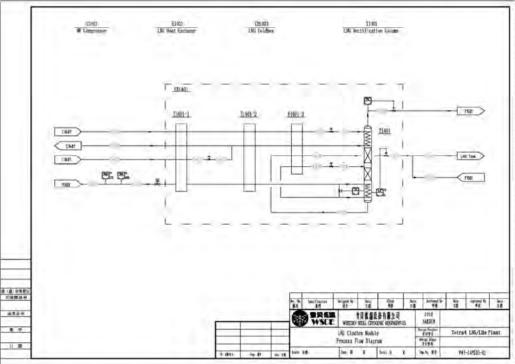




給爾濱雪貝低溫設備有限公司 Western Shell Cryogenic Equipment, Harbin, China

TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT

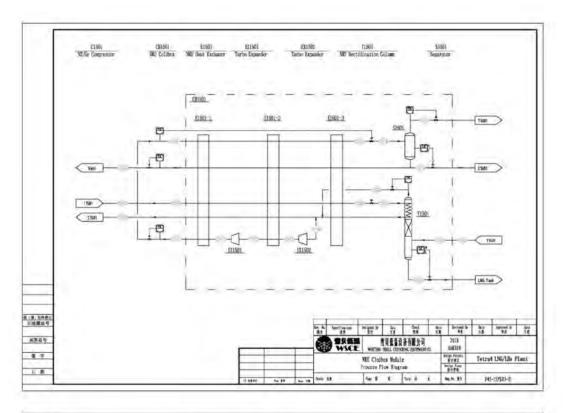


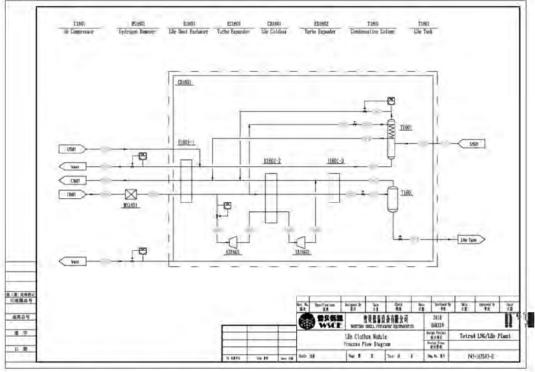




給爾濱雪貝低溫設備有限公司 Western Shell Cryogenic Equipment, Harbin, China

TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT







給爾濱雪貝低溫設備有限公司 Western Shell Cryogenic Fouldment Harrin China

TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT

5.4.3 Mass/Flow Balance Data Sheet (MFBD)

		1614	1615	1616	1617	1618	1619
Vapour Fraction		1,0000	1,0000	1.0000	0, 0000	1,0000	1_0000
Temperature	0	-243.00	-344.62	-198.00	-193.00	27.13	28,00
Pressure	kFa4	1135	140	130	150	104	110
Molar Eles	kgmole/h	9,5104	9,5104	9,5101	1,5709	2, 3208	0.1814
Mass Flow	kg/h	38,0700	38.0700	38, 0700	44, 0485	68.0466	5.0796
Wolesular Weigh	t	4, 0830	4. 0000	4.0030	28, 0348	28. 8278	28. 0045
Mole Frac							
Methane	CH4	D. 0000	0.0000	0.0000	0.0002	0.0018	0.0051
Ethylene	C2H4	0.0000	0.0000	0.0000	D. 0000	D. 0000	0.0000
Et hane	£2716	0,0000	0.0000	0.0000	0,0000	0.0000	0.0000
Propone	C018	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Butane	n-C4H10	0,0000	0.0000	0.0000	0,0000	0.0000	0.0000
i-But are	1-C4H10	0.0000	0.0000	0.0000	0.0000	D. 0000	0.0000
n-Pentane	n-CHIL2	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000
i-Penzane	1-13/112	0.0000	0.9000	0.0000	0,0000	0.0000	0.0000
Carbon diaxide	1002	0.0000	0,0000	0.0000	0.0000	0,0000	0;0000
Water	H20	0.0000	0.0000	0.0000	9, 0000	8,0000	0.0000
Nitrogen	12	0,0000	0.0000	0.0000	0.9955	0.9897	0,9776
Oxygen.	02	0.0000	0.0000	0.0000	0.0025	0.0052	0.0108
Avgon	Ac	0.0000	0.0000	0,0000	0, 0017	0: 0026	0.0016
Helium	He	1.0000	1.0000	1.0000	0.0001	0.0006	0,0018
Neon	Ne	0.0000	0,0000	0.0000	0.0000	0,0000	0.0000
Hydrogen	Ho	0,0000	0.0000	0.0000	0,0000	0.0000	0,0001

		1101	1102	1201	1202	1203	1204	1205	1206
Vapour Fraction		1,0000	1.0000	1.0000	1.0000	0.9991	1.0000	0,0000	0.0025
Temperature -	6	20,00	40.00	40.00	48.07	40.00	39.92	39, 92	52.37
Pressure	burA	6.00	50, 00	50.00	49.30	49.10	48.90	6,00	6. 19
Molar Flow	kgmole h	149, 6875	149.6875	149.6875	148.4971	148, 4971	148, 3571	0.1400	51.0496
Mass Flow	kg h	.2495. 7399	2495, 8399	2495, 8399	3469. 2711	2469. 2711	2400, 7918	2,5200	1570, 0688
Moleculur Weigh	1	16, 1737	16.0737	16.0737	16.6284	16, 6284	10.6274	18.0000	30, 1558
Mole Frac									
Wethane	CH4	0, 8988	0.8988	0.8988	0.8970	0.8970	0.8978	0.0000	0.0264
Ethylene	C204	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000
Ethany	C2H6	0.0013	0.0013	0.0013	0,0013	0.0013	0.0013	0,0000	0,0000
Fropane.	C3118	0.0001	0.0001	0.0001	0.0001	0. 0001	0.0001	0.0000	0.0000
n-Butane	ir-C4H10	0, 0000	0.0000	0.0000	U. 0000	0,0000	0.0000	0.0000	0,0000
i-Butame	i-C4HL0	0.0000	0.0000	0.0000	D. 0000	0.0000	0.0000	0.0000	0.0000
u-Pentane	n-C5Ht2	0,000	0,0000	0.0000	0,0000	0.0000	0.0000	0,0000	0.0000
i-Pentanu	1-C5H12	0,000	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000	0,0000
Carlon dioxide	002	0, (00)	0.0004	0.0004	0,0000	0.0000	0.0000	0,0000	0,0041
Vater -	1120	0, 1001	0.0001	0.0001	0.0025	0.0025	0:0016	E. 0000	0,8254
Nitrogen	NZ -	0.0680	0.0680	0.0680	0.0618	0.0678	0.0679	0.0000	0.0020
Oxygen	02	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0000	0.0001
Argon	Ar:	0,0010	0.0010	0.0010	0.0010	0,0010	0.0010	0,0000	0,0000
delium-	Ho	0.0254	D. 0254	0.0254	0.0263	0.0253	0.0254	0.0000	0.0007
Near	No	13, 8000	0.0000	0.0000	D. 0000	8. 0000	0,0000	0.0000	0.0000
Hydrogen	101	0, 0003	0.0003	0.0003	-0.0003	0, 0003	0.0003	0,0000	-0.0000
aMDEAmi nee		0,1000	0.0000	0.0000	0,0000	0,0000	0.0000	0,0000	0.1412



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TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT

		1207	1208	1209	1210	1211	1212	1213	1214
Vapour Fraction		0,0000	0.0000	0.0000	0,0000	0.0000	0.0000	0. 0000	1.0000
Temperature	2	52. 37	98,00	123.39	79, 05	45, 70	45, 70	48.11	103, 50
Pressure	bard	6,00	5.70	1.94	1.74	1, 54	1.03	67, 00	1.69
Molar Flow	kgmoIa/h	49. 6984	49. 6984	49.5691	49. 5691	49.5691	49.8592	49. 8592	0.1293
Massi Flow	ke/h	1547.7966	1547, 7966	1544.1386	1544, 1386	1544, 1386	1543, 5000	1543, 5000	3.6580
Molecular Weigh	t	31.1438	31.1438	31.1513	31. 1513	31. 1513	30.9572	30. 9572	28. 2854
Mole Frac									
Mothane	CH4	0.0001	0,0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0379
Ethy Lewe	C2H4	:0.0000	0,0000	0.0000	0,0000	0.0000	0.0000	0, 0000	0.0000
Ethane	C2H6	0.0000	0.0000	0.0000	0, 0000	0,0000	0.0000	0.0000	0.0003
Propane	C3H8	0.0000	0, 0000	0.0000	0.0000	0.0000	0.0000	0. 0000	0.0000
n-Butane	n-CAHLO	0.0000	0,0000	0,0000	0.0000	0.0000	0.0000	0, 0000	0,0000
i-Briane	i-C4H10	0.0000	0.0000	0,0000	0, (000)	0.0000	0.0000	0.0000	0.0000
n-Pentane	n-C5H12	0,0000	0,0000	0.0000	0,0000	0.0000	0.0000	0.0000	0,0000
i-Pentane	t-C5H12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0. 0000	0.0000
Carbon dioxide	002	0.0042	0.0042	0.0032	0, 0032	0.0032	0.0032	0.0032	0.3923
Water	H30	0,8507	0.8507	0.8514	0.8514	0:8514	0.8523	0, 8523	0.5679
Nitrogen	12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0,0000
Oxygen	02	0.0000	0,0000	0.0000	0,0000	0.0000	0.0000	0, 0000	0.0000
Argon	Ar	0.0000	0, 0000	0.0000	0.0000	0.0000	0,0000	0, 0000	0.0000
Helium	W.	0.0000	0, 0000	0.0000	0.0000	0,0000	0.0000	0,0000	0.0000
Neon	Ne	0.0000	0,0000	0.0000	0,0000	0.0000	0.0000	0, 0000	0.0000
flydrogen.	112	0.0000	0, 0000	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000
aMDEAmine		0.1450	0.1450	0.1454	0, 1454	0.1454	0.1446	0, 1446	0.0016

		1215	1216	1217	1218	1219	1301	1302	1303
Vapour Fraction		0.4530	0.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
Temperature	U	10.00	40.00	40.00	52.37	30, 00	39, 84	39.61	39.84
Pressure	bard	1.49	1.49	1,49	0,00	4.00	48. 60	48, 00	48.60
Molar Flow	kgmole/h	0.1293	0.0707	0,0586	1, 4912	0.0029	148, 3571	126, 1036	22, 2536
Mass Flow	kg/h	3, 6580	1. 2937	2.3643	24, 7922	0.0522	2466.7918	2096, 7730	370, 0188
Molecular Weigh	t	28. 2854	18, 2870	40.3604	16, 6259	18,0000	16.6274	16, 6274	16, 6374
Mole Prac									
Methane	CH4	0.0379	0, 0000	0,0836	0, 8990	0.0000	0.8978	0.8978	0,8978
Ethylene	C2114	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0, 0000	0.0000
Ethane	C2H6	0.0003	0.0000	0,0007	0.0013	0.0000	0.0013	0.0013	0,0013
Propane	C3H8	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0001	0.0001
n-Butane	n=C4H10	0,0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
i-Entane	i-C4H10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0. 0000	0.0000
n-Pentane	л-05И12	0.0000	0,0000	0,0000	0,0000	0.0000	0.0000	0, 0000	0,0000
i-Pentane	i=05H12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Carbon dioxide	002	0.3923	0.0000	0.8661	0.0000	0.0000	0.0000	0.0000	0.0000
Water	1/20	0.5679	0.9972	0.0495	0, (000	1.0000	0.0016	0, 0016	0.0016
Ni trogen	1/2	0.0000	0.0000	0.0001	0.0682	0.0000	0.0679	0.0679	0.0679
Uxygen	02	0,0000	0.0000	0.0000	0.0046	0.0000	0.0046	0.0045	0.0046
Argon	Ar	0.0000	0,0000	0.0000	0.0010	0.0000	0.0010	0.0010	0.0010
Helium	He	0.0000	0.0000	0.0000	0. 0255	0.0000	0.0254	0. 0254	0.0254
Neon:	Ne	0,0000	0,0000	0.0000	0.0000	0.0000	0.0000	0, 0000	0.0000
Hydrogen	112	0.0000	0.0000	0.0000	0.0004	0.0000	0.0003	0, 0003	0.0003
aMDEAmina		0.0016	0.0028	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000



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TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT

	- 1	1304	1305	1306
Vapour Fraction	ř	1,0000	1,0000	0.8629
Temperature	C	4¢,00	40, 00	14, 20
Pressure	barA	47.60	47. 50	1.49
Molar Flow	kgmole/h	146, 6233	146, 6233	1,3935
Mass Flow	kg/h	2443, 3625	2443, 3625	23.4293
Molecular Weigh	it.	16, 6642	16. 8642	16,8129
Note Frac				
Methane	CHI	0, 8993	0, 8993	0.7760
Ethylene	CDH	0, 0000	0,0000	0,0000
Ethane	62H6	0.0013	0.0013	0.0011
Fropane	CHS	0.0001	0,0001	0.0001
n-Burane	n-C4H10	0,0000	0,0000	0,0000
i-Botane	1-C4H10	0, (000	0,0000	0.0000
n-Pentane	n-C5H12	0, 0000	0,0000	0,0000
j-Pentane	i-C5H12	0.0000	D. 0000	0,0000
Carbon dioxide	C02	0.0000	0.0000	0.0000
Water	H20	0, 0000	0,0000	0,1371
Nitrogen	No.	0.0680	0.0680	0,0587
Oxygen	02	0. 0046	0.0046	0.0040
Argon	Ar	0.0010	0.0010	0,0009
Helium	He	- 0,0354	0,0254	0.0219
Neon	Ne	0, 0000	0,0000	0.0000
Hydrogen	H2 -	0,0004	0.0004	0.0003
aMDEAmi ne		70, (0000	0.0000	0,0000

		1401	1402	1403	1404	1405	1406	1407	1408
Vapour Fraction		1,0000	0.0000	0.0270	0,0000	120000	0.0000	0.0000	0,0000
lemperature -	C	40.00	-162.30	-160.80	-126, 10	-160,00	-162,30	-162, 00	-162, 21
Pressure	bard	46, 50	45, 70	11.00	10, 50	10,00	10.40:	2.87	2, 87
Molar Flow	kgmole/h	146, 6230	146, 6230	146.6230	134, 3230	12, 3000	134, 3230	134, 3230	136, 0533
Mass Flow	kg/h	2443.3620	2143, 3620	2143, 3620	2205, 6090	237.7540	2205, 6090	2206. 6090	2237, 7652
Molecular Weigh	t	16,6642	16,6642	16.6642	16, 4202	19.3296	16. 4202	16. 4202	16.4477
Male Frac									
Mesthane	CH4	0.8990	0.8990	0.8990	0.9710	0.1140	0, 9710	0.9710	0.9689
Ethylene	C244	0,0000	0,0000	0,0000	0.0000	0,0000	0,0000	0.0000	0,0000
Ethane	tZHa.	0.0010	0,0010	0.0019	0.0010	0.0000	0.0010	0.0010	0.0014
Propane	CHS	0,0700	0,0000	0.0000	0, 0000	(0.0000	0,0000	0.0000	9,9931
n Bulane	a C-11110	0.0000	0,0000	0, 0000	0.0000	Q. 0000	0.0000	0000	0.0000
Butane	2-C41110	0,0000	0.0000	0.0000	0.0000	0.0000	0.0660	6, 0000	0.0000
n-Pentane	n-C5H12	0,0000	0.0000	0,0000	0, 0000	0.0000	D_ 0(x)0	0.0000	0,0000
(-Pontane	1-15H12	0.0000	0.0000	0.0000	0.0000	0.0000	D. 0000	0.000	0.0000
Carbon dioxide	£02	0, 0000	0.0000	0.0000	0, 0000	0.0000	0.0000	0, 0000	0.0000
Water	100	0. (000	0,0000	0,0000	0.0000	0.0000	0.0000	0.0000	9.0000
Nitrogen	N2	0.0680	0.0680	0.0680	0. 0320	0.5690	0. 0220	0.0220	0.0242
Oxygen	02	0,0050	0,0050	0.0050	0, 0040	0.0070	0,0040	0,0040	0,0046
Argon	Ar	0.0010	0,0010	0.0019	0, 0010	0, 0030	0.0010	0.0010	0,0009
flelium	He	0.0250	0,0250	0, 0250	0, 0000	0.3030	0,0000	0.0000	0,0000
Neon	Ne	0.0000	0.0000	0.0000	0.0000	0, 0000	0,0000	0.0000	0.0000
Hydrogen	112	D. 0000	0.0000	0.0000	0.0000	0.0040	0.0000	0.0000	0.0000



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TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT

		1409	1410	1411	1412	1413	1414	1415
Vapour Fraction		1.0000	0.0000	0.0000	0.0730	0.0000	0.1080	1,0000
Temperature	c	40.00	40.00	55.00	58, 80	162, 30	-168, 00	20.70
Pressure	barA	32, 80	32, 80	32, 60	3,90	32, 40	4: 80	3,70
Molar Flow	kgmole/h	475, 0050	124, 9950	124.9950	124, 9950	175, 0050	475, 0050	600, 0000
Mass Flow	kg/h	13562, 8920	6812, 0900	6812.0900	6812, 0900	13562, 8920	13562, 8920	20374, 9820
Molecular Weigh	t	28. 5532	54. 4989	54. 4989	54. 4989	28. 5532	28, 5532	33.9583
Mole Frac								
Methane	CH4	0.3410	0.0660	0.0660	0.0660	0.3410	0.3410	0.2840
Ethylene	C2H4	0. 2870	0.1520	0.1520	0.1520	0.2870	0.2870	0.2590
Ethane	C2H6	0.0000	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000
Propane	-C3H8	0.1330	0. 2370	0. 2370	0.2370	0.1330	0.1330	0.1550
n-Butane	n-C4H10	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000
i-Butane	i-C4H10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Pentane	n-C5H12	0,0000	0,0000	0.0000	0,0000	0.0000	0.0000	0.0000
i-Pentane	i-C5H12	0,.0560	0.5310	0, 5310	0, 5310	0.0560	0.0560	0, 1550
Carbon dioxide	£02	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water	H2O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	N2	0. 1820	0.0140	0.0140	0.0140	0.1820	0.1820	0.1470
Oxygen	02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Argon	Ar	0.0000	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000
Helium	He	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Neon	Ne	0,0000	0,0000	0.0000	0.0000	0.0000	0.0000	0,0000
Hydrogen	H2	0,0000	0.0000	0.0000	0,0000	0.0000	0,0000	0.0000

		1501	1502	1503	1504	1505	1506	1507	1508
Vapour Fraction		1.0000	0.0000	1, 0000	1. 0000	1.0000	1.0000	1.0000	1:0000
Temperature	(F)	-155, 00	-175, 30	-185.00	26.40	40,00	40, 00	10, (0	40, 00
Pressure	kPaA .	983	304	260	230	2800	2800	2800	2800
Molar Flow	kgmole/h	12 3000	1, 7300	10. 5700	51-4116	51.4116	24, 5050	16.3366	10, 5700
Mass Flow	kg/h	237,7540	32, 1670	295, 5956	1000, 0000	1000.0000	476, 6427	317.7618	205. 5956
Molecular Weight		19.3296	18, 5879	19, 4509	19.4509	19, 4509	19:4509	19, 4509	19:4509
Mole Frac									
Methane	CH4	0.1140	0.7960	0. 0026	0.0026	0.0026	0,0026	0.0026	0: 0026
Ethylene	C2H4	0,0000	0.0000	0.0000	0.0000	0.0000	0,0000	0.0000	0.0000
Ethane	r2H6	0,0000	0,0000	0.0000	0,0000	0.0000	0,0000	0.0000	0,0000
Propane	C3HS	0.0000	0.0000	D. 0000	0, 0000	0.0000	0.0000	0.0000	0.0000
n-Butano	n-C4H10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.10000
i-Butane	i-CHIO	0.0000	0,0000	0.0000	0,0000	0,0000	0.0000	0.0000	0.0000
n-Pentane	n-0902	£ 0000	0.0000	0.0000	0, 1900	0.0000	0.0000	0.8800	0.0000
i-Pentane	1-0902	0.0000	0.0000	0.0000	0.0000	0.0000	0,0000	0: 0000	0.0000
Carbon diarrile	102	0.0000	0,0000	0, 0000	0.0000	0.8000	0.0000	0.000	0.0000
Water	1120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000
Nitrogen	N2	0.5690	0.1830	0. 6320	0.6320	0.6320	0,6320	0.6320	0.6320
Oxygen	02	0.0070	0.0180	0.0057	0.0057	0.8057	0.0057	0.0067	0: 0057
Argon	Ar	0.0030	0.0040	0.0025	0.0025	0.0025	0,0025	0.0025	0,0025
Heliuw	1/e	0.3030	0.0000	0. 3523	0. 3523	0.3523	0.3523	0.3523	0.3523
Neon	No	0.0000	0,0000	0,0000	0,0000	0.0000	0.0000	0,0000	0,0000
Hydrogen	1/2	0.0040	0,0000	0, 0049	0.0049	0.0049	0,0049	0,0049	0,0049



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TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT

		1509	1510	1511	1512	1513	1514	1515	1516
Vapour Fraction		0.4519	0.5991	L 0000	1.0000	1, 6000	1,0000	0.3714	D. 5048
Temperature	C	178: 00	194.47	109.50	-145.97	152.00	170: 92	188. (1)	201.51
Pressure	APnA .	2700	300	2780	900	880	260	2700	170
MoIser Flow	kgmola/h	24.5050	24.5050	16. 3366	16, 2266	(6.2365	16.3366	10.5700	10.5700
Mass Flow	kg/h	476, 6427	476.6427	317. 7618	317, 7618	317, 7618	317, 7618	205, 5966	205, 5956
Molecular Weigh	t	19, 4509	19.4509	19. 4509	19, 4509	19, 4509	19.4509	19.45(9	19, 4509
Mole Frae									
Mothano	CH4	0.0026	0,0026	0, 0026	0.0026	0.0026	0,0026	0.0036	0,0026
Ethylene	C2H4	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethane	C2H6	0.0000	0.0000	0,0000	D. 0000	0.0000	0.0000	0.0000	0.0000
Propone	CSHS	0.0000	0.0000	0,0000	0.0000	0.0000	0,0000	0,0000	0.0000
n-Butane	n-C4R10	0,4000	0.0000	0.0000	0.0000	0,0000	0,0000	0.0000	0, 0000
l-Butane	1-C41110	0.0000	0.0000	0, 0000	D. 0000	0.0000	D. 0000	0.0000	0.0000
n-Pentane	in C5H12	0.000	0,0000	0.0000	0,0000	0,0000	0.0000	0,0000	0.0000
i-Pentano	1-09112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Carbon dioxide	-02	D. 0000	0.0000	0,0000	0,0000	0,0000	0.0000	0,0000	0,0000
Water	1120	0.0000	0,0000	0,0000	0.0000	0,0000	0,0000	0,0000	0, 0000
Mirrogen	A2	D. 6320	0.6320	0. 6320	0. 6320	0.6320	0. £320	0.6330	0, 6320
Oxygen	02	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0067	0, 0057
Argon	Ar	0.0025	0.0025	0, 0025	0.0025	0.0025	0,0025	0.0035	0,0025
Helium	He	0.3523	0.3523	0. 3523	D. 3523	0.3523	0.3523	0.3523	0. 3523
Neon	No	0.0000	0.0000	0,0000	9. 0000	0:0000	0.0000	0.0000	0.0000
Hydrogen	H2	0,0049	0.0049	0, 0049	0.0049	0,0049	0,0049	0,0049	0,0049

		1517	1518	1519	1601	1602	1603	1604	1605
Vapour Fraction		1.0000	1.0000	0.0000	1, 0000	1,0000	1,0000	1,0007	1.0000
Temperature	C	-201.51	28, 00	-201.61	-191.51	242.80	28. 45	41: 15	40. 00
Pressure	kPn/l	170	110	170	160	150	92	1180	1150
Molar Flow	-kgmole/h	5.3359	4, 3029	0.9313	5. 3359	3.7650	87.4880	87.4880	87.4348
Mass Flow	kg/li	59, 0159	120.5000	26, 0796	59. 0159 Y	19:970W	350, 1121	350.112	350,0000
Molecular Weigh	t.	11.0602	28.0045	28. 0045	11.0602	3.9762	4.0018	4.0018	4.0030
Mole Frac									
Mothane-	1714	0.0001	0.0051	0.0081	0.0001	0.0000	0.0000	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000	0, 0000	0,0000	0.0000	0,0000	0,0000	0,0000
Ethane	C2H6	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000
Propone	C3H8	0.0000	0.0000	0.0000	0.0000	0.0000	0,0000	0,0000	0,0000
n-Botani	n-C4H10	0.0000	0.0000	0.0000	0,0000	0.0000	0.0000	0,0000	0.0000
i Butane	1-04/10	0.0000	0.0000	0.0000	0, 0000	0.0000	0,0000	0,0000	0,0000
n-Pentano	n-C5H12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0_0000	0.0000
i-Pentane	1-05012	0.0000	0.0000	0.0000	0. 0000	0.0000	0.0000	0.0003	0.0000
Carbon dioxide	C02	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water:	H20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nî trogen	A2	0.2931	0.9776	0.9776	0, 2931	0.0000	0.0000	0,0000	0,0000
Oxygen	02	0.0007	0.0108	0.0108	0.0007	D. 0000	0.0000	0.0000	0.0000
Argon	Ar	0.0005	0.0046	0.0046	0,0005	0.0000	0.0000	0,000	0.0000
Helium	He	0.6961	0,0018	0.0018	0.6951	0.9865	0.9994	0,9994	1.0000
Neon	Ne	0.0000	0.0000	0.0000	0,0000	0,0000	0.0000	0.0000	0.0000
Hydrogen	1/2	0.0096	0,0001	0.0001	0, 0096	0.0135	0.0006	0,0005	0.0000

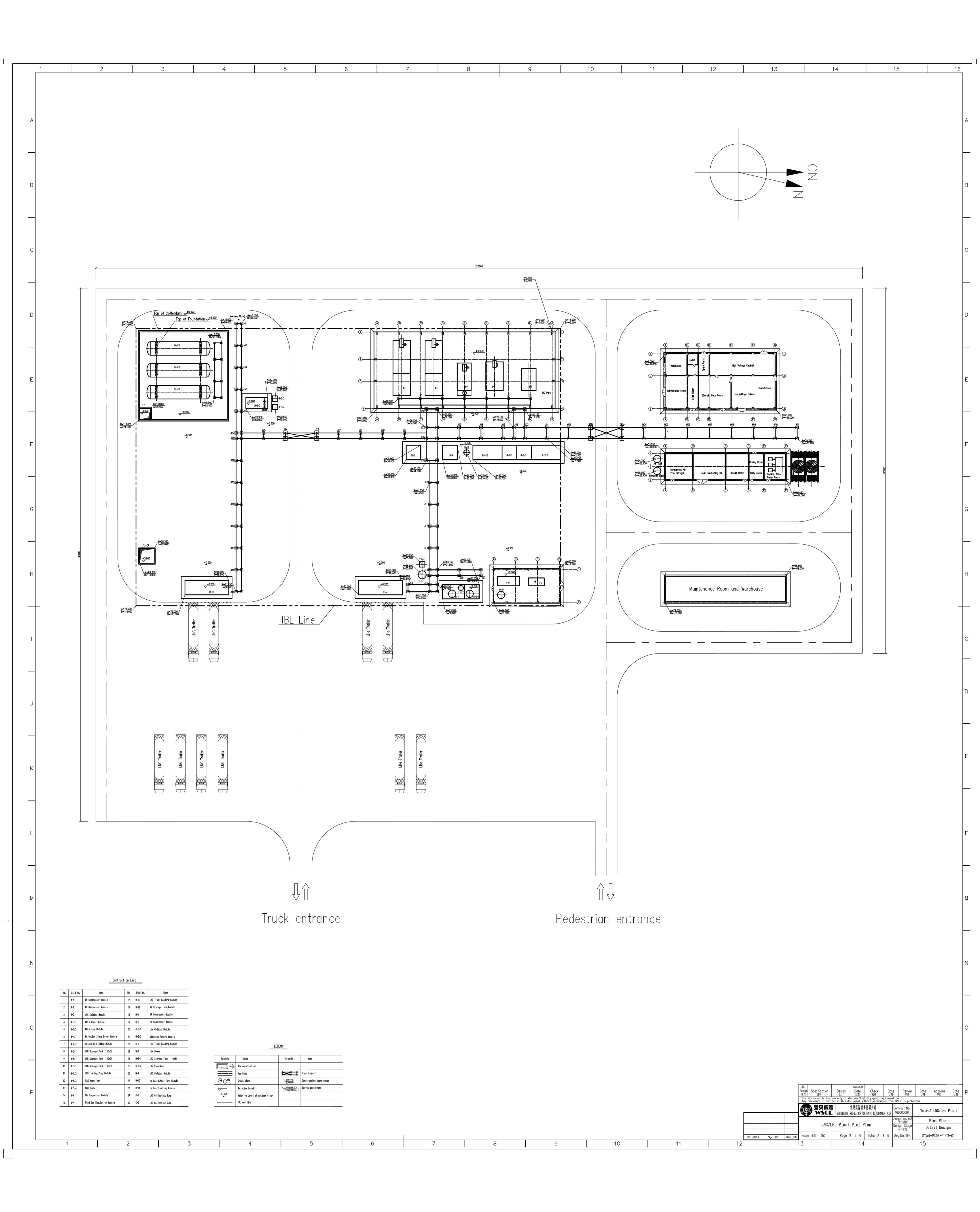


哈爾濱雪貝低溫設備有限公司 Western Shell Cayogenic Equipment, Harbin, Chima

TECHNICAL AND COMMERCIAL PROPOSAL FOR WS-Mini-LNG/LHe-I PLANT

		1606	1607	1608	1609	1610	1611	1612	1613
Vapour Fraction		1.0000	1.0000	1.0000	L 0000	0,0000	0.6900	0,0000	1,0000
Temperature	·E	-235.03	= -243.77	-259. 27	-263, 4)	-286, 70	268, 87	268,87	-268, 87
Pressure	kPisA	1137	400	396	106	1092	107	107	107
Molar Flow	kgmole/h	65, 9508	65, 9508	65, 9508	65.9508	11.9736	11.9736	1.7118	8.2618
Mass Flow	keh	264, 0000	264, 0000	264, 0000	264, 0000	47, 9300	47, 9300	14, 8583	33, 6717
Molecular Weigh	t	4,0030	4, 0030	4,0030	4.0030	4,0030	4.0030	4,0030	1.0030
Mole Frac									
Methune	CH4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylene:	12/14	9.0000	0,0000	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000
Ethane	(2116	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Propage	C3/18	0.0000	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Butane	tr-U4H10	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0,0000	0.0000
I-Butane	1-04/10	0.0000	0,0000	0,0000	D. 0000	0.0000	0.0000	0.0000	0,0000
a Pentane	n-0902	0: 0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000	11, 0000
i-Pentane	1-C5H12	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000	d, 0000
Carbon dioxide	CO2	0.0000	0,0000	0.0000	D. 0000	0, 0000	0.0000	0.0000	0.0000
Water	H20	9.0000	0,0000	0.0000	0,0000	0,0000	0.0000	D. 0000	0.0000
Nitrogen	N2	0.0000	0,0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Oxygen	02	0,0000	0.0000	0.0000	0.0000	0,0000	0.0000	0,0000	0.0000
Argon	Ar	g. 0000	0.0000	0.0000	0.0000	0.0000	0,0000	D. 0000	0,0000
Hel tum	He	1.0000	1,0000	1,0000	1,0000	1, 0000	1.0000	1,0000	1.0000
Neon	Nec	0.0000	0,0000	0.0000	0.0000	0,0000	0,0000	0.0000	3.0000
flydrogen	102	U, 0000	U. 0000	U. OUUU	U, DUOU	0.0000	0, 0000	9, 0900	0.0000

SCHEDULE "F"



SCHEDULE "G"

SCHEDULE "H"

SCHEDULE "I"

SCHEDULE "J"

SCHEDULE "K"

SCHEDULE "L"

SCHEDULE "M"

SCHEDULE "N"

SCHEDULE "O"

Non-Confidential File SCHEDULE "P"



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Independent Reserve and Resource Evaluation Report

2019 UPDATE ON THE ESTIMATION OF THE METHANE AND HELIUM RESERVES OF THE TETRA4 VIRGINIA GAS FIELD IN THE FREE STATE OF THE REPUBLIC OF SOUTH AFRICA

Renergen Limited

Prepared for: Mr. Stefano Marani



March 01, 2019

Mr. Stefano Marani Chief Executive Officer Renergen Limited 1 Bompas Road Dunkeld West Johannesburg, 2196 Republic of South Africa

Re: AN UPDATE ON THE ESTIMATION OF METHANE AND HELIUM RESERVES AND RESOURCES AND ASSOCIATED ECONOMICS OF THE TETRA4 VIRGINIA GAS FIELD IN THE FREE STATE OF THE REPUBLIC OF SOUTH AFRICA

Dear Mr. Marani:

At the request of Renergen Limited (Renergen), MHA Petroleum Consultants (MHA) has conducted an update to its March 2018 independent assessment of the unconventional methane and helium reserves and resources in the Tetra4 Virginia Gas Field, located in the Free State of the Republic of South Africa. This evaluation, based on the analysis methodology described herein using technical and economic data supplied by Tetra4, has an effective date of March 1, 2019. Material changes to this report are the inclusion of the HDR-1 well as a Proved Developed Producing well, updated CAPEX and OPEX costs, updated currency exchange rates, and an updated field development plan. Ongoing work by Tetra4 that may have a positive future impact that is discussed within this report includes the evaluation of a shallow conventional "White Sandstone" play, increased evaluation and definition of the helium market, and future potential of the South Africa liquid fuels market.

This evaluation includes estimates of recoverable methane and helium volumes from Proved Developed Non-Producing wells (PDNP's), Proved Undeveloped locations (PUDs), total proved, probable, and possible reserves. MHA has now added the HDR-1 well as a Proved Developed Producing reserve (PDPs) due to the established history of production and sales of gas to the Megabus fleet. Associated pre-tax net present value of future income for selected discount rates are presented for Reserves volumes. MHA has estimated the volumes of Contingent Resources, those volumes of gases that are discovered but are not yet considered commercially viable for extraction due to one or more contingencies. MHA has also estimated the volumes of Prospective Resources, those volumes of gases that are undiscovered, but the likelihood of their existence can be estimated. Prospective Resources thus carry significant exploration risk. All Prospective Resources volumes presented in this report are un-risked. The estimates of reserves and future net revenue for individual properties may not reflect the same confidence level as estimates of reserves and future net revenue for all properties, due to the effects of aggregation. Further, estimates of Net Present Value, either discounted or undiscounted, are a calculation of the reserve value at a given date and are not a representation of the fair market value of the company or corporation owning working interest in the project.



Renergen | March 5, 2019

Resource and reserve estimates and associated economics contained in this report are prepared in accordance with the Society of Petroleum Engineers (SPE) Petroleum Resources Management (PRMS) guidance and provides a Technical Value, defined as an assessment of a mineral asset's future net economic benefit at the valuation date under a set of assumptions deemed most appropriate by a practitioner excluding any premium or discount to account for market considerations. These estimates are aligned with the Australian Stock Exchange (ASX) rules in conjunction with the SPE PRMS guidance and specific additional rules. Our evaluation based upon data supplied by Tetra4, supplemented where necessary by MHA's corporate awareness of current South African industry costs and best practices.

RESERVE AND RESOURCE ESTIMATES

The reserve and resource estimates presented in this report have been prepared for publication in both South Africa under the SAMOG regulatory guides and Australia using an evaluation approach for unconventional resources consistent with Society of Petroleum Engineers Petroleum Resources Management System (SPE PRMS) 2018 and the SPE 2011 PRMS guidelines (attached). The reserve and resource estimates contained in this report have been prepared as of March 1st, 2019 and are generated from the data supplied to MHA from Tetra4. Sustained commercial sales of methane gas from pilots located on the Tetra4 licenses and periodic measurements of the free flow gas volumes from multiple blowers, some producing for decades, allow estimation of the gas production decline rate and thus ultimate recoverable volumes of gas.

Estimated net methane and helium reserves and net present values at Tetra4 specified discount rates are summarized in Table 1.

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Table 1: Summary of Methane and Helium Net Gas Reserves and Net Present Values at Selected Discount Rates

Virginia Gas Project - Specified Prices and Costs

	PDP	PDNP	PUDs	Total Proved (1P)	Probable	Proved +Probable (2P)	Possible	Proved+ Probable+ Possible (3P)
Methane (BCF)	.89	13.29	26.57	40.76	98.23	138.99	145.18	284.18
Helium (BCF)	.03	0.33	0.65	1.01	2.39	3.41	3.45	6.86
						Net	Present Va	lue (MZAR)
Undiscounted	466	6,462	13,440	17,069	50,367	64,477	75,065	135,196
5%	231	3,471	5,820	7,995	20,988	27,754	30,430	56,387
8%	172	2,580	4,049	5,599	14,369	19,059	20,481	38,224
10%	146	2,170	3,303	4,541	11,620	15,375	16,376	30,624
15%	106	1,502	2,175	2,878	7,516	9,788	10,301	19,242
20%	83	1,113	1,562	1,945	5,318	6,758	7,092	13,162
30%	58	695	934	978	3,104	3,699	3,929	7,127

Unrisked net Contingent Resources were calculated from the technically recoverable gas volumes for each type well multiplied by the number of locations in the portion of the Virginia Gas Field classified as Contingent Resources and, in the case of helium, multiplied by a constant helium content of 3%. These gas volumes were combined with the same prices and costs used for estimating Reserves to obtain the net Contingent Resources in Table 2 below.



Table 2: Summary of Net Methane and Helium Contingent Resources Virginia Gas Field – Specified Prices and Costs

Category Contingent Resources (BCF)	Low Case (C1)	Best Case (C2)	High Case (C3)
Methane	237.3	435.9	648.5
Helium	7.9	14.4	20,9

Unrisked gross Prospective Resources (Table 3) were calculated volumetrically as the technically recoverable gas volumes for each type well multiplied by the number of locations in that portion of the Virginia Gas Field classified as Prospective Resources. No economics were calculated for methane Prospective Resources, and no helium Prospective Resources were estimated as part of this work.

Table 3: Summary of Gross Methane Prospective Resources Virginia Gas Field

Category Prospective Resources (BCF)	Low Case	Best Case	High Case
Methane	640	1,278	2,069

PROSPECTIVE RESOURCES: The estimated quantities of petroleum that may potentially be recovered by the application of a future development project(s) relate to undiscovered accumulations. These estimates have both an associated risk of discovery and a risk of development. Further exploration appraisal and evaluation is required to determine the existence of a significant quantity of potentially moveable hydrocarbons."



STATEMENT OF RISK

The accuracy of resource, reserve, and economic evaluations is always subject to uncertainty. The magnitude of this uncertainty is generally proportional to the quantity and quality of data available for analysis. As a prospect, project, or well matures and new information becomes available revisions may be required which may either increase or decrease the previous estimates. Sometimes these revisions may result not only in a significant change to the reserves and value assigned to a property, but also may impact the total company reserve and economic status. The resources, reserves and economic forecasts contained in this report were based upon a technical analysis of the available data using accepted geoscience and engineering principles. However, they must be accepted with the understanding that further information and future reservoir performance subsequent to the date of the estimate may justify their revision. It is MHA's opinion that the estimated resources, reserves, economics, and other information as specified in this report are reasonable, and have been prepared in accordance with generally accepted geoscience and petroleum engineering and evaluation principles. Notwithstanding the aforementioned opinion, MHA makes no warranties concerning the data and interpretations of such data. In no event shall MHA be liable for any special or consequential damages arising from Renergen's use of MHA's interpretation, reports, or services produced as a result of its work for Renergen. Neither MHA, nor any of our employees have any interest in the subject properties and neither the employment to do this work, nor the compensation, is contingent on our estimates of the resources or economic evaluations for the properties in this report. This report was prepared for the exclusive use of Renergen and will not be released by MHA to any other parties without Renergen's written permission (other than the stated purpose set out above). The data and work papers used in this preparation of this report are available for examination by authorized parties in our offices.

Thank you for this opportunity to be of service to Renergen. If you have any questions or wish to discuss any aspect of the report further, please feel free to contact me.

Sincerely,

Jeffrey B. Aldrich

1 / delle

Partner

MHA Petroleum Consultants

John P. Seidle

Partner

MHA Petroleum Consultants



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BACKGROUND

Renergen's Tetra4's South Africa Virginia project, which is located in the Free State, is approximately 250 km southwest of Johannesburg. The exploration right covers a large area where gas emitting boreholes have been identified from mineral exploration activities. Several of these boreholes are flowing gas at high production rates and have been doing so for decades. Past studies have conducted a work program which involved the cataloging and sampling of the gas emitting boreholes, a soil gas geochemistry survey, and structural mapping. The gas emitting boreholes, or "blowers," were drilled by mining companies to explore for gold in Witwatersrand formations which underlie the coal-bearing Karoo and Ventersdorp lavas. Some flowing wells were capped because of what was regarded as dangerously high gas emission rates. Tetra4 now owns 100% working interest in 187,427.2189 hectares (Figure 1) that currently has 18 wells currently producing gas and 28 wells that are known to have produced gas in the past but are now currently capped.

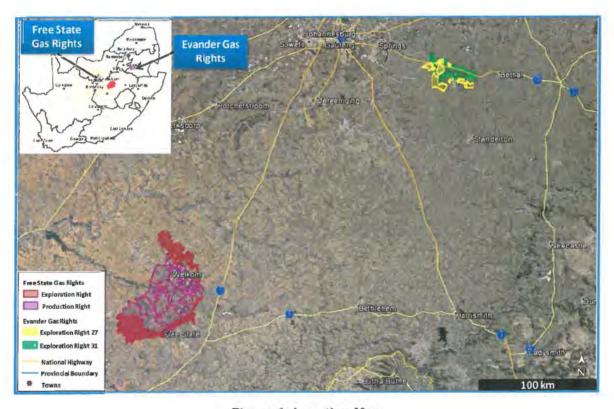


Figure 1: Location Map



The Tetra4 Production License is subject to a 5% state tax plus an overriding royalty (ORRI) on certain concurrent leases that are owned by GFI Mining South Africa (GFIMSA) of Goldfields. The Goldfields ORRI is an additional 1% on top of the state tax on all wells and locations that are located within the Goldfields mining leases. These two reductions in the revenue stream, the state tax and the GFIMSA ORRI, have been accounted for in the economic analysis.

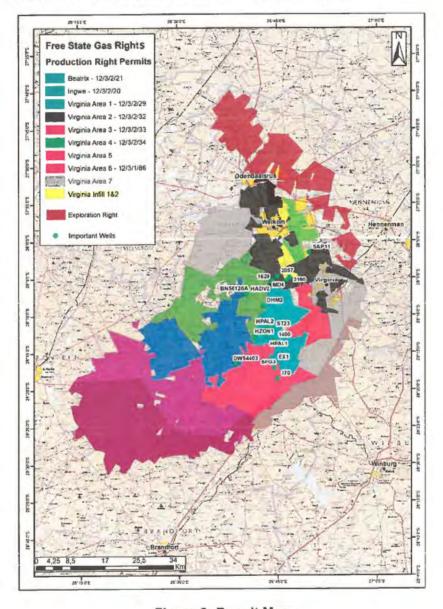


Figure 2: Permit Map



GEOLOGY

REGIONAL GEOLOGY

The Virginia Gas Field Project overlies Witwatersrand Precambrian age Supergroup of metasediments that host the Welkom Goldfield. These 'basement' lithologies have been tectonically flexed into a large north to south trending anticline that is in turn bisected by a large extensional graben (low area) and many large faults that extend deep into the earth's crust. Uncomfortably overlying the Witwatersrand Supergroup is the Venterdorp Supergroup of primarily volcanic lithologies. Many of the larger faults do not extend beyond the upper Ventersdorp formations. After another large unconformity lies the Karoo Supergroup, a Permian aged sedimentary section composed of sandstones, coal seams and carbonaceous shales. There is often a basal glacial deposit on top of the unconformity that separates the Karoo from the Ventersdorp known as the Dwyka Tillite.

The primary source of the Methane gas is primarily microbial in origin from deep within the Witwatersrand Supergroup with groundwater circulating through the large faults and coming in contact with bacteria living deep within the crust. Methane isotope studies demonstrate that very little, if any, of the methane can be attributed to the Karoo coal beds or the carbonaceous shales. Thus, the methane is a biogenic and a continuing renewable resource. Being a renewing resource conventional in-place, static, estimates of gas volumes are not applicable and the authors of this study have instead relied on pressure decline analysis. The helium, as with almost all helium around the world, is either mantle-derived, that is from deep within the earth or from decay of radioactive minerals within the crust, and as the helium moves up the large faults mixes with the microbial methane in the deep subsurface.



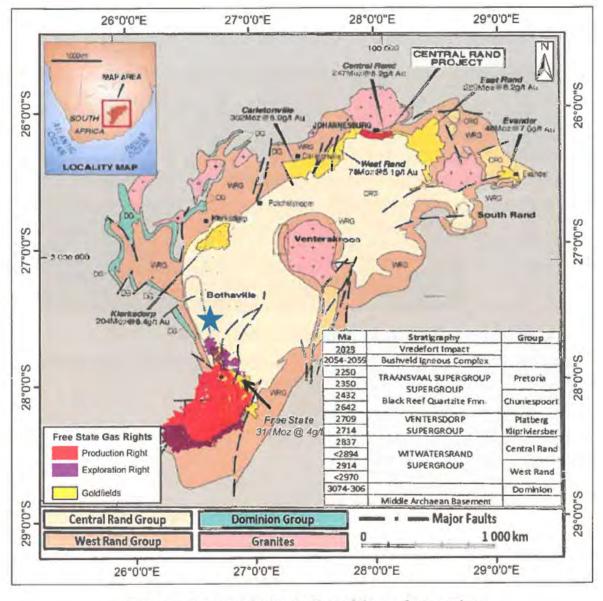


Figure 3: Regional Geologic Map of the surface geology.

The Virginia Gas Project is annotated in the southwest corner of the map.



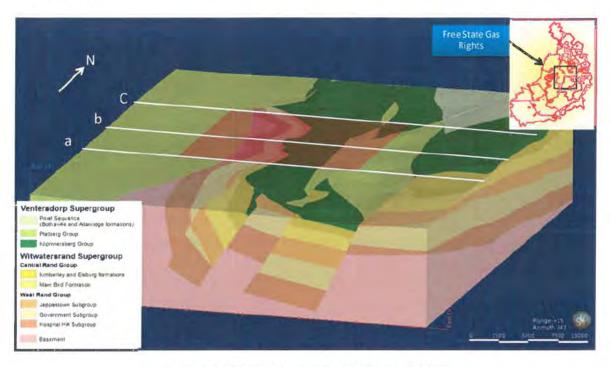


Figure 4: Map of Known Rand Group Faults

The known gas wells are associated with the wells intersecting the faults that penetrate the Witwatersrand Supergroup.



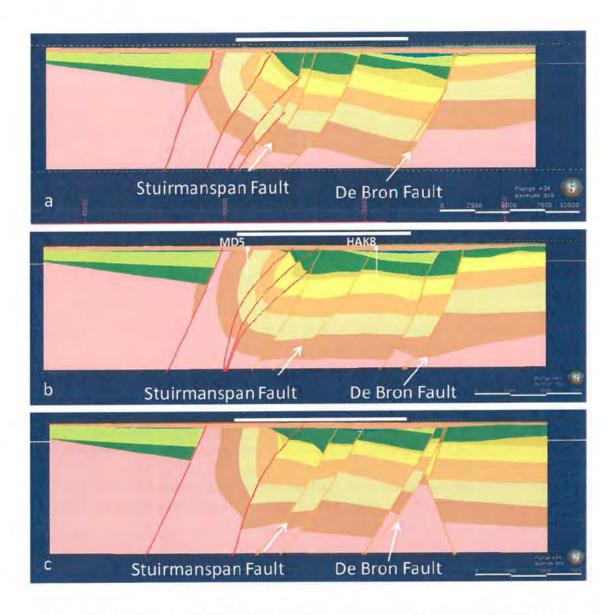


Figure 5: West to East Cross-Section within the area of the Virginia Gas Project

Demonstrating the tilted nature of the rock strata and the penetration of the faults into the Witwatersrand Supergroup.



EXISTING WELLS AND PRODUCTION HISTORY

HISTORIC WELLS

There are nearly two thousand wellbores which have been drilled, either for water, mining assessment, or for disposal, across the Welkom District over the past several decades and many tens of these wells have naturally produced flammable gas and have been called "blowers." Data from the South Africa Council for Geosciences lists at least 136 historic wells within the production area and notes that 68 of them produced gas in the past, 18 are currently producing gas (blowers), 29 have odors, and 28 are dormant.

EVALUATED WELLS

Twelve wells were evaluated for the original 2008 Molopo reserves evaluation study (Burning Flame, Burning Cross, Flame 1, ML-1, Retreat, Sand, SP-3, Squatter, DBE-1, Kotze EX-1, ST23, and Tewie). Molopo drilled three additional wells in 2009 (HADV1, HADV2, and HADR1). Tetra4 took over the project and drilled 4 wells in 2016 (MDR1, MDR4, MDR5 and 2057) and in 2017 reworked an older well that had resumed flowing gas (2190).

For the 2019 update MHA has included a new well that Tetra4 drilled in 2018, the T4 WN 01, which was drilled to test a shallow conventional sandstone play, plus 12 historic wells or vents (AD1A, SH3, P7, W1, SP8, TR3, TR4, TR5, TR6, TR7, TR8, and AL4) that were described in the publication of Hugo, P.: "Helium in the Orange Free State Gold-Field" (1963) which documented these wells and vents as far back as 1957. Using the published data and on-site verifications, as possible, these wells were added to the Tetra4 database. The importance of this data is twofold, A) the new well opens an additional play for Tetra4 within the lease area and B) the data from the historic wells support both the longevity of the wells and the gas composition; including the high helium concentrations.



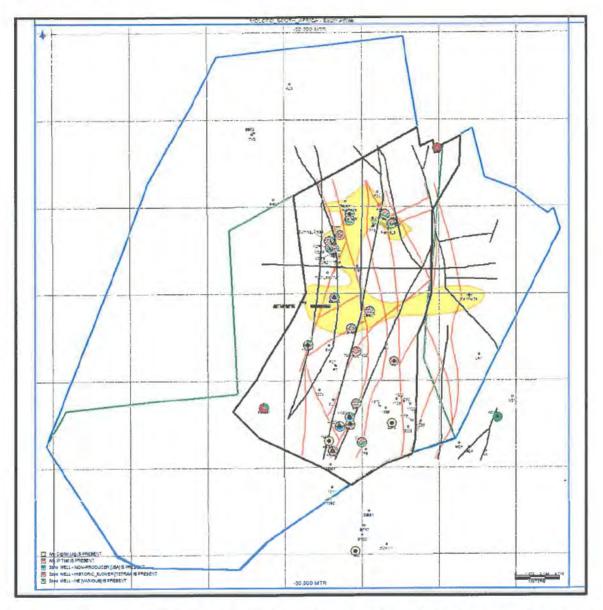


Figure 6: Map of the Tetra4 well Control and the New "White Sandstone" Play Existing wellbores are annotated with circles.



METHODOLOGY

Data Set

Tetra4 delivered to MHA driller's logs, completion reports, LAS files, gas analysis reports, production test data, and license data from the Virginia Gas Fields Project in the Free State in South Africa.

Analysis

MHA reviewed the well data, LAS files, gas analysis reports, production test data, and historical geological data to ascertain the source of the gas, reservoir conditions, reservoir extents, Tetra4 development plans and market conditions.

Table 4: List of Existing Blowers (PDNP wells)

Tetra4 Existing Methane Producers	CH4 Producer	He Producer
HDR 1	X	X
BEI 02	X	Х
Burning Cross	х	Х
EX 1	х	X
Highpipe	Х	X
HZON 1	х	Х
MDR 5	X	X
ML1	х	Х
Retreat	х	Х
ST 23	х	X
SPG 3 \ Lucky	×	X
Squatter	X	Х
Tewie-1400	X	X
Burning Flame	X	X
DBE 1	х	х
SP 3	х	X
Flame 1	х	
Sand	x	
BN 56120A	×	X
2190	Х	X



VOLUMETRICS

PAST STUDIES

Volumetric Assessments have been conducted by MHA Petroleum Consultants in 2008 and by Venmyn-Deloitte in 2015 and 2016. The 2008 MHA study analyzed 12 existing blowers and concluded that the best well decline rates ranged from 3 to 7% with an economic cutoff of 30,000 scf/day. Initial production rates ranged from a low of 150,000 scf/day to a high of 380,000 scf/day with a best case of 260,000 scf/day. The MHA study determined that the Estimated Ultimate Recovery (EUR), on a per well basis of marketable gas, varied from a Low case of 0.9 BCF to a High Case of 2.6 BCF with a Best Case of 1.7 BCF.

The 2016 Venmyn-Deloitte assessment was done after the HADV1, HADV2, HDR1, HPAL1, HZON1, MDR1, MDR4, MDR5, and 2057 wells were drilled. In drilling these 9 wells, there were 7 wells with gas shows and 5 wells that had sustained gas production. The Venmyn-Deloitte report concluded that the decline rates averaged from 2 to 6% but did not use an economic cut off to calculate the EURs. They ran their range of Initial Production rates from 140,000 scf/day to 300,000 scf/day and used 150,000 scf/day as the Best Case. The production runs were allowed to run out 49.5 years into the future, which gave a slightly optimistic EUR. The EURs that were presented in the report ranged from a Low case of 0.9 BCF to a High Case of 3.5 BCF.

The 2008 MHA report assigned 54 locations to the P2 (Probable) Reserve Category, an additional 63 locations to the P3 (Possible) Reserve Category, and no locations to the Proved Category. There were 357 locations assigned to the Contingent Resources Category.

The 2016 Venmyn-Deloitte report assigned 52 locations to P1 (Proved), 60 to the P2 (Probable), and 128 locations to P3 (Possible). Thus far, at best 17 wells that have tested gas, and a drilling program that has about a 60% commercial success rate Venmyn-Deloitte assigned 240 well locations to the Reserve Category and with 22% of the locations having a 90% confidence factor of delivering the base case EUR. There were no Contingent Resources assigned.

In 2017 MHA conducted another assessment (below) for IDC reviewing the updated test information and new wells. This report, prepared for an update on the JSE Stock Exchange News Service, draws substantially from the IDC Report, with permission from IDC. It uses the IDC 2017 Reserve and Resource volumetric assessments but generates a different economic analysis based on the complete 1P-2P-3P volumes of gas rather than a limited first phase field development plan that was used for the 2017 IDC report.

2017 Assessment

MHA reviewed the updated test data from the HADV1, HADV2, HDR1, HZON1, MDR1, MDR5, and 2057 wells plus addition flare and test data from selected historic blowers. This data confirmed, but did not alter, MHA's original assessment of a range of well performance and lacking sustained, long-term, well production data MHA did not change either the range of expected decline rates nor the range of expect EURs for the wells. MHA expected the current ranges captured the inherent



uncertainties and as more data is made available through sustained production the range of uncertainties will be reduced.

The continued drilling and testing, plus the advancement of gas sales agreements and Tetra4's advancement of development and marketing plan allowed MHA, in 2017, to elevate many of the locations into the PROVED category. MHA assigned Proved, Developed, Non-Producing (PDNP) status, on a project basis subject to the submitted Tetra4 development plan and budget, to all wells that have tested significant rates of gas and assigned two offset Proved Undeveloped (PUD) locations to each well, except for well MDR5 which has no offset locations. Thus, MHA assigned 18 PDNP and 34 PUD locations for 52 Proved well locations. In addition MHA assigned 4 Possible and 4 Probable well locations for seventeen PDNP locations; thus, there were 68 Possible and 68 Probable locations for a total of 188 total Reserve locations. All offset wells were expected to be drilled on a spacing of about 1well\ 0.91 km2 or 225 acres. It is important to note that wherever MHA has assigned an undrilled location it is for the purposes of accounting for undrilled reserves and may not be the exact location that Tetra4, for operational or permitting reasons, chooses, to drill. All wells in the program and economics were planned as vertical wells however Tetra4 had expressed interest and had started planning for slant wells that might intersect more fault and fracture surfaces. As this style of wells had not been executed at of the time of this report MHA did not include them in the economics nor construct a type curve for these wells, however as Tetra4 demonstrates its ability to execute these style of wells and these wells have improved economics it is possible that, with measurable flow data, MHA will be able to forecast increased recoveries per well with slant or horizontal style wells.

2019 Assessment

MHA has reviewed the updated production from the HDR1 well, limited single test data from other wells that are not currently on production and the data from the 2018 Tetra4 T4 WN 01 well that was drilled to test the shallow "White Sand" play towards the eastern edge of the license. MHA has also reviewed the Tetra4 updated drilling schedule, OPEX and CAPEX costs and sales agreements in order to update the MHA financial model.

The "White Sand" play Is a Permian Karoo age sandstone that was identified in a 44 borehole study by Shango Solutions commissioned by Tetra4 as part of a broader study of the fractured basement play. Gas flows from the Permian sandstone were identified in 3 wells (2057, 2089, and HAK4) and a 3D model of the sandstone was developed. Tetra4 extended that model and drilled the T4 WN 01 well beyond the initial boundaries defined by Shango Solutions and encountered 73 meters of gas bearing Karoo sandstone and siltstone with the well. This well did not test gas at commercial rates however the potential for this play, as a conventional, low pressure, gas resource, to potentially add to the future resource and future reserve base of Tetra4 has been established by four wells penetrating the sandstone over a wide area, each with good gas content. As Tetra4 continues to evaluate this play MHA will use the new data to assess the ability to add new volumes to Tetra4's reserve and resource base.

Additionally, Tetra4 has added data from 2 existing blowers to the database and MHA has reviewed this data and confirmed that both wells, BN 56120A (AKA Dumidi) and 2190 (AKA Big Flame) are Proved Developed Non-Producing (PDNP) wells, and each will have 2 offset, Proved Undeveloped



(PUD) locations, 4 Probable, and 4 Possible locations assigned to each well for a total of 22 new reserve well locations. These new reserve locations, and volumes are removed from the Contingent Resource volumes of the 2018 Report.

Based on this discussion the Technically Recoverable Methane Volumes associated with the reserve categories are referenced in Table 5 (below).



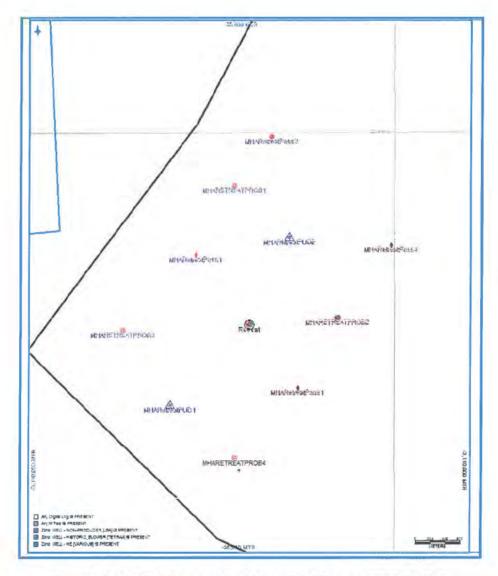


Figure 7: Idealized Spacing of New Field Development Wells

Idealized spacing of an existing Blower (Retreat) and a symmetrical spacing of two PUD wells (blue triangles), four Probable wells (red hexagons), and four Possible wells (small red diamonds).



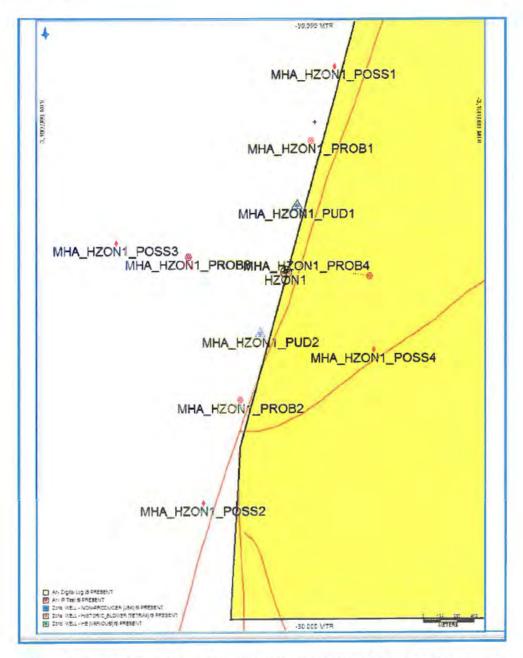


Figure 8: Typical Spacing of Field Development Wells Influenced by Faults

A more typical development scenario where wells are spaced out along known fault and fracture spacing around an existing blower, HZON1 with two PUD wells (blue triangles), four Probable wells (red hexagons), and four Possible wells (small red diamonds).



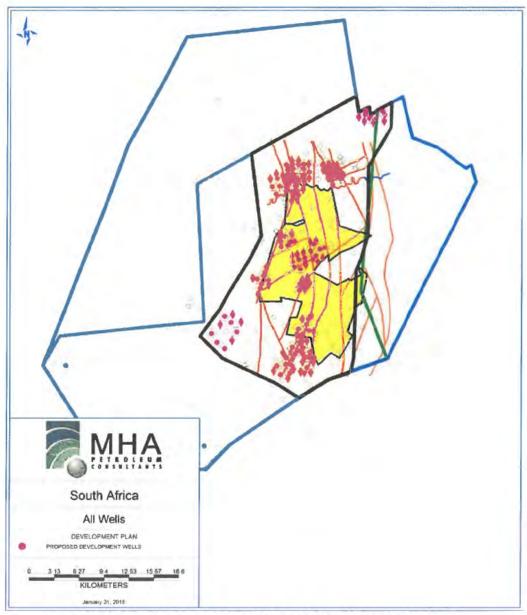


Figure 9: Map Proved, Probable and Possible well locations

Map of the existing wells and the future wells with Proved Iocations (Blue Triangles with purple centers), Probable Iocations (Red Hexagons with purple centers) and Possible Iocations (small Red diamonds with purple centers). In the black outline is the area defined as the "Core Area" for the Contingent Resources. All Prospective Resources are outside of the "Core Area."



Table 5: Technically Recoverable Methane Volume Estimates-Virginia Gas Field

Category	Recoverable	Totals (Bcf)		
200	Developed	Undeveloped		
Proven (1P)	15.7	29.5	45.3	
Probable (P2)		109.2	109.2	
Possible (P3)		161.3	161.3	
Total (P+P+P)	15.7	297.0	315.8	

Possible reserves are those additional reserves that are less certain to be recovered than probable reserves. There is a 10% probability that the quantities actually recovered will equal or exceed the sum of proved plus probable plus possible reserves

MHA has defined a core area that has been delineated by drilling and testing within the production license of 505.12 Km2. Within that area are 19 development locations of 11 wells each (209 well locations) and a reserve development area of approximately 190 Km2 or 0.91km2/well. Possible reserves are those additional reserves that are less certain to be recovered than probable reserves. There is a 10% probability that the quantities actually recovered will equal or exceed the sum of proved plus probable plus possible reserves. Removing the 190 Km2 that have been assigned to the Reserve area from the total 505.12 Km2 in the core production area leaves 315.12 Km2 of area in the Contingent Resource Category. With a well spacing of 0.91 Km2/well that equates to 346 contingent wells. MHA assigned volumes to these wells probabilistically using a range of EURs, with the C1 category of 0.9 BCF/well, C2 category 1.7 BCF/well and C3 category 2.6 BCF/well. Contingent Resources are considered discovered however there is no certainty that it will be commercially viable to produce any portion of the resources.

Table 6: Technically Recoverable Contingent Methane Volume Estimates of the Virginia

Gas Field

Category	EUR/Well	Total BCF
Contingent (C1)	0.9	294.8
Contingent (C2)	1.7	529.7
Contingent (C3)	2.6	952.0

MHA has assigned all of the production area outside of the defined core area as Prospective Resource area. This area has historic gas blowers on the license, there are existing deep gold and other metal mines and there are, in the South African Geologic Survey and literature, mapped faults that extend deep into the sub-surface. There is reasonable expectation that there will be the same type of gas occurrences within the rest of the production area however neither the historic operators nor the current operators of the license have delineated the resource to an extent that it can be considered a Contingent Resource. MHA has taken the same range of EURs/well as in the Contingent Resource area but has, until there is sufficient information to warrant updating the evaluation, doubled the distance between the wells from the well spacing used in the Contingent Resource evaluation area to 1.82 Km2/well. There is no certainty that any portion of the



resources will be discovered. If discovered, there is no certainty that it will be commercially viable to produce any portion of the resources.

The entire production license is 1,874.2 Km2 and once the 505.12 Km2 core production area is removed their remains 1,369.08 Km2 of Prospective Resource area. Using a 1.82 Km2/well density that will equate to an unrisked, a potential 752 wells. MHA has run a probabilistic distribution of recoverable volumes using the range of EURs calculated for the recoverable methane in the development area. No helium is assessed as there is insufficient information at this time.

Table 7: Technically Recoverable Prospective Methane Volume Estimates of the Virginia

Gas Field

Category	EUR/Well	Total BCF
Prospective Resource Low Estimate	0.9	640.6
Prospective Resource Best Estimate	1.7	1,278.4
Prospective Resource High Estimate	2.6	2,068.9

PROSPECTIVE RESOURCES: The estimated quantities of petroleum that may potentially be recovered by the application of a future development project(s) relate to undiscovered accumulations. These estimates have both an associated risk of discovery and a risk of development. Further exploration appraisal and evaluation is required to determine the existence of a significant quantity of potentially moveable hydrocarbons."

TECHNICALLY RECOVERABLE HELIUM RESERVES

MHA has used the He concentration data supplied by Tetra4 to map the spatial distribution of He enrichment in the produced gases. Seven of the tested wells tested Helium (He) concentrations at least 2% by volume or greater and some of wells tested over 10%; including the 2057 well. The 2016 Venmyn-Deloitte report made the assumption that all wells would produce an average of 2% He and all wells would be scrubbed for He and the He sold. MHA has used the data available and mapped out the He concentrations by well and found that there appears to be a significant enrichment trend on the west side of the De Bron fault with all wells to the east of the fault showing no testable He concentrations, at least until you cross the Virginia fault and move further east. Only the AD1 well, outside of the production license and well to the east of the Virginia fault, shows enrichment of He gas on the eastern side of the production area. It is very important to note that there is A) a sparsity of well sampling over the structural high, B) most of the wells that did have gas compositional sampling did not sample for helium, and C) there is antidotal evidence that even those wells that attempted to sample for helium used improper methodologies. It is therefore a distinct possibility that there is sufficient helium concentration over the entire lease for gathering and commercial sales and once sufficient data is gathered the maps are subject to revision.

This area of low to zero concentrations coincides with a structural high of the Base of the Karoo. All other known readings of He gas east of the De Bron fault until the Virginia fault is crossed, appear, at this time until more data is available, to have low to zero enrichment of He. Thus, MHA has



assigned He reserves only to a mapped area in the center of the production license but has increased the average He concentration in those wells to 3-4%. Gas percentages of up to 4% are found in this zone and an average He concentration of 3.05% over 202.4 Km2 has been mapped. Within the mapped He concentration area MHA has 7 known blowers or wells that all have tested greater than 2% He concentrations. Within the concentration area MHA has mapped an additional 14 Proved well locations, 26 Probable well locations and 27 Possible well locations. The estimated volumes of technically recoverable helium are shown in Tables 8 and 9.



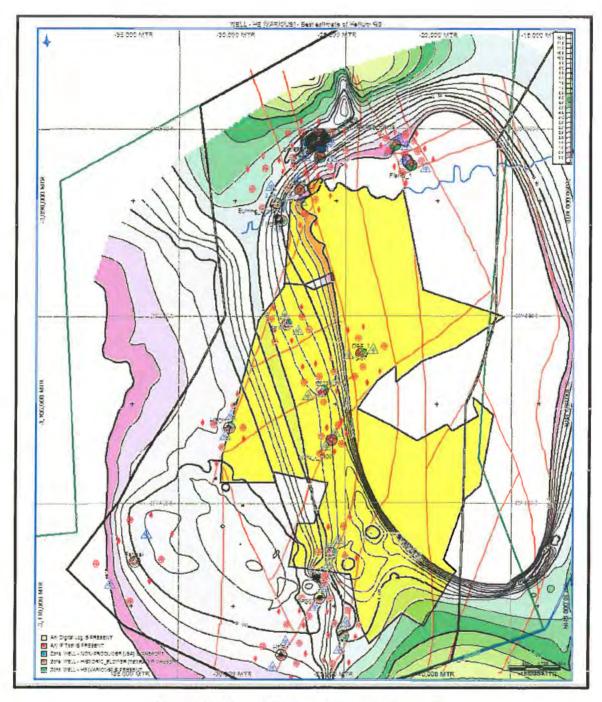


Figure 10: Map of Helium Concentration in %

Wells with measured helium concentrations have green annotations. The Yeliow polygon is the area of the Goldfields Mining Lease.



Table 8: Technically Recoverable Helium Estimates of the Virginia Gas Project

	# of Wells	EUR (BCF)	He%	He/Well (BCF)	Reserves
PDP	1	1.2	0.0305	0.0366	0.0366
Proved Dev NP	14	0.9	0.0305	0.02745	0.3843
PUD	28	0.9	0.0305	0.02745	0.7686
Prob	56	1.7	0.0305	0.05185	2.9036
Poss	56	2.6	0.0305	0.0793	4.4408
Total (P+P+P)	155				8.5339

Table 9: Technically Recoverable Helium Volume Estimates by Contingent Resource Category - Virginia Gas Field

Number of Wells	Low Case (C1)	Best Case (C2)	High Case (C3)
	(Bcf)	(Bcf)	(Bcf)
346	10.1	19.1	29.2

ECONOMICS

TETRA4 OPERATING CONDITIONS AND SALES AGREEMENTS

Tetra4 operates under a Production License from the Petroleum Authority of South Africa and must pay a 5% royalty based on wellhead price to the South African Revenue Service. An additional royalty of one percent of wellhead price is owed to the GFI Mining South Africa (GFIMSA) or Goldfields on all new wells located on their existing licenses.

Tetra4 plans to sell 30% of its LNG production into the local wholesale LNG market and 70% into the local transport market.

Tetra4 has provided to MHA a signed Gas Sales Agreement (GSA) with Unitrans Passenger Limited (Megabus) for the purchase of natural gas. The gas will be sold in liquefied state by the liter, and the purchase price is indexed to a local pricing point for sulphur free diesel at the Megabus purchase price minus a 30% discount.



Renergen has disclosed to its shareholders and MHA that several original engine manufacturers (OEMs) have agreed to begin manufacturing LNG capable heavy trucks for the South African market, although these agreements are not with Renergen nor Tetra4 directly. This has the potential to accelerate the market for liquid fuel gas in South Africa that Tetra4 wishes to supply as Tetra4 has been supplying to Megabus. It is anticipated that as these agreements are completed Tetra4 can potentially move forward its field development plan.

Tetra4 has also provided MHA a signed Gas Sales Agreement with Linde Global Helium (Linde) for the purchase of Helium gas at the price point of approximately \$200/mcf escalating according to US CPI index.

Renergen has entered into a commitment letter with OPIC, the United States' government development finance institution, for OPIC to provide capital assistance for the development of the helium resource, indicating the United States' government's level of interest in the Virginia Gas Project as part of the global helium supply system.

The Tetra4 field development plans call for the construction of a gas gathering system, setting compression, the installation of the above-mentioned gas processing facilities and as production increases, an expansion of the entire system. MHA has reviewed Tetra4's detailed plans for abandonment and rehabilitation of the wells and all infrastructures that have been submitted to, and accepted by, the Petroleum Authority of South Africa (PASA). These plans meet, and in places exceed, governmental regulations for abandonment, rehabilitation, and monitoring.



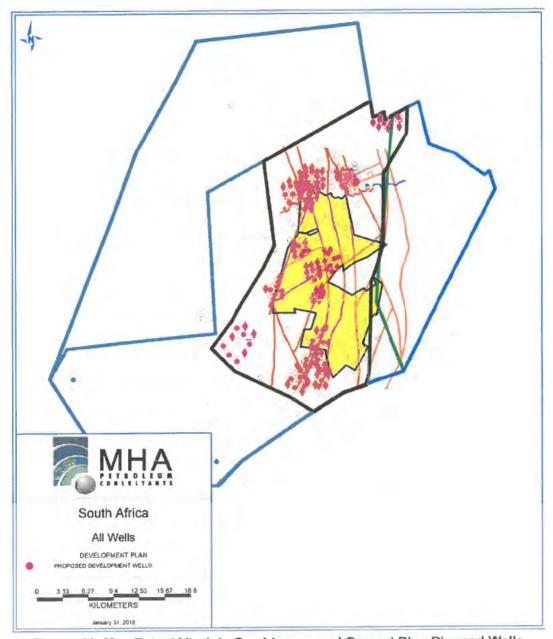


Figure 11: Map Tetra4 Virginia Gas License and Current Plus Planned Wells



ECONOMIC PARAMETERS

Proved Developed Producing Well

Sufficient production data are now available to classify the HDR-1 well as Proved Developed Producing (PDP) reserves. Decline curve analysis of this well (Figure 12) yields a shallow decline of 4.73%/yr.

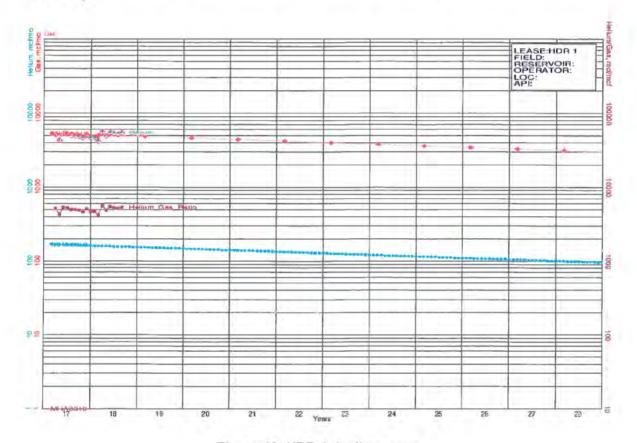


Figure 12: HDR-1 decline curve

Type well rates and recovery are on a gross gas volume. Produced gas volumes were multiplied by 0.9 to account for 10% impurities in the produced gas stream and were subject to a 5% shrink. Helium production was forecasted from methane production volumes and the assumed 3% helium in the wellhead gas stream. The estimates of reserves and future net revenue for individual properties may not reflect the same confidence level as estimates of reserves and future net revenue for all properties, due to the effects of aggregation.



Capital Costs

Well drilling and completion CAPEX was 1.5 mZAR per well. The recent drilling campaign of 9 wells resulted in 5 producers and 4 dry holes. This dry hole risk of roughly 40% was addressed by decreasing the type well gas production rate by a factor of 0.6. Connection CAPEX was 1.0 mZAR per well. Pipeline capital of 170 mZAR was allocated into two payments of 68 mZAR (scheduled for May 19 and Dec 19) and one payment of 34 mZAR (in May 20). Capital for the initial methane and helium liquefaction plants was 121.48 mZAR and 52.48 mZAR, respectively. Development of the Virginia Field will require additional liquefaction plants for each 6 mmcfd increment in gross gas production. CAPEX for these additional methane and helium liquefaction plants was 180.0 mZAR and 100.0 mZAR, respectively. Based on the three type wells discussed above, new plants will be required for every 40 1P wells drilled (6 mmcfd/150 mcfd per well), every 24 2P wells, and every 16 3P wells. All capital costs were escalated at 2 %/yr.

Operating expenses

Fixed lease operating expenses (LOE's), assigned at the plant level rather than individual wells, were 1,500 mZAR per month. The variable OPEX was 13.9 ZAR/mcf, reflecting truck transport of the methane and helium. All operating expenses were escalated at 2%yr until the price doubled then the LOE was held constant for the life of the project.

Prices

The methane price was a blended price reflecting the 30%/70% split between the wholesale and transport sectors discussed above. The wholesale LNG price of 217 ZAR/mcf was escalated at the South African CPI of 6%/year and the transport LNG price of 171 ZAR/mcf was escalated based on historical diesel prices, 10%/yr. The resulting blended price was 236 ZAR/mcf and escalated at 9%/yr. The blended price was held constant once the initial price had doubled.

The initial helium price of 2863 ZAR/mcf (200 USD/mcf) was held constant for the first two months then was escalated at the average US CPI of 2.4%/yr. forecast. Monthly methane and helium prices are plotted in Figure 14 and listed in Appendix 1.



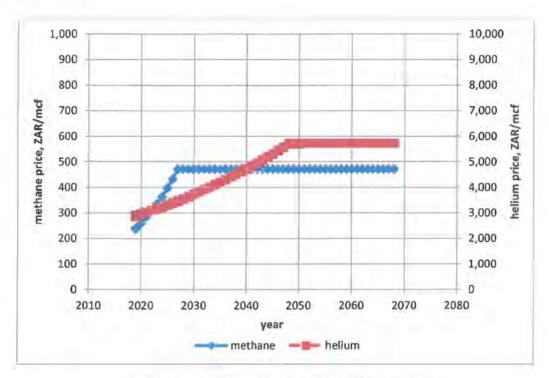


Figure 13: Methane and Helium Monthly Prices

MHA assumed a methane BTU factor of 1.01 Gj/mcf (0.960 mmbtu/mcf). Shrink, which accounts for gas used by the plant, measurement imbalances, and surface losses as well as helium extraction, was assumed to be a constant 5 % throughout the life of the field. All wells are burdened with a 5% overriding royalty interest (ORRI) on the wellhead gas price plus those wells in the Goldfields area are subject to an additional 1% ORRI. The well counts associated with field development of Reserves and Contingent Resources are given in Table 10 below.



Table 10: Wellcount by Reserve and Contingent Resource Category

Reserves	PDNP	Total Proved (1P)	Probable	Proved + Probable (2P)	Possible	Proved + Probable + Possible (3P)
Number of wells	19	58	76	134	76	210
Contingent Resources		Low Case		Best Case		High Case
Number of Methane wells		346		346		346
Number of He wells		346		346		346

RESERVE ECONOMICS

Based on the economic parameters discussed above, reserves and economics were calculated for the Virginia Gas Field. Gross and net methane and helium reserves based on a 10% discount rate are collected in Table 11.



Table 11: Gross and Net Methane and Helium Reserves at a 10% Discount Rate

1P Reserve Cat	Gross CH4 (MMCF)	Gross Helium (MMCF)	Net CH4 (MMCF)	Net Helium (MMCF)
TOTAL PDNP	14,765.3	346.0	13,288.8	327.7
TOTAL PUD	29,526.1	691.9	26,573.5	655.3
TOTAL 1P PRV	45,285.1	1,069.5	40,759.0	1,013.1
2P Reserve Cat	Gross CH4 (MMCF)	Gross Helium (MMCF)	Net CH4 (MMCF)	Net Helium (MMCF)
TOTAL PDNP	14,765,3	346.0	13,288.8	327.7
TOTAL PUD	29,526.1	691.9	26,573.5	655.3
TOTAL PROVED	45,285.1	1,069.5	40,759.0	1,013.1
TOTAL PROBABLE	109,146.6	2,528.4	98,231.8	2,394.7
TOTAL 2P PRV+PRB	154,431.7	3,597.9	138,990.9	3,407.8
3P Reserve Cat	Gross CH4 (MMCF)	Gross Helium (MMCF)	Net CH4 (MMCF)	Net Helium (MMCF)
TOTAL PDNP	14,765.3	346.0	13,288.8	327.7
TOTAL PUD	29,526.1	691.9	26,573.5	655.3
TOTAL PROVED	45,285.1	1,069.5	40,759.0	1,013.1
TOTAL PROBABLE	109,146.6	2,528.4	98,231.8	2,394.7
TOTAL POSSIBLE	154,431.7	3,597.9	138,990.9	3,407.8
TOTAL 3P PRV+PRB+POS	315,749.7	7,238.6	284,176.8	6,856.1



At the request of Tetra4, net present values associated with the reserves volumes were calculated for various discount rates. The results are shown in Table 12.

Table 12: Virginia Gas Field - Methane and Helium Reserves Net Present Values for Selected Discount Factors, mZAR

Discount Factor	PDNP	Total Proved (1P)	Probable	Proved + Probable (2P)	Possible	Proved + Probable + Possible (3P)
Undiscounted	6,462	17,069	50,367	64,477	75,065	135,196
5%	3,471	7,995	20,988	27,754	30,430	56,387
8%	2,580	5,599	14,369	19,059	20,481	38,224
10%	2,172	4,541	11,620	15,375	16,376	30,624
15%	1,502	2,878	7,516	9,788	10,301	19,242
20%	1,113	1,194	5,318	6,758	7,092	13,162
30%	695	978	3,104	3,699	3,929	7,127

CONTINGENT RESOURCE ECONOMICS

According to the PRMS guidance economics are not required, nor normally run, on Contingent Resources as by definition contingent resources have not met the threshold of "commerciality" due to one or more contingencies. Per Renergen's request, MHA has run Contingent Resource economics for the Virginia Gas Project utilizing costs and prices discussed above. The resulting gas volumes and associated un-risked net present values are in Table 13 below. Contingencies to be resolved include quantification of in-place methane volumes and recharge rates of this biogenic gas play and confidence that the proposed development program will not deplete the contingent resource gas volumes.



Table 13: Net Methane and Helium Contingent Resources and Net Present Values
Virginia Gas Field - Specified Prices and Costs

	Low (C1)	Best (C2)	High (C3)
Methane (BCF)	237	435	648
Helium	7.9	14.4	20.8
Net Present Value (M	ZAR)		
Undiscounted	126,597	234,899	349,070
5%	48,886	89,010	131,607
8%	31,470	56,968	84,118
10%	24,344	43,970	64,899
15%	14,014	25,269	37,300
20%	8,802	15,897	23,489
30%	4,059	7,392	10,958

CONCLUSIONS

Based on analysis of technical and economic data provided by Tetra4, MHA has estimated methane and helium Reserves and Resources for the Virginia Gas Field under SPE PRMS and SAMOG guidance's. Estimated Reserves and Contingent Resource gross and net methane and helium volumes are presented in Table 14. Net present values of the Reserves as requested discount rates are given in Table 12 above.

Table 14: Virginia Gas Field - Gross and Net Methane and Helium Reserves and Contingent Resources

Reserve Cat	Gross CH4 (MMCF)	Gross Helium (MMCF)	Net CH4 (MMCF)	Net Helium (MMCF)
RESERVES				
TOTAL 1P	45,285.0	1069.5	40759.0	1013.0
TOTAL 2P	154,431.7	3597.9	138,990.8	3407.8
TOTAL 3P	315749.7	7238.6	284,176.8	6856.0
CONTINGENT	RESOURCES			
TOTAL C1	262,978.3	8362.7	237,337.9	7944.5
TOTAL C2	483,058.3	15168.0	435,960.1	14409.6
TOTAL C3	718,612.4	21989.5	648,547.7	20890.0



QUALIFICATIONS

Jeffrey B. Aldrich is a Partner in MHA Petroleum Consultants, Inc. (MHA) and is a Certified Petroleum Geologist, #6254, by the American Association of Petroleum Geologists (AAPG) and a Licensed Professional Geoscientist, #394; He is an active member of the AAPG and the Society of Petroleum Engineers (SPE). He has over thirty years as a practicing petroleum geologist/geophysicist and over twenty years of experience in oil and gas reserve evaluations. He holds a Bachelor's of Science degree in Geology from Vanderbilt University and a Master's of Science degree in Geology from Texas A&M University. He is an instructor in the PetroSkills Alliance and is the Course Director for "Prospect and Play Analysis", Evaluating and Developing Shale Reservoirs", "Unconventional Resource and Reserve Estimation", and "Coalbed Methane Reservoirs".

John Seidle is a Partner and Senior Reservoir Engineer with MHA Petroleum Consultants LLC in Denver, Colorado. He has more than thirty-five years of experience in unconventional gas and oil reservoir engineering in domestic and international plays. His current duties include unconventional reservoir engineering, reserve studies and economic evaluations, unconventional well performance analysis, and serving as an expert witness for litigation and regulatory hearings. Dr. Seidle is an instructor for industry classes, primarily unconventional reservoirs. Privileged to work with others on over 29 technical papers, he is the author of "Fundamentals of Coalbed Methane Reservoir Engineering". John is editor and chapter author of SPEE Monograph 4, "Estimating Ultimate Recovery of Developed Wells in Low-Permeability Reservoirs". He received a PhD in Mechanical Engineering from the University of Colorado, is a member of SPE, AAPG, and SPEE, and is a Registered Professional Engineer in Colorado, Oklahoma, and Wyoming. Unconventional reservoir experience includes USA, Canada, Australia, China, India, South Africa, New Zealand, Colombia, Mexico, France, UK, Turkey, Poland, Mongolia, Ukraine.



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APPENDIX 1: METHANE AND HELIUM PRICES

As discussed above, the methane price was a blended price reflecting the 30%/70% split between the wholesale and transport sectors discussed above. The wholesale LNG price of 217 ZAR/mcf was escalated at the South African CPI of 6%/year and the transport LNG price of 171 ZAR/mcf was escalated based on historical diesel prices, 10%/yr. The resulting blended price was 236 ZAR/mcf and escalated at 9%/yr. The blended price was held constant once the initial price had doubled.

The initial helium price of 2863 ZAR/mcf (200 USD/mcf) was held constant for the first two months then was escalated at the average US CPI of 2.4%/yr. forecast.

Annual methane and helium prices are listed in Table A.1 below.

year	methane, ZAR/mcf	helium ZAR/mcf	year	methane, ZAR/mcf	helium ZAR/mcf
2019	236	2,863	2044	471	5,180
2020	257	2,932	2045	471	5,304
2021	280	3,002	2046	471	5,432
2022	306	3,074	2047	471	5,562
2023	333	3,148	2048	471	5,695
2024	363	3,224	2049	471	5,695
2025	396	3,301	2050	471	5,695
2026	432	3,380	2051	471	5,695
2027	471	3,461	2052	471	5,695
2028	471	3,544	2053	471	5,695
2029	471	3,629	2054	471	5,695
2030	471	3,716	2055	471	5,695
2031	471	3,806	2056	471	5,695
2032	471	3,897	2057	471	5,695
2033	471	3,991	2058	471	5,695
2034	471	4,086	2059	471	5,695
2035	471	4,184	2060	471	5,695
2036	471	4,285	2061	471	5,695
2037	471	4,388	2062	471	5,695
2038	471	4,493	2063	471	5,695
2039	471	4,601	2064	471	5,695
2040	471	4,711	2065	471	5,695
2041	471	4,824	2066	471	5,695
2042	471	4,940	2067	471	5,695
2043	471	5,059	2068	471	5,695



APPENDIX 2: RESERVE CATEGORY CASH FLOW

PIPELINE AND PLANT COSTS

DATE : 02/22/2019
TIME : 17:45:01
DBS : MAA
SETTINGS : SET0319 LAR
SCENARIO MHA0319 1P

RESERVES AND ECONOMICS

Ag	OF	DATE .	03/2019

				AG U	B DATE: 03/8	13				
END HO-YEAR	GROSS OIL	GROSS CH4	GROSS BELIUM	NET	NET CH4	HELLUM	NET OIL PRICE	MET CH4 PRICE	NET HELIUM PRICE	TOTAL NET SALES
0000000	MBBLS	MMCE	MACE	MBBLS	MMCF	MACF	SAR/BBL-	ZAR/MCF-	ZAR/MCF-	ZAR M\$
12-2019	0.000	0,000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.000
12-2020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.600
12-2021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0,000	0_000	0.000
12-2022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2024	0.000	0.000	0.000	0,000	D,000	0.000	0.000	0.000	0.000	0.000
12-2025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2027	0 - 000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2031	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2032	0.000	0.000	0_000	0,000	0.000	0.000	0.000	0.000	0.000	0.000
12-2033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
					6330			15000		1100
S TOT	0.000	0.000	0_000	0.000	0.000	0.000	0.000	0.000	0.000	0,000
AFTER	0.000	0_000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0 - 0 0 0	0.000	0.900	0,000	0.000	0.000	0.000	0.000	0.000
END	NET	NET	NET	TOTAL	DIRECT OPER	A D A MINOS MARKET	r EQUITY	FUTURE NET	CUMULATIVE	CUM. DISC.
	OIL SALES	CH4 SALES HE		TAX	EXPENSE	COST	INVESTMENT		CASHFLOW	CASHFLOW
PATTAGE	ZAR M3			ZAR M\$		ZAR M\$	ZAR MS			2108 ZAR MS
12-2019	0.000	0.000	0.000	0.000	15.000	0.00	000.686	-403.000	-403.000	-392.794
12-2020	0.000	0.000	0.000	0.000	24.480	0.00	348.840	-373,320	-776.320	-713.932
12-2021	0.000	0.000	0.000	0.000	34.333	0.00				
12-2022	0.000	0.000	0.000	0.000	35,020	0.00				
12-2023	0.000	0.000	0.000	0.000	35,720	0.00				
12-2024	0.000	0,000	0,000	0.000	36.435	0.00				-812,495
								100		
12-2025	0.000	0.000	0.000	0.000	37.163	0.00				
12-2026	0.000	0.000	0.000	0.000	37.967	0.000				-851.675
12-2027	0.000	0.000	0.000	0.000	38.665	0.00				-869 155
12-2028	0.000	0.000	0.000	0.000	39.438	0.000			-1071.001	-885.364
12-2029	0.000	0.000	0.000	0.000	40.227	0.00	0.000	-40.227	-1111.228	-900,393
12-2030	0.000	0.000	0.000	0.000	41.031	0.000	0.000	-41.031	-1152.259	-914.330
12-2031	0.000	0.000	0.000	0.000	41.852	0.000	0.000	-41.852		-927.253
12-2032	0.000	0.000	0.000	0.000	42.689	0.000	0.000	-42.689	-1236.800	-939.237
12-2033	0.000	0.500	0.000	0,000	43,543	0.000	0.000	-43,543	-1260,343	-950.349
s TOT	0.000	0.000	0.000	0,000	543,503	0.000	736.840	-1290.343	-1280,343	-950.349
AFTER	0.000	0.000	0.000	0,000	2019.582	0.000	0.000	-2019.582	-3299,924	-1079.328
TOTAL.	0.000	0.000	0.000	0.000	2563.084	0,000	736.840	-3299.924	-3299.924	-1079.328
		OIL	GAS					P.W. & P.	W, , ZAR MS	
-				924			22.42		2000 000	
GROSS WEI		0.0	0.0		E, YRS.		49.83	0.00	-3299.925	
	I., MB & MMF		0.000		COUNT 8	Votes	10.00	5.00	-1527.604	
	d., MB & MMF		0.000		DISCOUNTED PA		49.83	8.00	-1202.621	
NET RES	S., MB & MAF		0.000		COUNTED PAYO		49.83	15.00	-1079.328 -905.970	
NET REVEN		0.000	0.000		COUNTED NET		-0.59	20.00	-905.970 -813.670	
INITIAL P		0.000	0.000		E-OF-RETURN,		0.00	30.00	-709.916	
	N.I., PCT.	0.000	100.000		TIAL W.I., P		0.00	60.00	-569.591	
THE LINE D	Cresy Plats	0.7000	100.000	TMI	LAME W.L., P		0+464	60.00	-517.960	
								100.00	-481.702	
								200.00	401.702	



PROVED DEVELOPED PRODUCING RESERVES TETRA4 VIRGINIA METHAME AND HELIUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 17:45:01
DBS : MHA
SETTINGS : SET0319 LAR
SCENARIO : MHA0319 1P

PERPERS AND ECONOMICS

				AS OF	DATE: 03/20	19				
END MO-YEAR	GROSS	GROSS CH4	GROSS HELLUM	MET	NET CH4	NET RELIUM	NET OIL PRICE	NET CH4	NET HELIUM PRICE	TOTAL NET SALES
790- 2200	MBHLS		MACF	MBBL8	MMCF	IMCF	ZAR/BBL-	ZAR/MCF-	ZAR/MCF-	DAR MO
12-2019	0.000	43.162	1,373	0.000	38.954	1.304	0,000	226.560	2863,000	12.559
	0.000	49.548	1,576	0.000	44.717	1.497	0.000	246.720	2932.000	15.421
12-2020	0.000	47.206	1.501	0.000	42,603	1.426	0.000	268.800	3002.000	15.733
12-2021		44.974	1.430	0.000	40.589	1.359	0.000	293.760	3074.000	16.100
12-2022	0.000	42.848	1,363	0.000	38.671	1.294	0.000	319,680	3148,000	15.437
12-2023	0.000	40.823	1.298	0.000	3€.843	1.233	0.000	348.480	3224.000	16,915
	70.20			0.000	22-152	1 175	0.000	380.160	3301.000	17.223
12-2025	0.000	38.893	1.237	0.000	35.101	1.175	0.000	014.720	3380.000	17.653
12-2026	0,000	37.055	1.178	0,000	33.442	1.119	0.000	452.160	3461.000	18.098
12-2027	0.000	35.303	1.123	0.000	31,661	1.016	0.000	453.120	3544_000	17.356
12-2028	0,000	33.635	1.070	0.000	28.920	0.958		453.120	3629.000	16.617
12-2029	0.000	32.045	1.019	0_000	29.920	V , 350	9.000			
41.00 33.25		30.530	0.971	0.000	27.553	0.922	£.000	453.120	3716,000	15.912
12-2030	0.000	29.087	0.925	0.000	26,251	0.879	0.000	453,120	3806.000	15,239
12-2031	0.000	27.712	0.881	0.000	25.010	0.837	0.000	453.120	3897.000	14.598
12-2032		26.402	0.840	0.000	23,826	0.798	0.000	453,120	3991.000	13.980
12-2033	0.000	26.402	0.000	0.000	, , , , , , , , , , , , , , , , , , , ,				-com 200	239.737
3 TOT	0.006	559.222	17.783	0.000	504.698	16,894	0.000	363.429	3333.440	
AFTER	D.000	434,424	13,815	0,000	392.068	13.124	0_600	453.120	5106.937	244.677
TOTAL	0.000	993.647	31.598	0.000	896.766	30.018	0.000	402.642	4108,816	484.414
			200	TOTAL	DIRECT OPER	ED ANDVINDENT	EOUTTY	FUTURE NET	CUMULATIVE	COM. DISC.
END	NET	NET	NET	TAX	EXPENSE	COST	INVESTMENT		CASHFLOW	CASHFLOW
MO-YEAR	OIL SALES	CH4 BALES H	ELIOM SALES			ZAR M9	ZAR MS		ZAR M\$	910% ZAR MS
	ZAK MŞ	Fac Mo							11.989	11.528
12-2019	0.000	8.825	3.733	0.000	0 .570	0.000	0.000			
Sec. 3022	0.000	11.033	4.389	0.000	0.667	0.000	0.000		26.743	
12-2020	0.000	11.452	4.281	0.000		0.000		15.084		
12-2021	0.000	11.923	4,177	0.000		0.000	0,000			
12-2022	0.000	12.362	4.075	0,000		0.000	0.000			
12-2023	0.000	12.839	3.976	0.000		0.000	0.000	16.22	89,341	68.127
45-5454	4,000						2 000	100	105.905	77.235
12-2025	0.000	13.344	3.879	0.000		0_000				
12-2026	0.000	13.869	3.784	0.000		0.000				
12-2027	0.000	14.405	3,691	0.000		0.000				
12-2028	0.000	13.755	3.601	0.000		0.000				
12-2029	0.000	13.104	3.513	0.000	0.516	0.000	0.000	16.10	1/3,434	1601014
		100 100		0.000	0.501	0.000	0.000	15.41	188.965	111.847
12-2030	0.000	12.485	3.427	0.000		0.000				
12-2031	0.000	11.895	3.262	0.000		0.000			2 217.839	
12-2032	0,000	11.333	3.183			0.000		13.52	231.35	123.821
	3.50	183.422	56.316			0.000	9.000	231,35	9 231.95	123.621
S TOT			67.023				5 0.000	234.74	466.099	146.804
AFTER		177.654	3.00					466.09	9 466.099	146.804
TOTAL	0.000	361.076	123,339	0.000	18.039	0,27	9. 4.896			
		OIL	GAS					Supplied to	.W., ZAR M8	
GROSS W	21 Y.C.	0.0	1.1	LI	FR, YRS.		49.83	0,00	466,099	
	LT., MB 6 MM				SCOUNT &		10.00	5.00	231,300	
GROSS U	CM., MB & MM			I UN	DISCOUNTED PA		0.00	8.00	172.514	
	ES., ME 6 HM			7 51	SCOUNTED PAY	OUT, YRS.	0.00	10.00	146,804	
MET PES	, MB 5 1941			6 1.78	DISCOUNTED N	ET/INVEST.	*****	15.00	106.332 83.193	
NET REV	ENUE, MS	0.000	361075.68	DI DI	SCOUNTED NET		*****	20.00	58.209	
	PRICE, 3	0.000			TE-OF-PETURN		100.00	30.00	31.974	
	N.I., PCT.	0.000	95.00	11	SITIAL W.I.,	PCT. 10	00.000	60.00 80.00	25.357	
	1							100.00	21.383	
								100.00	44.303	



EROVED NON-PRODUCING RESERVES TETRA4 VIRGINIA METHANE AND HELIUM HAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 17:45:02
DBS : MEA
SETTINGS : SET0319_ZAR
SCENARIO : MHA0319_IP

RESERVES AND ECONOMICS

END MO-YEAR	GROSS	GROSS CH4	GROSS	NET	KET CH4	NET HELIUM	NET OIL	NET CH4	NET HELIUM PRICE	TOTAL NET SALES
100.000	MBBL8	MACF	MMCF	MBBLS			XAR/BBL-	ZAR/MCF-	ZAR/MCF-	ZAR M\$
12-2019	0.000	0,000	0_000	n one	0.000	n one	0 000	0 600	a non	0 000
12-2620	0.000	311,410	7.298	0.000	280.269	6,912	0.000	246,720	2932.000	89.414
12-2021	0.000	904.851	21,204	0.000		20.084	0.000	268.800	3002.000	279.193
12-2022	0.000	859.609	20.144	0.000	773.648	19,079	0,000	293.760	3074-000	285,917
12-2023	0.000	816,628	19.137	0.000		18,126	0.000	319.680	3148.000	292.013
12-2024	0.000	775.796	16.180	0.000		17.219	0.000	348.480	3224.000	298.829
12-2025	0.000	727 707	47.074							
12-2025	0.000	737,007	17.271	0.000		16,358		380.160	3301.000	306.161
12-2026	0.000	565.149				15.540	0.000	414.720	3380.000	313.858
12-2028	0.000	631.891	15.587	0.000		14.763	0.000	452.160	3460.999	321.774
12-2029	0.000	600.297	14.067	0.000		13.324		453.120	3544.000	293.158
15-5059	0.000	800.297	14,000	0.000	340.267	13.324	0.000	453.120	3978 383	293.158
12-2030	0.000	570.282	13.364	0.000	513,254	12.658	0.000	453.120	3716.000	279,602
12-2031	0.000	541.768	12.696	0.000	487.591	12,025	0.000	453.120	3806.000	266,704
12-2032	0.000	514.679	12.061	0.000		11.424	0.000	453.120	3897.000	254.408
12-2093	0.000	488.945	11,459	0.000		10,852	0,000	453,120	3991.000	242.708
S TOT	0.000	9118.467	213.684	0.000	8206.622	202.389	0.000	382.989	3399.842	3831.134
AFTER	0.000	5646.872	132,336	0.000	5082,165	125.335	0.000	453.120	4856.511	2911 532
TOTAL	0.000	14765.340	346,014	0.000		327.725	0.000	409.810		
									3956.932	6742.666
- END	NET	NET	NET	TOTAL	DIRECT OPER			FUTURE NET		
	OIL SALES		ELIUM SALES	TAX	EXPENSE	COST	INVESTMENT	CASHFLOW	CASHFLOW	CASHFLOW
*****	ZAR M\$	ZAR MS	LAR MS	ZAR MS	ZAR MS	ZAP. MS	ZAR M\$	ZAR MS	ZAR MS	6108 ZAR MS
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2020	0.000	69.148	20.266	0.000	4.194	0.000	19,380	65,639	65.839	55.909
12-2021	0.000	218,902	60,291	0.000	12.431	0.000	0.000	266.761	332,601	269.645
12-2022	0.000	227.267	58.650	0.000	12.046	0.000	0.000	273.871	60 €. 472	469.130
12-2023	0.000	234.954	57.059	0.000	11.672	0.000	0.000	280.340	886.812	654.763
12-2024	0.000	243.315	55,515	0,000	11.311	0.000	0.000	287.519	1174,331	827.842
12-2025	0.000	252,162	53,999	0.000	10.960	0.000	0.000	295.201	1469.532	989.391
12-2026	0.000	261.332	52.526	0.000		0.000			1772.770	1140,252
12-2027	0.000	270.576	51.096	0.000	10.291	0.000				1281.127
12-2028	0.000	257.690	49.705	0.000	9.972	0.000				
12-2029	0.000	244.806	46.352	0.000		0.000				
147 640	0/222	334 340	114-124	200	24.2		100	22.0	Pal 130 105	Autol con-
12-2030	0.000	232.565	47.036	0.000						1601,206
12-2031	0.000	220.937	45.766	0,000	9_073	0.000		257.631		1680.790
12-2032	0.000	209,890	44.518	0.000		0.000		245,616	3438,658	1749.765
12-2033	0,000	199.396	43.312	0.000	0.519	0.000	0.000	234.189	3672.846	1809.552
S TOT	0,000	3143,042	688.092	0.000	136.908	0_600	19.380	3672.846	3672.846	1809.552
AFTER	0.000	2302.840	608.693	0.060	116.414	5.253	0.000	2789.865	6462.712	2170.016
TOTAL	0,000	5445,882	1296 785	0.000	255.322	5.253	19.300	6462.712	6462.712	2170.416
		OIL	GAS.						N. EAR MS	
GROSS WEI	7.6	0.0	19.0	200	no tros		22 00	0.00	6460 711	
			14765.339		E, YRS.		33.08		6462.711	
	., MB & MMF		0.006		COUNT &		10.00	5.00	3471.006	
	C., ME & MANE		14765,339		DISCOUNTED PAYO		1.06	8.00	2580.760	
NET RES.	MB & MMF		13288.809		DISCOUNTED PAYO		1.06	10.00	1502.599	
NET REVEN		0.000	5445880.832		COUNTED NET/			20.00		
INITIAL E		0.000	245-720				30.20	30.00	1113.688	
	I.I., PCT.	0.000	94.737		TIAL W.I., P		00.00	60.00	695.925	
THITTING !		0.000	34.737	7.002	ALPH W.L., E	. 10	0.000	80.00	278.4E7 183.571	
								100.00	131.074	
								200.00	131.074	



PROVED UNDEVELOPED RESERVES TETRAM VINGINIA METHANE AND WELLOM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019

DATE : 02/22/2019
TIME : 17:45:04
DBS : MHA
SETTINGS : SET0319_ZAR
SCENARIO : MHA0319_IF

				AS OF	P DATE: 03/20	19				
	WW. V. C.		*****	NET	HET	NET	NET OIL	NET CH4	MET MELIUM	TOTAL
END	GROSS	GROSS	GROSS HELIUM	OIL	CH4	HELIUM	PRICE	PRICE	PRICE	NET SALES
MO-YEAR	OIL MBBLS	CH4	MMCF	MBBLS	MACE	MCF		TAR/MCF-	ZAR/MCF-	ZAR M\$
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
					S 22 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	777	0.00	-14 700	2931.999	111.789
12-2020	0.000	382.792	9.650	0.000	344.483	9.140	0_000	246.720	3002.000	376.808
12-2021	0.000	1221.428	28.600	0.000	1099.286	27.089	0 - 0 0 0		3074.002	392.594
12-2022	0.000	1180.524	27.643	0.000	1062.472	26,182	0.000	293.760		407.936
12-2023	0.000	1140.990	26.717	0.000	1026.891	25,305	0.000	319.680	3148.000	424.718
12-2024	0.000	1102.778	25.822	0.000	992.502	24.457	0.000	348.480	3224,001	424.710
94.9150		1000 040	24.957	7.000	959.264	23,638	0.000	380.160	3301.001	442.704
12-2025	0.000	1065,848	24.122	0.000	927,140	22.847	0.000	414.720	3380.000	461.725
12-2026	0.000	1030,154 995,655	23.314	0.000	896,091	22.082	0.000	452.160	3461.000	481.601
12-2027	0.000	962.312	22.533	0.000	866,082	21.342	0.000	453.120	3544.001	468 075
12-2028	0.000		21.778	0.000	B37.077	20.627	0.000	453.120	3628.999	454.153
12-2029	0_000	930.086	21.774	0.000	037.477	20,020			Action Service	
12-2030	0.000	898.938	21.049	0.000	809.045	19.937	0.000	453.120	3716.001	440 + 679
12-2030	0.000	868.834	20.344	0_000	781,951	19.269	0.000	453,120	3805.999	427.655
12-2032	0.000	839.738	19.663	0.000	755.764	18.624	0.000	453.120	3897.001	415.020
12-2032	0,000	811.616	19.004	0_000	730,455	18.000	0.000	453,120	3991.001	402.821
s TOT	0.000	13431.694	315, 198	0.000	12088.502	298.537	0.000	387.738	3420.395	5708.286
2.300			376,723	0.000	14484.971	356,811	0.000	453,120	5173,328	8409.330
AFTER	0.000	16094.391		22.00				423_377	4374.797	14117,616
TOTAL	0.000	29526.084	691.921	0.000	26573.472	655.345	0.000			
END	NET	NET	NET	TOTAL	DIRECT OPER	ABANDONMEN	T EQUITY	FUTURE NE		
	OIL BALES		HELIUM SALES	TAX	EXPENSE	COST	INVESTMENT	CASHFLOW	CASHFLOW	CASHFLOW
700 - 120M	ZAR M\$	ZAR M\$	ZAR M8	ZAR M\$	EAR MS	SAR MS	ZAR M\$	ZAR MS	ZAR MS	910% ZAR MS
00.32.0	4 444		0.000	0.000	0.000	0.00	6.000	-6.00	-6,000	-5.653
12-2019	0.000	0.000	0.000	4.000	0.500	0.40				15000
12-2020	0.000	84.991	26,798	0.000	5,156	0.00	C 90.780	1.5 . 0.5		
12-2020	0.000	295.488	91,320	0.000	16,781	0.00	0.000	360.02		
12-2022	0.000	312.112	80.482	0.000	16.543	0.00	0.000	376.05		
12-2022	0.000	328.277	79.659	0.000	16.309	0.00	0 0.000	391.62		
12-2024	0.000	345.867	78.850	0.000	16.078	0.00	0.000	408.64	1546,199	1072.903
29. 65					- D Mc	0.00	V 00000	100 00	1973.052	1306.547
12-2025	0.000	364 674	78.030	0,000		0.00		426,85		
12-2026	0.000	384.503	77.222	0.000		0.00		446.09		
12-2027	0.000	405.177	76.424	0.000		0.00		466.19		
12-2029	0.000	392.439	75.636	0.000		0,00		452,88	The state of the s	
12-2029	0.000	379.297	74.857	0.000	14.971	0.00	0 0_000	439,16	2 3777,418	2069.207
	20.07	1000000	50.000	0.000	14.759	0.00	0.000	425 91	9 4203.338	2234.294
12-2030	0.000	366.594	74.084	0.000		0.00		415.10		2361.888
12-2031	0.000	354.318	73.337			0.00		10000000		
12-2032	0.000	342,452		0.000		0.00			0 0000000000000000000000000000000000000	
12-2033	0.000	330.984	71.633	0.000	14.141	0.00	0.000			
S TOT	0.000	4687.171	1021_115	0.000	205.700	0.00	0 96.780	5405.80	7 5405.807	2573.609
AFTER	0.000	6563.431	1845.898	0.000	363.759	10 50	6 0.000	1035.06	4 13440.873	3303.474
TOTAL	0.000	11250.602	2867.013	0.000	569.459	10,50	6 96,780	13440.87	0 13440.873	3303,474
		OIL	GAS					P.W. 8 P	.W., ZAR M\$	
		022						September 19		
GROSE W	PTTG	٥.		EI	FE, YRS.		49.08	0.00	13440,872	
	LT., MB & MME	0,00	0 29526.080		SCOUNT &		10.00	5.00	5820 658	
	UM., MB & MAG			UN	DISCOUNTED PA	AYOUT, YRS.	1.21	B.00	4049,233	
GROSS E	ES., MB & MMS			DI	SCOUNTED PAYO	OUT, YRS.	1.34	10.00	3303,475	
NET RES					DISCOUNTED N			15.00	2175.569	
	ENUE, MŞ		011250603.008	DI	SCOUNTED NET,		39,65	20.00	1562,043	
	PRICE, \$	0.00			TE-OF-RETURN		100.00	30.00	934.397	
	N.I., PCT.	0.00			TTIAL W.I.,	PCT. 1	00.000	60.00	342.094	
THEITH	are the cost				A			90.00	214.566	
								200.00	146.096	



TOTAL PROVED (1P) RESERVES TETRA4 VIRGINIA METHANE AND RELIUM GAS FIELDS EMPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 17:85:04
DBS : MHA
SETTINGS : SET6319_ZAR
SCENARIO : MHAG319_IF

DECEDUDO AND PROMONTES

				240 0	E LIME. VSIE	113					
END MO-YEAR	GROSS	GROSS CE4	GROSS HELLUM	NET	NET CH4	NET HELIUM	NET OIL PRICE	NET CH4 PRICE	NET HELIUM PRICE	TOTAL NET SALES	
98-4-	MBBLS	MMCF	MACF	MBBI.2	MACE	MACE	ZAR/BBI	ZAR/MCF-	ZAR/MCE-	EAR MS	
12-2019	0.000	43.162	1.373	0.000	36.954	1.304	0.000	226,560	2863.000	12.559	
12-2020	0.000	743.750	18.523	0.000	669.469	17.549	0.000	246.720	2932.000	216.624	
12-2021	0,000	2173.484	51.306	0.000	1956.255	48.598	0.000	268,800	3002.000	671.734	
12-2022	0.000	2085.106	49.217	0.000	1876.708	46.620	0.000	293,760	3074.001	694,611	
12-2023	0.000	2000.466	47.217	0.000	1800.527	44.725	0.000	319.660	3148,000	716.386	
12-2024	0.000	1919.398	45,301	0.000	1727.562	42.910	0.000	348.480	3224.000	740,362	
12-2025	0.000	1841.748	43,465	0.000	1657,671	41.172	0.000	380 160	3301.000	766,097	
12-2026	0.000	1767.366	A1.708	0.000		39,506	0.000	414.720	3360,000	793, 236	
12-2027	0.000	1696,107	40,024	0.000		37,911	0.000	452.160	3461.000	821,473	
12-2028	0.000	1627.838	38.411	0.000	1465.139	36.383	0.000	453.120	3544.001	792.826	
12-2029	0.000	1562.427	36.865	0,000		34.919	0.000	453.120	3628.999	763.929	
12-2030	0.000	1499.750	35.384	0.000		33.517	0.000	453.120	3716.001	736.193	
12-2031	0.000	1439,688	33,965	0.000		32,172	0.000	453.120	3805.999	709.598	
12-2032	0.000	1382,129	32,605	0,000	1243.986	30.884	0.000	453.120	3897.000	684.031	
12-2033	0.000	1326,963	31.302	0.000	1194.334	29,650	0.000	453,120	3991.000	659,509	
S TOT	0,000	23109,384	546.665	0.000	20799.822	517.821	0.000	385.274	3409.525	9779.159	
AFTER	0.000	22175.692	522.868	0.000	19959.226	495.270	0.000	453,120	5091.394	11565.539	
TOTAL	0.000	45285.076	1069.532	0.000	40759.048	1013,090	0.000	418.498	4231.741	21344.698	
END	NET	NET	NET	TOTAL	DENESE OFFI	ABANDOWNENT	EQUITY	FUTURE NET	CUMULATIVE	CUM. DISC.	
MD-YEAR	OIL SALES		ELIUM SALES	TAX	EXPENSE	COST	INVESTMENT		CASSFLOW	CASHFLOW	
Pag-Tabak	ZAR MS	IAR MS		ZAR MS		ZAR MS	ZAR MS			8109 ZAR MS	
12-2019	0.000	8.825	3.733	0.000	15.570	0,000	394.000	-397.011	-397.011	-386,919	, a
12-2020	0.000	165.171	51,453	0.000	34.498	0.000		-276.874	-673.985		
12-2021	0.000	525.841	145.893	0.000	64.194	0.000					
12-2022	0,000	551.302	143.309	0.000	64.239	0.000					
12-2023	0.000	575.593	140.793	0.000	64.314	0.000					
12-2024	0.000	602.020	138.341	0.000	64,418	0.000	0.000	675.944	1892,043	1156,457	
12-2025	0.000	630 .180	135.907	0.000	64.552	0.000	0.000	701.535	2593.578	1540.348	
12-2026	0.000	659.705	133.532	0.000	64.715	0.000				1902,765	
12-2027	0.000	690.261	131.211	0,000	64,907	0.000					
12-2028	0.000	663.884	128.943	0.000	65.127	0.000	0.000	727.699	4806.365	2544.096	۲.
12-2029	0.000	637.207	126.722	0.000	65_377	0.000	0.000	698.552	5504,918	2805,183	
12-2030	0.000	611.645	124.546	0.000	65.655	0.000	0.000	670.537	6175.455	3033.017	
12-2031	0.000	587.150	122.448	0.000	65,963	0.000	0.000		6819.090	3231,929	
12-2032	0.000	563,675	120.356	0,000	65.299	0.000	0.000			3405-293	
12-2033	0.000	541.176	118.333	0.000	66.663	0.000	0.000			3556.635	
S TOT	0.000	9013.636	1765.522	0.050	896.490	0.000	853.000	8029.668	8029.668	3556.635	
AFTER	0.000	9043.924	2521.614	0.000	2509.415	16.036		9040.088	17069.756		
TOTAL	0.000	17057.561	4287.136	0.000	3405.905	16.036					
TOTAL	0,000	OIL	GAS	0.000	3403.903	10.035	853,000			4341.367	
		011	GAS					P.W. & P.	W., 2AR M\$		
GROSS WEI		0.0			E, YES.		49.83	0.00	17069.757		
	C., MB & MME	0.000			COUNT &		10.00	5.00	7995.390		
	1., MB & MMF				DISCOUNTED PA		2.94	8.00	5599.886		
	., ME & MMF	0.000			COUNTED PAYO		3.14	10.00	4541.368		
NET RES.		0.000			SCOUNTED NE		21.01	15.00	2878.530		
NET REVER			17057563.648		COUNTED NET/		6.82	20.00	1945.254		
INITIAL S		0.000			E-OF-RETURN,		67, 93	30.00	978.615		
INITIAL N	(.1., PCT.	0 000	95.000	INI	TIAL W.I., P	CT. 10	0.000	60 - 00	63.964		
								80,00	-94.466		
								100.00	-183.149		



PIFELINE AND PLANT COSTS

DATE : 02/22/2019
TIME : 17:56:23
DBS : MMA
SETTINGS : SET0319 ZAR
SCENARIO : MHAD319 ZP

EVSTRUES AND ECONOMICS

				AS OF	DATE: 03/20	19					
	2,000	GROSS	GROSS	NET	NET	NET	NET OIL	MET CH4	NET HELTUM	TOTAL	
END	GROSS	CH4	HELIUM	OIL	CH4	BELIUM	PRICE	PRICE	PRICE	NET SALES	
MO-YEAR	OLI	MMCF	MACE	MBBLS	MMCF	MCF		ZAR/MCF-	DAR/MCF-	ZAR M\$	
240	WBB1'3		- s - past. b	MANAGER					2.742		
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.600	0.000	0.000	0.000	
					2010	15 744	0.000	0.000	0.000	0.000	
12-2020	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	
12-2021		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2022	0,000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2023		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2024	0.000	0.000	0.000	0.000	0.000	6.000	0.000	0.00	0.000		
7 3 5 5	1 244		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2025		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2027		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2028			0,000	0.000	0.000	0,000	0.000	0.000	0.000	0.000	
12-2029	0.000	0.000	0.000	0,000	0.000						
12-2030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
		0.000	0.000	0.000	0.000	0.000	0.000	0_000	0.000	0,000	
12-2031		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2033	0.000	0,000	0.000		*****	15.77			06.51		
s ror	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	
AFTER	0.000	0.000	0,000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
				200			0.000	9.000	0.000	0.000	
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000		7 - 2 - 2 - 2 - 2		
END-	NET	NET	MET	TOTAL	DIRECT OPER	ABANDONMENT		FUTURE NET			
MO-YEAR		CH4 SALES H	ELIUM SALES	TAX	EXPENSE	COST	INVESTMENT	CASHFLOW	CASHFLOW	CASHFLOW	
10 1000	ZAR M8	ZAR MS	EAR MS	ZAR M5	ZAR M3	ZAR MS	ZAR M\$	LAR MS	EAR M9	9108 ZAR MS	
			4.37	2 245	40.040	0.000	383.000	-403.000	-403,000	-392,794	
12-2019	0.000	0.000	0.000	0.000	15.000	0.000	384.900	-402.000	-402.000	224.184	
		57.44	2 447	0.000	24.480	0.000	348.840	-373.320	-776.320	-713.932	
12-2020		0.000	0.000	0.000	49.003	0.000		-340.315			
12-2021		0.000	0.000	0.000		0.000		-363,039		-1268.795	
12-2022		0.000	0.000	0.000		0.000		-68.193			
12-2022		0.000	0.000	0.000		0,000		-69.557		-1355.787	
12-2026	0.000	0.000	0.000	0,000	03.327	41754	1311				
		0.000	0.000	0.000	70.948	0.000	0.000	-70.948	-1688.373		
12-202		0.000	0.000	0.000		0.000		-72.367	-1760.740	-1430.586	
12-2026		0.000	0.000	0.000		0.000		-73.815	-1834.554	-1463.956	
12-202		0.000	0.000	0.000		0.000		-75.291	-1909.845	-1494.900	
12-202		0.000	0.000	0.000		0.000		-76.79	-1986.642	-1523.594	
12-2025	9 0.000	0.000	0.004	0.000	(20,00)	21071					
12-2030	0.000	0.000	0.000	0.000	78.333	0.000	0.000	+7E.333			
12-2030		0.000	0.000	0.000		0.000	0.000	-79.899			
		0.000	0.000	0.000		0.000	0.000	-81.497	-2226,371		
12-2033		0.000	0.000	0.000		0.000	0.000	-83,127	-2309,498	-1618.962	
12-203				P 150.7			1000000		State of the state		
3 TO:	0.000	0,000	0.000	0.000	984,206	0.000	1325.290	-2309.498	-2309.498	-1618.962	
		0.000	0.000	0.000	3950 .060	0.000	0.000	-3950.060	-6259.558	-1866.044	
AFTE	R 0,000	0.000	0,000	0.000	3330 10.00						
TOTAL	0.000	0.000	0.000	0.000	4934 .268	0.000	1925,290	-6259,556	-6259.556	-3866.044	
		OIL	GAS						W. , ZAR 115		
		bishished							2010 550		
GROSS 1	WELLS	0.0			FE, YRS.		49.83	0.00	-6239.558		
	ULT., MB 4 MMS	0.000			SCOUNT ?	100 miles 100 miles	10,00	5.00	-2756.481 -2112.901		
	CUM., MB & MM	0.000			DISCOUNTED PA		49_83	B_00	-1866,044		
	RES., MB & MM	0,000			SCOUNTED PAYO		49.83	10.00	-1512.424		
	S., MB 6 MM	0.000			DISCOUNTED W		-3.72	15.00			
	VENUE, MS	0.000			SCOUNTED NET	manage at	-0.63	20.00	-1318,283 -1093,619		
	L PRICE S	0.000			TE-OF-RETURN		0_00	30.00	-785.496		
	L N.I., PCT.	0.000	100.000	THE THE	ITIAL W.I., I	PCT	0.000	60.00			
-								80.00	-679.926 -607.560		
								100.00	- au /. 2 au		



2P PROVED DEVELOPED PRODUCING RESERVES TETRAS VIRGINIA METHANE AND HELLUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019 TIME : 17:56:23 DBS : MHA SETTINGS : SET0319 LAR SCENARIO : MEA0319 2P

RESERVES AND ECONOMICS

				No C	B 1941E: 43/20	119				
ZND	GROS5	GROSS	GROSS	MET	HET	NET	NET OIL	NET CH4	NET RELIUM	TOTAL
MO-YEAR	OIL	CH4	HELIUM	OII.	CH4	BELLUM	PRICE	PHICE	PRICE	NET SALES
manager.	MBBLS	MACE	MMCF	MBELS	HMCF	MHCF		ZAR/MCF-	ZAR/MCF-	ZAR M3
12-2019	0.000	43.162	1.373	0.000	38.954	1.304	9.000	226,560	2863.000	12,559
12-2020	0.000	49.548	1,576	0.000		1.497		246.720	2932.000	15.421
12-2021	0.000	47,206	1.501	0.000		1,426		268.800	3002.000	15.733
12-2022	0.000	44.974	1.430	0.000		1.359		293,760	3074,000	16.100
12-2023	0.000	42.848	1.363	0.000		1.294	0.000	319 680	3249.000	16.437
12-2024	0.000	40.823	1.298	0.000	36.843	1.233	0.000	349.480	3224.000	16.815
12-2025	0.000	38.893	1.237	0.000	35,101	1.175	0.000	380,160	3301,000	17.223
12-2026	0.000	37.055	1.178	0.000		1.119		414.720	3380,000	17.653
12-2027	0.000	25.303	1.123	0.000		1.967		452.160	3461.000	10.098
12-2028	0.000	33.635	1.070	0.000		1.016		453,120	3544.000	17.356
12-2029	0.000	32,045	1.019	0.000		0.968	0.000	453,120	3629.000	16.617
	3,1,1	10000				4,500	11111	408.250	20201110	20,000
12-2030	0.000	30.530	0,971	0.000	27.553	0.922	0.000	453.120	3715.000	15.912
12-2031	0.000	29.087	0,925	0.000		0.879	0.008	453.120	3896,000	15.239
12-2032	0.000	27.712	0.081	0.000	25.010	0.837	0.000	453.120	3897_000	14.595
12-2033	0-000	26.402	0.840	0.000	23.828	0.798	0.000	453.120	3991.000	13.980
s TOT	0.000	559.222	17.783	0.000	504.698	16.894	0,000	363.429	3333.440	239_737
AFTER	0.000	434.424	13.815	0.000	392.068	13,124	0.000	453.120	5106,937	244_577
TOTAL	0.000	993,647	31.598	0.000			7.77	337 37		
	1, 1, 1, 1,				896.766	30.018	0.000	402.642	4108.816	484.414
END	NET	NET	NET	TOTAL	DIRECT OPER			FUTURE NET	CUMULATIVE	
MO-YEAR	OIL SALES	CH4 SALES B		TAX	EXPENSE	COST	INVESTMENT		CASKFLOW	CASEFLOW
Exterior Services	ZAR M\$	ZAR M\$	ZAR MS	ZAR M\$	ZAR M9	ZAR M8	2AR MS	ZAR M9	ZAR MS	910% ZAR M\$
12-2019	0.000	8.825	3.733	0.000	0.570	0.000	0.000	11.939	11.969	11.528
	2		23.55		0.510	5.65	0,400	12.502	11.363	12.520
12-2020	0.000	11.033	4.389	0.000	0.667	0.00		14,754	26.763	24.531
12-2021	0.000	11.452	4.261	0.000	0.649	0.001	0.000	15.084	41.827	36.617
12-2022	0.000	11.923	4.177	0.000	0,630	0.000	0.000	15.470	57.297	47,884
12-2023	0,000	12,362	4.075	0.000	0.612	0.001	0,000	15.825	73,121	58.363
12-2024	0.000	12.839	3,976	0.000	0.595	0.001	0.000	16.220	89.341	68.127
12-2025	0.000	13,344	3.879	0.000	0.578	0.000	0.000	16.644	105.985	77 755
12-2026	0.000	13.869	3.784	0.000	0.562	0.000			123.076	77.235 85.737
12-2027	0.000	14.406	3.691	0.000	0.546	0.000			140.627	93.675
12-2028	0.000	13.755	3.601	0.000	0.531	0.000				100.593
12-2029	0.000	13.104	3.513	0.000	0.516	0.000			157.452 173.554	106,611
12-2025	0.000	15.104	3,313	0.400	0,516	0.000	9.000	16,102	1/3.554	100.611
12-2030	0.000	12.485	3.427	0.000	0.501	0.000	0.000	15.411	188.965	111.847
12-2031	0.000	11.895	3.344	0.000	0.457	0.000			203.717	116.404
12-2032	0.000	11.333	3.262	0.000	0.473	0.000			217.839	120.370
12-2033	0.000	10.797	3.183	0.000	4.460	0.000			231,359	123.821
s TOT	0.000	183,422	56,316	0.000	8.379	0.000	0.000	231.359	231.359	123.821
AFTER	0.000	177.654	67,023	0.000	9.660	0.276		57837		1000000
		4.4								
TOTAL	0.000	361.076	123.339	0,000	18.039	0276	0.000	466.099	466.039	146.804
		OIL	GAS					P.W. 8 P.	, LAR MS	
GROSS WE	LT.S.	0.0	1.0	7.375	E, YRS.		49.83	0.00	466_099	
	T., ME & MMF				COUNT &		10.00	5.00	231.300	
	M., MIB & MMF				ESCOUNTED PA		0.00	8.00	172.514	
	S., MB 6 MMF				COUNTED PAYO		0.00	10.00	146.804	
NET RES.			896,766		DISCOUNTED NE			15.00	106.332	
NET REVER		0.000			COUNTED NET/		*****	20.00	83,193	
INITIAL		0.000	226.560		E-OF-RETURN.		00.00	30.00	56.209	
INITIAL	N.I., PCT.	0.000	95.000		TIAL W.I., P		0_000	60.00	31.974	
	and a second	2,000		1141	THE PARTY E	10	2-400	80.00	25.357	
								100.00	21.383	
								100.00	44	



2F PROVED NON-PRODUCING RESERVES TEFRAA VIRGINIA METHANE AND HELIUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019 TIME : 17:56:24 DBS : MHA SETTINGS : SET0319_ZAR SCENARIO : MHA0319_2P

PRETRUES AND ECONOMICS

				AS OF	DATE: 03/20	19				
END	GROSS	GROSS CH4	GROSS HELIUM	NET OIL	NET CH4	HET HELIUM	NET CIL PRICE ZAR/EBL-	NET CH4 PRICE EAR/MCF-	NET HELIUM PRICE LAR/MCF-	TOTAL NET SALES ZAR MS
	MBELS	100CF	BEAL B					200		
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0,000	0,000	0.000	0.000
-60.10.		252 222	7.298	0.000	280.269	6.912	0.000	246.720	2932,000	89.414
12-2020	0.000	904,651	21.204	0.000	814.366	20.084	0.000	268.800	3002.000	279.193
12-2021	0.000	859,609	20.144	0.000	773.648	19.079	0.000	293.760	3074.000	285.917
12-2022	0.00.0	816,628	19.137	0.000	734.965	18.126	0.000	319 680	3148.000	292.013
12-2023	0.000	775.796	18,180	0.000	698,217	17.219	0.000	348,480	3224.000	298.829
12-2024	0.000	(13.150	20.000						Carr See	262.424
12-2025	0.000	737,007	17.271	0.000	663,306	16.350	0.000	380.160	3301.000	306.161
12-2026	0.000	700.157	16.408	0_000	630.141	15.540	0.000	414.720	3380.000	313.858
12-2027	0.000	665.149	15.587	0_000	598.634	14.763	0.000	452.160	3460.999	307.396
12-2028	0.000	631.891	14.808	0.000	568.702	14.025	0.000	453.120	3628.999	293,159
12-2029	0.000	600.297	14.067	0.000	540.Z67	13.324	0.000	453_120	3626.999	233,430
					513,254	12.658	0.000	453.120	3716.000	279.602
12-2030	0.000	570.282	13.364	0.000	487.591	12.025	0.000	453,120	3806.000	266,704
12-2031	0.000	541.768	12.696	0.000	463.212	11.424	0.000	453.120	3897.000	254.408
12-2032	0,000	514.679	12.061	0.000	440.051	10.852	0.000	453.120	3991.000	242,706
12-2033	0.000	488.945	11.458	0.000	440.031	10.032	0.000	400.424		
S TOT	0.000	9118.467	213,684	0.000	8206.622	202.389	0.000	382,989	3399,842	3831.134
AFTER	0.000	5646.872	132,330	0.000	5082.185	125.335	0.000	453.120	4856,511	2911,532
TOTAL	0.000	14765.340	346.014	0.000	13288.806	327.725	0.000	409.810	3956.932	6742.666
TOTAL	0.000	2012011							COLOR SETTING	CUM. DISC.
EXD	NET	NET	NET	TOTAL		ABANDONNENT		CASHFLOW	CASHFLOW	CASHFLOW
MO-YEAR	OIL SALES		ELIUM SALES	PAX	EXPENSE	COST	INVESTMENT	ZAR MS		9209 ZAR MS
Service.	IAR MS	ZAR MS	LAR MS	ZAR MS	ZAR M\$	ZAR M8	SAR MS	SAM BES	and the same	William Been too
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0,000	0,000
		0		0.000	4.194	0.000	19,380	65.839	65,839	55.909
12-2020	0.000	69.148	20.266	0.000	12.431	0.000		266.761		
12-2021	0.000	218.902	50.291	0,000		0.000		273.671		
12-2022	0.000	227.267	58.650 57.059	0.000		0.000		280 .341		654.763
12-2023	0.000	234.954	55.515	0.000		0.000		287.515		827.842
12-2024	0.000	243.315	35.313	41044	22,000	4.477	7070			
12-2025	0.000	252.162	53.999	0.000	10.960	0.000	0,000			
12-2025	0.000	261,332	52,526	0.000		0.000				
	0.000	270.578	51.096	0.000		0.000	0.000			
12-2027	D.000	257.690	49,705	0.000	9.972	0.000	0.000			
12-2029	0.000	244.806	48,352	0.000		0.000	0.000	263.495	2665.172	1509,379
15-10-0							0 444	1226 1226	000F 310	1601.206
12-2030	0.000	232.565	47_036	0.000		0.000				
12-2031	0.000	220.937	45,766	0.000		0.000				
12-2032	0.000	209_890	44.518	0.000		0,000				
12-2033	0.000	199,396	43.312	0.000	8.519	0.000	0.000	254.10	3672.040	2805.552
S TOT	0.000	3143.042	688.092	0.000	136,908	0.000	19.380	3672.84	3672.846	1809.552
AFTER	0.000	2302,840	608.693	0.000	116,414	5,253	0.000	2759.56	6462.712	2170.016
TOTAL	0.000	5445,882	1296,785	0.000	255.322	5.253	19.300	6462.71	6462.712	2170.416
10174		OIL	GAS					P.W. 1 P	W., SAR MS	
		bearing to						Address S		
GROSS WE	CLES	0	19.0		FE, YRS.		33.08	0.00	6462.711	
GROSS UI	T., MB & MM	0.00			SCOUNT #	Town Carlo States	10.00	5.00	3471.00E 2580.760	
GROSS CU	M., ME & MAG	0.00			DISCOUNTED PA		1.06	8.00	2170.416	
GROSS RE	MM & MM . BZ	0.00			SCOUNTED PAY		1.06	10.00	1502.599	
NET RES.		F 0.00			DESCOUNTED N		134.47	20.00	1113.688	
NET REVE	ENUE, MS		6 5445880.832		SCOUNTED NET	Carbon and Co.	130.20	30.00	695,925	
	PRICE, \$	0,00			TE-OF-RETURN		00.000	60.00	278.487	
INITIAL	S.I., PCT.	0.00	94.737	IN	ITIAL W.I.,	(1)	4.4.0	60.00	103.571	
								100.00	131.074	
								-44.644	200	



2F PROVED UNDEVELOPED RESERVES TETRAA VIRGINIA METHANE AND HELIUM GAS FIELDS REPUBLIC DE SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 17:56:26
OBS : MRA
SETTINGS : SET0919 VAR
SCENARIO : MRA3319_2F

RESERVES AND ECONOMICS

				As O	E DATE: F3/20	119					
END	GROSS	GROSS	GROSS	NET	NET	NET	NET C	OF I.	NET CH4	NET HELLUM	TOTAL
MO-YEAR	OIL	CH4	RELIUM	OIL	CH4	BELLUM	PRIC		PRICE	PRICE	NET SALES
******	MBBLS	MICF	MMCF	MEBLS	MCF	MMCF			ZAR/MCF-	BAR/MCF-	ZAR MS
12-2019	0.000	0.000	0.000	0.000	0.000	0.00	10 0	000	0,000	0.000	0.000
12-2020	0.000	382.792	9.650	0.000	344.483	9.1		000	245.720	2931 999	111.789
12-2021	0.000	1221.428	28.600	0.000	1099.28€	27.08		000	268.800	3002,000	376.808
12-2022	0.000	1180.524	27,643	0.000	1062.472	26.1		000	293.760	3074.002	392.594
12-2023	0.000	1140.990	26.717	0.000	1025.891	25.30		000	319.680	3148.000	407.936
12-2024	0.000	1102.778	25 . 822	0.000	992.502	24 4		000	348 480	3224.001	424.718
12-2024	0.000	1102.718	20.622	0.000	992.502	24.4	17. 0.	000	348 480	3224.001	424.716
12-2025	0.000	1065,848	24,957	0.000	959.264	23.63	38 D.	000	380.160	3301.001	442,704
12-2025	0.000	1030,154	24.122	0.000	927.140	22.8	17 0.	000	414.720	3380,000	461.725
12-2027	0.000	995.655	23.314	0.000	896.091	22.01	2 0.	000	452.160	3461.000	481.601
12-2028	0.000	962,312	22,533	0_000	866,082	21.34	12 0.	000	453.120	3544.001	468.075
12-2029	0.000	930.086	21.778	0.000	837.077	20.60	27 0.	000	453.120	3628.999	454,153
12-2030	0.000	858,938	21.049	0_000	809.045	19.93		000	453.120	3716.001	440.679
12-2031	0.000	066.834	20.344	0.000	781.951	19.26		000	453.120	3805,999	427.655
12-2032	0.000	839,738	19.663	0.000	755,764	18.52	24 0.	000	053,120	3897.001	415,028
12-2033	0.000	811.616	19.004	0.000	730 .455	18.00	0 0.	000	453.120	3991.001	402,821
S TOT	0.000	13431.694	315.198	0.000	12088.502	298.53	17 0.	000	387.738	3420.395	5708.286
AFTER	0.000	16094.391	376.723	0.000	14484.971	356.83	1 0	000	453.120	5173.328	8409.330
TOTAL	0.000	29526.084	691.921	0.000	26573_472	655.34	.0.	000	423.377	4374.797	14117.616
END	TEM	HET	NET	TOTAL	DIRECT OPER	ABANDONME	NT EQUI	TY	FUTURE NET	CUMULATIVE	CUM. DISC.
MO-YEAR	CIL SALES	CHA SALES H	ELIUM SALES	TAX	EXPENSE	COST	INVEST	MENT	CASHFLOW	CASHFLOW	CASHFLOW
	ZAR M9	EAR M\$	ZAR MS	EAR MS	EAR MS	ZAR MA-	TAR	M\$	ZAR M3	ZAR M\$	0108 ZAR M\$
12-2019	0.000	0.000	0.000	0.000	0,000	0.0	70 2	.000	-6.000	-6.000	-5.653
12-2019	0.000	0.000	0.000	0.000	0,000	4.5		-000	-4.000	-0.000	-3,423
12-2026	0.000	84,991	26.798	0.000	5.156	0.0	00 90	780	25.853	9.853	5.438
12-2021	0.000	295.488	81.320	0.000	16.781	0.0	00 0	.000	360.020	369.881	293.863
12-2022	0.000	312.112	80.482	0.000	16.543	0.0	00 0	_000	376.052	745.932	567.737
12-2023	0.000	328.277	79.659	0.000	16.309	0.0	00 0	.000	391-527	1137.559	827.026
12-2024	0.000	345.867	78.850	0.000	16.078	0.0	00 0	.000	408.640	1546,199	1072.983
12-2025	0.000	364,674	78.030	0.000	15.850	0.0		.000	426,854		1306.547
12-2026	0.000	364.503	77.222	0.000	15.626	0.0		.000	446.099		1528.451
12-2027	0.000	405.177	76.424	0.000	15.405	0.0	00 0	.000	466.196	2885.348	1739.270
12-2028	0.000	392,439	75.636	0,000	15.186	0.0		.000	452,689	3338,237	1925,452
12-2029	0.000	379,297	74.857	0.000	14.971	0.0	00 0	.000	439,182	3777.418	2089.587
12-2030	0.000	366.594	74.084	0.000	14.759	0.0		.000	425.919	4203.338	2234.294
	0.000	354.318	73.337							4616,443	2361,888
12-2031				0,000	14.550	0.0		.000	413.105		
12-2032	0.000	342.452	72.576	0.000	14.344	0.0		- 900	400.604	5017.127	2474.395
12-2033	0.000	330.984	71.938	0.000	14.141	0.0	04 0	.000	388.680	5405.807	2573.609
S TOT	0.000	4687_171	1021.115	0.000	205.700	0.0	00 96	.780	5405.807	5405.847	2573,609
AFTER	0.000	6563,431	1845,898	0.000	363.759	10 _5	06 0	.000	8035.064	13440.873	3303,474
TOTAL	0.000	11250.602	2867.013	0.000	569,459	10.5	06 96	790	13440.870	13440.873	3303,474
		OIL	GAS						P.W. 4 P.	W., ZAR MS	
		-10-31915	PAPERFEE						waterie ele		
GROSS WEI		0.0	38.0		E, YRS.		49,08		0.00	13440.872	
	" . HB & MMF	0.000	29525.080		COURT &		10,00		5_00	5820.688	
	M., ME & MMF	0.000	0.000		TSCOUNTED PA		1.21		B.00	4049.233	
GROSS RES	E., MB & MMF	0.000	29526.080		COUNTED PAYO		1.34		10.00	3303.475	
NET RES.		0.000	26573.480		DISCOUNTED NE		139.88		15.00	2175.569	
NET REVEN			1250603.008		COUNTED NET/		39.65		20.00	1562.043	
INITIAL E		0.000	246.720		E-OF-RETURN,		100.00		30.00	934.397	
INITIAL N	V.I., PCT.	0.000	94.729	INI	TIAL WI., P	CT.	100.000		60.00	342.094	
									80.00	214.566	
									100.00	146.096	



2P FROBABLE PESERVES TETRAA VIRGINIA METHANE AND BELIUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019 TIME : 17:56:29 DBS : MHA SETTINGS : SET0319 KAR SCENARIO T MHA0319 ZP

RESERVES AND ECONOMICS

				A5 OI	DATE: 03/20	19				
	N0000	2004	GROSS	NET	NET	ROUT-	NET OIL	HEE CH4	NET HELIUM	TOTAL
-END	GROSS	GROSS	HELTUM	OIL	CH4	BELLUM	PRICE	PRICE	PRICE	NET SALES
MO-YEAR	OIL MBBLS	CH4		MBBLS	MMCE		ZAR/BBL-	ZAR/MCF-	2AR/HCF-	AAR MS
12-2019	0.000	0.000	0.000	0.000	0,000	0.000	0.000	0.000	0.000	0.000
12-2015	2.005							*** ***	2931.999	41.002
12-2020	0.000	132.860	4.172	0.000	119,320	3,944	0_000	246.720	3001.999	1104.778
12-2021	0.000	3491.457	92.530	0.000	3141.900	86.697	0,000	268,800		1383.752
12-2022	0.000	4174.122	96,230	0.000	3756.730	91.144	0.000	293.760	3074.001	1442.947
12-2023	0.000	4048,088	93,324	0.000	3643.299	88.392	0.000	319.680	3147.999	1507.652
12-2024	0.000	3925,863	90.506	0.000	3533.296	85.723	0.000	348.480	3223.999	1307.632
		3807, 326	67,773	0.000	3426.612	83.134	0.000	380,160	3301.000	1577.087
12-2025	0.000		65.123	0.000	3323.149	80.624	0.000	414.720	3380.002	1650,686
12-2026	0.000	3692,369	82.553	0.000	3222.810	78.190	0.000	452.160	3461.000	1727,842
12-2027	0.000	3472.762	80,061	0.000	3125.502	75.829	0.000	453,120	3543.999	1654.965
12-2028	0.000	3367.904	77.643	0.000	3031.130	73.539	0.000	453,120	3629.001	1640.341
12-2029	0.000	3207.304	17.445	33454						12.20.210
12-2030	0.000	3266.214	75.299	0.000	2939.610	71.319	0.000	453.120	3716.000	1597.017
12-2031	0.000	3167.596	73.025	0.000	2850.949	69.166	0.000	453.120	3806.000	1555.022
12-2032	0.000	3071.953	70.820	2.000	2764,773	57:077	0.000	453,120	3897-001	1514.173
12-2032	0.000	2979.200	68 . 68 2	0.000	2681.292	65,052	0.000	453.120	3991.001	1474.570
s ToT	0.000	46178.596	1076.742	0.000	41560.272	1019.820	0.000	394.434	3440.856	19901.833
	0.000	62968.040	1451.656	0.000	56671.544	1374.931	0.000	453.120	5198,460	32826.530
AFTER	0.0						0.000	428,291	4449.973	52728.365
TOTAL	0.000	109146.640	2526.398	0.000	98231.016	2394.751				
END	MET	MET	NET	TOTAL	DIRECT OPER	ABANDONMENT	EQUITY	PUTURE NET	CUMILATIVE	CUM. DISC.
	DIL SALES	CHA SALES E	HELIUM SALES	XAT	EXPENSE	COST	INVESTMENT	CASHFLOW	CASHFLOW	
	ZAR M5	ZAR M\$	SAR MS	EAR M9	ZAR M\$	IAR MS	ZAR MŞ	ZAR MS	ZAR MS	9109 ZAR MS
As tosts.	4 463	10.002	0,000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2019	0.000	0.000	0.000	0.000	0.000		3.4471	94117		
12-2020	0.000	29,439	11,563	0.000	1.790	0.000	79.050	-39.837		
12-2021	0.000	944.543	250,236	0.000	47.967	0.000	117.045	939,766		
12-2021	0.000	1103.577	280,175	0.000		0.000	0.000	1325.260	2225,198	
12-2022	0.000	1164.689	278.257	0.000		0.000	0.000	1365.086		
12-2024	0.000	1231.283	276_370	0.000		D.000	0.000	1450.416	5060.689	3466,259
12-2024	0.000		Soldings.						Could be a	1200 200
12-2025	0.000	1302.661	274.427	0.000	56.619	0.000	0.000	1520.468		
12-2026	0.000	1378.176	272.510	0.000		0.000	0.000	1594.679		
12-2027	0.000	1457,226	270.615	0.000		0,000	0.000	1672.438		
12-2028	0.000	1416,227	268.738	0.000	54.804	0.000	0.000	1630.161	11478_436	
12-2020	0,000	1373,466	266.875	0.000	54.213	0.000	0.000	1586.128	13064,565	7110.603
			adulated the lates	2-112		0.060	0.000	1543.390	14607.955	7634.959
12-2030	0.000	1331.996	265.022	0.000		0.000	0_000	1501.974		
12-2031	0.000	1291,777	263.244	0.000		0.000	0_000	1461.698	A 14 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1	
12-2032	0.000	1252.774	261.400	0.000		0.000	0.000	1422.662		
12-2033	0.000	1214.948	259.622	0.000	51.909	0.000	0.000			
S TOT	0.006	16392.780	3509.054	0.000	711.452	0.000	196,095	18994.289	18994.289	8672,411
AFTER	0.000	25679.006	7147.523	0.000	1432.708	21.013	0.000	31372,610	50367.103	11620.936
TOTAL	0.000	42071.785	10656.578	0.000	2144,161	21.013	196.095	50367,099	50367,103	11620,936
20474	264	OIL	GAS					P.W. & P.	W BAR MS	
		014	· ·					194201160 193		
GROSS WE	CLLS	0.1	76.0		FE, YRS.		49.83	0.00	50367.099	
	T. MB & MM	0.001	109146.632		SCOUNT %		10.00	5.00	20988.219	
GROSS CO	TM., MB & MME	0.004	0.000		DISCOUNTED PA		1.88	6.00	14369.788	
GROSS RI	S., MB & MM	0.00			SCOUNTED PAYO		1,68	10.00	7516.780	
NET PES		0.00			DISCOUNTED N	ner management -	57.85	15.00	5318,168	
NET REVI			042071785.472		SCOUNTED NET		71.94	20,00		
	PRICE, 4	0.00			TE-OF-RETURN		00.00	30,00	3104,746	
	N.I., PCT.	0.00	0 94.536	IN	HTIAL W.I.,	PCT. 10	0.000	50.00		
30,32,50	of displaying							80.00	662,058	
								100.00	444.059	



TOTAL PROVED + PROBABLE (2P) RESERVES TETRAS VIRGINIA METHANE AND SELIUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019 TIME : 17:56:29 DBS : MEA SETTINGS : SET0319_LAR SCENARIO : MEA0319_2F

RESERVES AND ECONOMICS

END	GROSS	GROSS	GROSS	NET	NET	NET	NET OIL	NET CH4	NET HELIUM	TOTAL
MO-YEAR	OIL	CH4	HELIOM	OIL	CH4	HELIUM	PRICE	PRICE	PRICE	NET SALES
Exce de la la c	MBBLS	MKF		MBBLS		brick	ZAR/SBL-	ZAR/MCF	ZAR/MCF-	ZAR M3
12-2019	9.090	43.162	1.373	0.000	38.954	1.304	0.000	226.560	2863,000	12,559
12-2020	0.000	876.610	22.695	0.000	788.789	21.492	0.000	246.720	2932.000	257, 626
12-2021	0.000	5664.942	142.836	0.000		135,286	0.000	268.800	3001.999	1776.512
	0.000			0.000		137.763			3074,001	2078.363
12-2022		6259.228	145.447	0.107.5			0.000	293.760		
12-2023	0.000	6048.554	140.541	0.000		133.116	0.000	319.680	3148,000	2159.333
12-2020	0.000	5845.261	135.807	0,000	5260.857	128.632	0.000	348,480	3224,000	2248.014
12-2025	0.000	5649.074	131.239	0.000	5084.283	124.306	0.000	380.160	3301,000	2343,174
12-2026	0.000	5459.734	126.831	0.000	4913,872	120,131	0.000	414 720	3380.001	2443.922
12-2027	0.000	5276.988	122.577	0.000		116,101	0.000	452.160	3461,000	2549.324
12-2028	0.000	5100.600	118.471	0.000		112.212	0.000	453,120	3544.000	2477.791
12-2029	0.000	4930.331	114.508	0.000		108,459	0,000	453,120	3629.000	2404.270
	17.7									
12-2030	0.000	4765.964	110.683	0.000		104.836	0.000	453.120	3716.000	2333.209
12-2031	0.000	4607.285	106.990	0.000	4146.642	101.338	0.000	453.120	3806,000	2264.621
12-2032	0.000	4454.082	103.426	0.000	4008.759	97.962	0.000	453.120	3897.001	2198.205
12-2033	0.000	4305.163	99,984	0,000	3875.626	94.702	0.000	453,120	3991,001	2134,079
S TOT	0,000	69287.976	1623,407	0.000	62360.096	1537.641	0,000	391,379	3430.305	29610.992
- Province	0.000	05143 705	1974.524	0.000	75570 775	1670.201	0.000	450 100	6376 306	44392.071
AFTER	0.000	85143.728						453,120	5170.106	
TOTAL	0,000	154431.712	3597.930	0.000	138990,880	3407.842	0.000	425,419	4385.096	74073.063
END	NET	NET	NET	TOTAL	DIRECT OPER	ABANDONMENT	EQUITY	FUTURE NET	CUMULATIVE	CUM. DISC.
MO-YEAR	OIL SALES		ELIUM BALES	TAX	EXPENSE	COST	INVESTMENT		CASHFLOW	CASHFLOW
20,000,000	ZAR MS	ZAR M\$	ZAR MS	ZAR MS		ZAR M8	ZAR M\$			010% ZAR MS
20 6420	0.000	0.000	2 744	2 200	12 200	0.000	394.000	207 017	202 012	200 010
12-2019	0.000	8.825	3,733	0.000	15.570	0.000			-397.011	
12-2020	0.000	194,610	63,016	0,000	36.207	0.000	539.050	-316.711		
12-2021	0.000	1370,384	40€.129	0.000	126,831	0.000	408.357	1241.325	527.602	315.433
12-2022	0.000	1654.879	423,484	0.000	153.613	0.000	297.138	1627.613	2155.215	1492.231
12-2023	0.000	1740.282	419,050	0.000	154.648	0.000	0,000		4159,899	
12-2024	0.000	1833.303	414.711	0.000	154.777	0.000				
	2,110	G1756717			0231364	2,000				
12-2025	0.000	1932.841	410.334	0,000	154.955	0.000	0.100	2168.219	6441,355	5276.774
12-2026	0.000	2037,061	406.042	0,000	155,183	0.000	0.000	2288.740	10730.096	6415,276
12-2027	0.000	2147.487	401,827	0.000	155,459	0.000	0,000	2393.854	13123.950	7497,811
12-2028	0.000	2080,211	397.681	0.000	155.784	0.000	0.000	2322,008	15445.957	8452.397
12-2029	0.000	2010.673	393.597	0.000	156.159	0.000	0.000	2248.111	17694.067	9292,585
50,4620	2000	3534 -12	200 000	0.000	00000	12 245		1140 002	19870 693	10032.105
12-2030	0.000	1943.541	389,569		156.584	0.000	0.000			
12-2031	0.000	1878.927	385,693	0.000	157.058	0.000	0.000		21978.255	10683_065
12-2032	0.000	1815.449	381.757	0.000	157.582	0.000	0.000			11256.052
12-2033	0.000	1756.124	377.955	0.000	158.155	0.000	0.000	1975.923	25994.801	11760.432
S TOT	0.000	24406.417	5274.576	0.000	2048.647	0.000	1637.545	25994.801	25994.801	11760.432
AFTER	0.000	34722.927	9669.137	0.000	5872.662	37.048	0.000	38482.420	64477.221	15975.588
TOTAL	0.000	59129.344	14943.713	0.000	7921.248	37.049	1637.545	64477.221	54477.221	15375.588
		OIL	GAS					P.W. 1 P.	W., ZAR M5	
		!!	******	70	2 (2)			MARKET ST	date the second	
GROSS WE		0.0			FE, YRS.		49.83	0.00	64477.225	
	I., MB 5 MMF				COUNT 4		10-00	5.00	27754.734	
	M., MB & MMP				DISCOUNTED PA		2,41	8.00	19059.495	
	S., MR & MMF				COUNTED PAYO		2.51	10.00	15375.5e7	
NET RES.					ISCOUNTED NE		10.37	25.00	9783.855	
NET REVEN	NUE, MS	0.000	59129356.288	DI S	COUNTED WET/		11.89	20.00	6758 : 810	
INITIAL I	PRICE, \$	0.000	257,472	RAS	E-OF-RETURN,	PCT. 1	00.00	30.00	3699.659	
	N.I., PCT.	0.000			TIAL W.I., F		0.000	60.00	946.520	
- A 10 V	and the same		1,41,72,51		and programme	200		80.00	405.626	
								100.00	135,053	
								25.51	4651446	



PIPELINE AND PLANT COSTS

DATE : 02/22/2019
TIME : 18:07:47
DBS : MHA
SETTINGS : SET0319 ZAR
SCENARIO : MHA0319 3F

PERERVES AND ECONOMICS

					AS O	DATE: 03/20	19				
ENI	EAR OIL		GROSS CH4	GROBS BELIUM	NET OIL	NET CH4	NET HELIUM	PRICE	NET CH4 PRICE ZAR/MCF-	NET HELIUM PRICE ZAR/MCF-	TOTAL NET SALES ZAR MS
	MBBI	9	MadTh								- C4D
12-2	019 0.	000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2	0.00	000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2	27.	000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2		000	0,000	0.000	0.000	0.000	0,000	0.000	0.000	0.000	0_000
12-2		000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2		000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000
1.1		100	233.2	2 200			0_000	0.000	0.000	0.000	0.000
12-2		000	0.000	0.000	0.000	0_000	0.000	0.000	0.000	0.000	0.000
12-2		000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2		000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2		000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0,000
12-2	029 0,	000	0.000	0.000	0.000	0.000	0.000	0.000			7.00
12-2	0 000	000	0.000	0.000	0.000	0.000	0,000	0.000	0.000	0.000	0.000
12-2		gen:	0.000	0.000	0.000	0,000	0.000	0.000	0.000	0.000	0.000
12-2		000	0.000	0.000	0.000	0.000	0_000	9.000	0.000	0.000	0.000
12-2		000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	TOT C.	60D	4.000	0.000	0.000	0.000	9.000	0.000	0.000	0.000	0.000
8		Sõ.							0.000	0.000	0.000
AF	TER 0	000	0.000	0.000	0.000	0.000	0.000	0.000			27727
TO	TAL 0,	000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0,000	0.000
EN	D NET		NET	HET	TOTAL	DIRECT OPER	ABANDONMEN	EOUITY	FUTURE NEX	CUMULATIVE	COM. DISC.
MO-Y		re.	CH4 SALES H		TAX	EXPENSE	COST	INVESTMENT	CASHFLOW	CASHFLOW	CASHFLOW
190-1			ZAR M9	EAR MS	ZAR M\$	EAR MS	ZAR M\$	ZAR M\$	2AR MS-	ZAR M\$	9108 ZAR M\$
						** **	0.00	388.000	-403,000	-403,000	-392,794
12-2	019 0.	000	0.000	0.000	0.000	15,000					
12-2	020 0.	000	0.000	0.000	0,000	24.480	0.00				
1.2-2	021 0.	000	0.000	0.000	0.000	64.297	0.00				
12-2	022 0.	000	0.000	0.000	0.000	97.737	0,00				
12-2	023 0.	0.00	0.000	0.000	0,000	115.928	0.00				
12-2	024 0.	000	0.000	0.000	0.000	119.241	0.00	0.000	-119.24	-2647.678	-2118 .498
13.3			4 500	0.000	0.000	121.626	0.00	0.000	-121.62	-2769.304	-2185.020
12-2		000	0.000	0.000	0.000		0.00				
12-2		000	0.000	0.000	0,000	126.539	0_00				
12-2		000	0.000	0.000	0.000		0.00				
12-2		000	0.000	0.000	0.000		0.00				
12-2	029 0.	uvu	0.500	0.000	15,500						1021 6 161
12-2	030 0.	000	0.000	0.000	0.000	134.264	0.00				
12-2		000	0.000	0.000	0.000	136.970	10.00				
12-2		000	0.000	0.000	0.000	139.709	0.00				
12-2		000	0.000	0.000	0.000	142.504	0.400	0.000	-142.50	-3834.090	-2569,645
s	TOT 0.	000	0.000	0.000	0.000	1523.095	0.00	0 2210.995	-3834.09	-3834.090	-2569.645
AF	TER 0.	000	0.000	0.000	0.000	6771.530	0,00	0.000	-6771.53	-10605.624	-2993.213
TO	TAL 0.	000	0,000	0.000	0.000	8394.625	0.00	0 2210.995	-10605.61	-10605.624	-2993.213
			OIF	GAS					P.W. & P	W., ZAR MS	
			stability below						MALESTON IN	water-select	
GROS	S WELLS		0.0	0.0	LI	FE, YRS.		49.83	0.00	-10605,622	
	S ULT., MB &	1449	0.000	0,000		SCOUNT *		10.00	5.00	-4554,501	
	S CUM., MB &					DISCOUNTED PA		49.83	8.00	-3429.028	
	S RES., MB 6					SCOUNTED PAYO		49.83	10.00	-2993,214	
	RES., MB &					DISCOUNTED RE		-3,80	15.00	-2360.463	
	REVENUE, MS		0.000			SCOUNTED NET/		-0.65	20,00	-2007 385	
	IAL PRICE, 8	9	0.000			TE-OF RETURN,		0.00	30,00	-1595.050	
	IAL N.I., PO		0.000	100.000	IN	ITIAL W.I., I	PCT.	0.000	50.00	-1039,394	
									\$0.00	-858.394	
									100.00	-739.061	



3F PROVED DEVELOPED PRODUCING RESERVES TETRAM VIRGINIA METHANE AND RELIUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 18:07:47
DES : MMA
SETTINGS : SET0015 LAR
SCENARIO : MHA0319 3P

RESERVES AND ECONOMICS

				AS O	F DATE: 03/20	119					
END MO-YEAR	GROSS OIL	GROSS CH4	GROSS HELIUM	NET	NET CH4	NET HELLUM		NET OIL PRICE	NET CR4	NET HELIUM PRICE	TOTAL NET SALES
2000	MBBLS	MMCF	MCF	MBBLS	MMCF	MACE		ZAR/BBL-	ZAR/MCF-	ZAR/MCF-	ZAR MS
12-2019	0.000	43.162	1.373	0.000	38.954	1.3	104	0.000	226.560	2863.000	12.559
12-2020	0.000	49.548	1.576	0.000	44.717	1.4		0.000	246.720		15.421
12-2021	0.000	47 206	1,501	0.000		1.4	26	0.000	269 800	3002.000	15.733
12-2022	0.000	44,974	1,430	0.000		1.3		0.000	293.760	3074.000	16.100
12-2023	0.000	42,848	1.363	0.000		1.2	94	0.000	319.680	3148.000	16.437
12-2024	0.000	40.823	1_298	0.000	36.843	1.2	33	0.000	348.480	3224.000	16.815
12-2025	0.000	38.893	1.237	0.000	35.101	1.1	75	0.000	380.160	3301,000	17-223
12-2026	0.000	37.055	1,178	0.000		1.1		0.000	414.720	3380.000	17.653
12-2027	0.000	35.303	1,123	0.000	31.861	1.0	67	0.000	452,160	3461,000	18,098
12-2028	0.000	33,635	1,070	0.000	30.355	2.0	16	0.000	453.120	3544.000	17.356
12-2029	0.000	32.045	1.019	0.000	28.920	0.9	68	0.000	453.120	3529.000	16.617
12-2030	0.000	30.530	0.971	0.000	27.553	0.9	20	0.000	453.120	3716,000	15,912
12-2031	0.000	29.087	0.925	0.000	26.251	0,8		0.000	453.120	3806,000	15,912
12-2032	0.000	27.712	0.881	0.000	25.010	0.8		0.000	453.120	3897.000	14,595
12-2033	0.000	26,402	0.840	0.000		0.7		0.000	453.120	3991.000	13.980
										T. D. C.	
5 TOT	0.000	559,222	17.783	0.000	504.698	16.6	94	0.000	363.429	3333.440	239.737
AFTER	0,000	434.424	13.815	0,000	392,068	13.1	24	0.000	453,120	5106.937	244.677
TOTAL	0.000	993.647	31.598	0.000	896.766	30.0	18	0,000	402,642	4108.816	484.414
KND	NET	NET	NET	TOTAL	DIRECT OPER	ANNIE CAN	manni.	EOUTTY	FUTURE NE	COMULATIVE	CUM. DISC.
	OIL SALES	CH4 SALES H		TAX	EXPENSE	COST	Esta 1	INVESTMENT	CASHELOW		CASHFLOW
B-10-0-	ZAR MS		EAR MS		ZAR MS		46	ZAR 145	ZAR MS-		E10# ZAR MS
12-2019	0.000	8,825	3.733	0.000	0.570	ø.	000	0.000	11.98	9 11.999	11.528
10 0000		** ***	4 000		0.000			27.555	24 60		
12-2020	0.000	11.033	4.385	0.000	0.667		000	0,000	14.75		
12-2021	0.000	11.452	4.281	0.000	0.649		000	0.000	15.08		
12-2023	0.000	12.362	4,075	0.000	0.612		000	0.000	15.67		
12-2024	0,000	12.639	3,976	0.000	0.595		000	0.000			
	7.77								16,22		
12-2025	0.000	13,344	3.879	0.000	0.578	0.	000	0,000	16.64	105.985	77.235
12-2026	0.000	13,869	3,784	0.000	0.562	0.	000	0.000	17.09	123.076	85.737
12-2027	0.000	14.406	3.691	0.000	0.546		000	0.000	17.55		
12-2028	0.000	13.755	3.601	0.000	0.531		000	0.000	16.82	157.452	
12-2029	0.000	13.104	3.513	0.000	0.516	0 .	000	0.000	16.10	173 554	106.611
12-2030	0.000	12.485	3.427	0.000	0.501	0.	000	0.000	15.41	188.965	111.947
12-2031	0.000	11.995	3,344	0.000	0.487		000	0.000	14.75		
12-2032	0.000	11.333	3.262	0.000	0.473	0.0	000	0.000	14.12	217.839	120.370
12-2033	0.000	10.797	3.183	0.000	0_460	0.	000	0.000	13.520	231.359	123.821
S TOT	0.000	183.422	56.316	0.000	8-379	0.0	000	0.000	231.35	231.359	123,821
AFTER	0.000	177.654	67.023	0.000	9.560	0.	276	0.000	234.740	466.099	145,904
TOTAL	0.000	361.076	123.339	0.000	18.039	0.:	276	0.000	466.099	466.099	146.004
		ort.	GAS						P.W. * P.	W., ZAR M\$	
										2011001001	
GROSS WEL	LS	0.0	1.0	LITS	E, YRS.		4.5	9.83	0.00	466.099	
GROSS ULT	., MR & MMF	0.000	1092.258	DIS	COUNT 4		10	0.00	5.00	231.300	
GROSS CUM	., MB & MMF	0.000	98.611	UNI	ISCOUNTED PA	YOUT, YES	. 1	0.00	E.00	172.514	
GROSS RES	HE & MMF	0.000	993.647	DT 8	COUNTED PAYO	UT, YRS.	1	0.00	10.00	146.804	
NET RES.			895.766	UND	TECOUNTED NE	T/INVEST			15.00	106.332	
NET REVEN		0.000	361075.680		COUNTED NET/			tires	20.00	83.193	
INITIAL P	RICE, \$	0.000	226.560		E-OF-RETURM,			0.00	30.00	58.209	
INITIAL N	.I., PCT.	0.000	95.000	IN	TIAL W.I., P	CT.	100	000	60.00	31.974	
									80.00	25.357	
									100.09	21.383	



SP PROVED NON-PRODUCING RESERVES TETRA4 VIRGINIA METHANE AND HELIUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 18:07:48
DBS : MRA
SETTINGS | 8ET0319_1AR
SCENARIO : MHA0319_3P

RESERVES AND ECONOMICS

				M0 02	Carray, Golden					
END	GROSS	GROSS	GROSS.	NET	NET	NET	NET OIL PRICE	NET CH4 PRICE	NET HELIUM PRICE	TOTAL NET SALES
MO-YEAR	OXI.	CH4	HELIUM MHCF	OIL MBBLS	CH4	HELIUM MMCF		-LAR/MCF-	ZAR/MCF-	ZAR M\$
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2019	9.550	9.0	2000						2932.000	89.414
12-2020	0.000	311.410	7.298	0.000	280.269	6.912	0.000	268.800	3002.000	279.193
12-2021	0.000	904.851	21.204	0.000	814.366	20.084	0.000	293.760	3074.000	285.917
12-2022	0.000	859,609	20.144	0.000	773.648	19.079	0.000		3148.000	292,013
12-2023	0.000	816.628	19.137	0.000	734.965	18,126	0.000	319,680 348,480	3224.000	298.829
12-2024	0.000	775.796	18.180	0.000	698.217	17.219	0.000	248.480	3224.000	250.025
			W 44.3	100		16.358	0.000	380.160	3301.000	306.161
12-2025	0.000	737.007	17.271	0.000	553,306	15.540	0.000	414.720	3380.000	313.858
12-2026	0.000	700.157	16.408	0.000	630 . 141	14.763	0.000	452.160	3460.999	321.774
12-2027	0_000	665.149	15.507	0.000	598.634	14.025	0.000	453_120	3544.000	307.396
12-2028	0.000	631.891	14.808	0.000	568.702	13.324	0.000	453,120	3628,999	293.158
12-2029	0.000	600.297	14.067	0.000	540.267	13.324	0.000		24012100	
		500 ct2		0.000	513.254	12.658	0.000	453,120	3716.000	279.602
12-2030	0.000	570.282	13.364		467.591	12.025	0.000	453.120	3806.000	266.704
12-2031	0.000	541.768	12,696	0.000	463.212	11.424	0.000	453.120	3897.000	254.408
12-2032	0.000	514.679	12.061		440.051	10.852	0.000	453,120	3991.000	242,708
12-2033	0.000	488.945	11.458	0.000	440.051	10.932	0.00	3441024		
3 TOT	9.000	9118.467	213.684	0.000	8206,622	202.389	0.000	382.989	3399.842	3831,134
AFTER	0.000	5646-872	132.330	0.000	5082.185	125.335	0.000	453.120	4856.511	2911,532
TOTAL	0_000	14765.340	346.014	0,000	13288.006	327.725	0.000	409.810	3956.932	6742.666
TOTAL	0.000	14/03.340	244.025				arrana a		CUMULATIVE	CUM. DISC.
END	NET	NET	NET	TOTAL	DIRECT OPER	ABANDONNENT		FUTURE NEW	CASHFLOW	CASHFLOW
	OIL SALES	CH4 SALES H	ELIUM SALES	TAX	EXPENSE	COST	INVESTMENT	CASHFLOW		GIOS ZAR MS
Lucia	EAR MS	ZAR MS	ZAR M9	ZAR MS	ZAR MS	ZAR M\$	ZAR M9	SAR MS-	KMM 672.	Stop and
					2332		0.000	0.000	0.000	0.000
12-2019	0.000	0.000	0.000	0.000	0.000	0.000				
12-2020	0.000	69.148	20.268	0.000		0.000		65.83		
12-2020	0.000	218,902	60.291	0.000	12.431	0.000		266.76		
12-2022	0.000	227,267	58 650	0.000	12.046	0.000		273.87		11.00
12-2023	0.000	234.954	57.059	0.000	11.672	0.000		280.34		* II
12-2024	0.000	243.315	55.515	0.000	11.311	0.000	0,000	287.51	9 1174,331	827.042
12-2024	4.444								1469.532	989.391
12-2025	0.000	252.162	53.999	0.000		0.000		295,20	The state of the s	
12-2026	0.000	261.332	52.526	0.000		0.000		303.23		
12-2027	0,000	270.675	51.096	0,000		0.000		311.48		20 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
12-2028	0.000	257.590	49.705	0.000		0.000		297.42		
12-2029	0.000	244.806	48.352	0.000	9.663	0.000	0.000	283.49	5 2665.172	1509.519
16 2025	1777				1000	5 42		270.23	8 2935 411	1601,206
12-2030	0.000	232.565	47,036	0,000		0.000		257.63	manual 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
12-2031	0.000	220.937	45,766	0,000		0.000		245.61		
12-2032	0.000	209.890	44.518	0.000		0.000	50 0.000.000	234.18		17021722
12-2033	0.000	199.396	43.312	0.000	8.519	0,001	0.000	234.16	20/2.04	
s TOT	0.000	3143.042	688.092	0.000	138.908	0.00	19.380	3672.84	6 3672.84	1909,552
AFTER	0.000	2302.840	608,693	0.000	116.414	5 25	3 0.000	2789,86	5 6462.71	2170,416
LATOT	0.000	5445.082	1296.785	0.000	255.322	5.25	3 19.380	6462,71	2 6462.71	2 2170.416
TOTAL	0,000	19:30	GAS					P.W. * P	.W. , ZAR MS	
		OIL	(A)						********	
GROSS WE	27.7.0	0.0	19.6	LI	FE, YRS.		33.08	0,00	6462.711	
	JI., MB & MMS			DI DI	SCOUNT &		10.00	5.00	3471.006	
GROSS U	JH., MB & MM			UN	DISCOUNTED P	AYOUT, YRS.	1.06	8.00	2580,760	
CBOSE OF	ES., MB & MM			DI	SCOUNTED PAY	OUT, YRS.	2.06	10,00	2170.416	
NET RES				o Un	IDISCOUNTED W	ET/INVEST.	334 .47	15.00	1502.599	
	ENUE, MS	0.000			SCOUNTED WET	/INVEST	130.20	20.00	1113.688	
	PRICE, \$	0.000		RJ RJ	TE-OF-RETURN		100.00	30.00	695.925	
	N.I., PCT.	0.000			ITIAL W.I.,	PCT. 1	00.000	60.00	278.487	
AMILIAN	Missel Eres							80.00	183.571	
								100.00	131.074	



3F PROVED UNDEVELOPED RESERVES TETRA4 VIRGINIA METHANE AND HELLUM GAS FIELDS REFUEDLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 18:07:50
DBS : MHA
SETTINGS : SET0319_XAR
SCENARIO : MHA0319_3P

RESERVES AND ECONOMICS

				AB 0	F DATE: 03/20	119					
END	GROSS	GROSS	GROSS	NET	NET	NET	NET	OTT	NET CH4	NET HELIUM	TOTAL
MO-YEAR	OIL	CH4	HELIUM	OIL	CH4	HELIUM	PRI		PRICE	PRICE	NET SALES
Para de de	MBBLS	MMCF		MBBLS		MMCF-			ZAR/MCF-	ZAR/MCF-	ZAR MS
	12000	14704		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			nearl	44144	- 6045/ 4002	End back	2201 120
12-2019	0.000	0.000	0.000	0.000	0.000	0.00	0 0	.000	0.000	0.000	0.000
12-2020	0.000	382,792	9,650	0.000	344.483	9.14		.000	246,720	2931.999	111.789
12-2021	0.000	1221.428	28.600	0.000		27.08		.000	268,800	3002.000	376.808
12-2022	0.000	1180.524	27.643	0.000		26.18		.000	293.760	3074.002	392.594
12-2023	0.000	1140.990	26.717	0.000							
12-2023	0.000	1102.778	25.822	0.000		25.30		000	319.680	3148.000	407.936
12-2024	0.000	1102.778	25.622	0.000	992.502	24.45	, 0	.000	348.480	3224.001	424.718
12-2025	0.000	1065.848	24.957	0.000	959.264	23 63	B D	.000	380 160	3301.001	442.704
12-2026	0.000	1030 .154	24.122	0.000	927.140	22,84		.000	414.720	3380,000	461.725
12-2027	0.000	995.655	23.314	0.000	896,091	22,09		.000	452,160	3461.000	481.601
12-2028	0.000	962.312	22,533	0.000		21.34		.000	453.120	3544.001	468.075
12-2029	0.000	930.086	21.778	0.000		20.62		000	453.120	3628,999	454,153
	4,777					-7100	0 0		100.20	4.44	
12-2030	0.000	898.938	21.049	0.000	809.045	19.93	7 0	.000	453,120	3716,001	440 . 679
12-2031	0.000	869.834	20,344	0.000	781.951	19.26	9 0	.000	453,120	3805.999	427.655
12-2032	0.000	839.738	19.663	0.000	755.764	16.62	4 0	.000	453,120	3897.001	415.026
12-2033	0.000	811.616	19.004	0,000		18.00		000	453,120	3991,001	402.821
							3	665			
3 TOT	0,000	13431.694	315.198	0.000	12008.502	298.53	7 0	.000	307.738	3420.395	5708.286
AFTER	0.000	16094.391	376,723	0.000	14484.971	356,81	1 0	.000	453.120	5173.328	8409.330
TOTAL	0.000	29526.084	691.921	0.000	26573.472	655.34	9 0	.000	423.377	4374,797	14117.616
EMD	NET	NET	NET	TOTAL	DIRECT OFER				FUTURE NE		
MO-YEAR	OIL SALES		ELIUM SALES	TAX	EXPENSE	COST	INVES		CASHELOW	CASHFLOW	CASHFLOW
******	ZAR MS	2AR MS	ZAR M9	ZAR MS	ZAR MS	SAB MS-	ZAR	M\$	ZAR MS-	ZAR M\$	9109 ZAR M\$
12-2019	0.000	0.000	0.000	0.000	0.000	0.0			2	-6,000	
12-2019	0.000	6.000	0.000	0.000	0.000	0.0	0.0	6.000	-6.000	-6.000	-5.653
12-2020	0.000	84.991	26.798	0.000	5.156	0.0	0 0	0 780	15.853	9.853	5_438
12-2021	0.000	295.488	81,320	0.000	16.781	0.0		0.000	360,026		293.863
12-2022	0.000	312.112	80.482	0.000	16,543	0.0		0.000	376.051		567.737
12-2023	0.000	328 . 277	79.659	0.000	16.309	0.0		0.000	391,621		\$27.026
12-2024	U.000	345.867	78.850	0.000	16.078	0.0		0.000	400.640		1072.983
	000	545.007	14.420	0.400	201010	0.0		4.000	400.04	4340.122	10/2.905
12-2025	0.000	364.674	78.030	0.000	15.550	0.0	10	0.000	425.854	1973.052	1306.547
12-2026	0.000	384.503	77.222	0.000	15.626	0.0		0.000	446.099		1528 451
12-2027	0.000	405.177	76.424	0.000	15.405	0.0		0.000	466.196		1739.270
12-2028	0.000	392,439	75.636	0.000	15.186	0.0		0.000	452.889		1925_452
12-2029	0.000	379,297	74.857	0.000	14.971	0_0		0.000	439.182		2089.587
		41244			24.271	0_0	4	0.000	432.102	3111-410	2003-201
12-2030	0.000	366.594	74.084	0.000	14.759	0.00	10	0.000	425.915	4203,338	2234 . 294
12-2031	0.000	354.318	73,337	0,000	14.550	0.00		0.000	413,105		2361.888
12-2032	0.000	342.452	72.576	0.000	14.344	0.00		0.000	400.684		2474.395
12-2033	0.000	330.984	71.638	0.000	14.141	0.0		0.000	388.680		2573.609
	0.000	220.304	12.034	4.555	14.241	0.00		0.000	200	5405.007	20 73.005
S TOT	0.000	4687.171	1021.115	0.000	205.700	0.01	00 90	6.780	5405.807	5405.807	2573,609
AFTER	0,000	6563,431	1845 898	0.000	363.759	10.5	6	0.000	8035,064	13440.873	3303.474
TOTAL	0.000	11250.602	2867,013	0.000	569.459	10.50	6 9	6.780	13440.870	13440,873	3303.474
		OIL	GAS								
									P.W. t P.	W., EAR MS	
GROSS WET	LES	0.0	38.0	LIS	E, YES.		49.00		0.00	13440.672	
GROSS UL1	T. MB & MMF	0.000	29526.080		COUNT 4		10,00		5.00	5820.668	
	1. MB & DMF				ESCOUNTED PA	YOUT, YES	1.21		8.00	4049,233	
	. ME & MMF				COUNTED PAYO		1.34		10.00	3303,475	
WET RES.					SECOUNTED NE		139.89		15.00	2175.569	
NET REVEN			11250603.008		COUNTED NET/		39 65		20.00	1562.043	
INITIAL B		0,000			E-OF-RETURN,		100.00		30.00	934.397	
	I.I., PCT.	0.020			TIAL W.I., P		00.000		60.00	342.094	
- was a state of	THE ST SHEET	0.040	24.152	5.00	Trees a				80.00	214.566	
									100.00	146.096	
									100.00	146,096	



3P PROBABLE RESERVES TETRAA VIRGINIA METHAME AND HELIUM GAS FIELDS REFUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 18:07:54
DBS : MRA
SETTINGS : SET0319 IAR
SCERARIO : MRAD319 3F

DESPRIVES AND ECONOMICS

				AS OF	DATE: 03/201	19				
END	GROSS OIL	GROSS CH4	GROSS NELLUM	NET	NET CH4	HELIUM	PRICE	PRICE ZAR/MCF-	PRICE	TOTAL NET SALES ZAR MS
1-0-0-1	MBBLS	MACF	MACE	MBBLS		MACE	ZAR/BBL-	SPR/MUH-	ARRI MOE	
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0,000	0,000	0.000
		Test value		0.000	119.320	3.944	0.000	246.720	2931.999	41.002
12-2020	0.000	132.860	4.172	0.000	3141 900	86.687	0.000	268.600	3001,999	1104.778
12-2021	0.000	3491.457	91.530		3756.730	91.144	0.000	293,760	3074.001	1383.752
12-2022	0.000	4174.122	96.230	0.000	3643.299	68.392	0.000	319,680	3147.999	1442.947
12-2023	0.000	4048.088	93.324	0.000	3533.296	65.723	0.000	348.480	3223.999	1507.652
12-2024	0.000	3925,863	90,506	0.090	3333,224					W. mar. J. Mar.
	17774	A 100 Aug.		0.000	3426,612	B3.134	0.000	380,160	3301.000	1577.087
12-2025	0.000	3807.326	87.773	0.000	3323.149	80.624	0.000	414.720	3390,002	1650.686
12-2026		3692,369	85.123	0.000	3222.810	78.190	0.000	452.160	3461.000	1727.842
12-2027	0.000	3580.881	80.061	0.000	3125,502	75.829	0.000	453.120	3543.999	1584.965
12-2028	0.000	3472,762		0.000	3031.130	73.539	0.000	453.120	3629.001	1640.341
12-2029	0.000	3367.904	77.643	0.000	2625.724	261221				
	5 144		75.299	0.000	2939,610	71.319	0_000	453.120	3716,000	1597.017
12-2030		3266.214	73.025	0.000	2850.849	69,166	0.000	453_120	3806-000	1555.022
12-2031		3167,596	70 . 820	0.000	2764.773	67.077	0.000	453,120	2897.001	1514.173
12-2032		3071.953		0.000	2681.292	65.052	0.000	453,120	3991.001	1474 570
12-2033	0.000	2979.200	68 . 68.2	0.000	EUN'A. A.Ph					1214 642
s ror	0.000	46178.596	1076 742	0.000	41560.272	1019_820	0.000	394,434	3440.856	19901.833
AFTER	0.000	62968.040	1451.656	0.000	56671.544	1374,931	0.000	453.120	5198.460	32826,530
TOTAL	0,000	109146.640	2528.398	0.000	98231,816	2394.751	0.000	428.291	4449.973	52728 , 365
					DIRECT OPER	A TO A SOTTONIA PROPERTY.	ECULTY.	FUTURE NET	CUMULATIVE	CUM. DISC.
END	NET	NET	NET	TOTAL		COST	INVESTMENT	CASHFLOW	CASHFLOW	CASHFLOW
MO-YEAR	OIL SALES		ELIUM SALES	TAX	EXPENSE	-ZAR MŞ	ZAR M8	ZAR M9	ZAR MS	9104 ZAR MS
	ZAR M\$	ZAR M5	ZAR MS	ZAR MS	EAR MS	arut pup	- Ties and	area. Ind.		
12-2019	0.000	0,000	0.000	0.000	0.000	0.00	0.000	0,000	0.000	0.000
			V. 10.56	2 442	1 700	0.00	79.050	-39.837	-39 837	-34.418
12-2020		29,439	11,563	0.000	1.790	0.00		939.766		711.127
12-2021	0.000	844.543	260.236	0.000		0.00		1325.260		1676.274
12-2022		1103.577	280.175	0.000		0.00		1385.086		2593,289
12-2023		1164.689	278.257	0_000		0.00	5 2 2 2 3 3	1450.016	5060.689	3466.259
12-2024	0.000	1231.283	276.370	0.000	37.237	0.00		36.45.110		
			274.427	0.000	56.619	0.00	0.000	1520.468	6561.158	
12-2025		1302.661		0.000		0.00		1594.679	8175.837	
12-2026	0.000	1379.176	272.510	0.000		0.00		1672,438		
12-2027		1457.226	270,615	0.000		0.00		1630.161		6517.839
12-2028		1416.227	268.738	0.000	54.213	0,00		1586,128		7110.603
12-2025	0.000	1373.466	266.875	0.000	34.443	0.00				
		No. of Care		0.000	53.627	0.00	0.000	1543.390		
12-2030		1331.996	265.022	0,000	254554	0.00		1501.974	16109.926	
12-2031		1291,777	263.244	0.000		0.00		1461.698		
12-2032		1252,774	259.622	0.000		0.00	0 0.000	1422.662	18994.289	8872.411
12-2033	0.000	1214,948	259.022	0.000	24.14	0.00		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1000	9 8872.411
s TO	0.000	16392.780	9509.054	0.000	711.452	0.00	0 196,095			
AFTE	P. 0.000	25679.006	7147.523	0.000	1432.708	21.01	0000 E.			
TOTAL	0.000	42071.765	10656,578	0.000	2144,161	21,91	.5 196.095	50367-09	9 50367.10	11620.936
		of L	GAS					P.W. & P.	W., EAR MS	
	200	0.			FT. YRS.		49.83	0.00	50367.099	
GROSS I	WELLS				SCOUNT &		10.00	5_00	20988.219	
GROSS I	ULT., MB 5 bad	F 0.00			DISCOUNTED P.	AYOUT YES.	1.68	8,00	14359.788	
GROSS (CUM., MB & MM	g 0.00			SCOUNTED PAY	OUT. YRS.	1.68	10.00	11620,935	
	RES., MB & MM	F 0.00			IDISCOUNTED N	ET/INVEST	257.85	15.00	7516,789	
NET RE			042071785.472		SCOUNTED NET		71.94	20.00	5318.168	
	VENUE, MS	0.90			ATE-OF-RETURN		100.00	30,00	3104.746	
	L PRICE, \$				MITIAL W.I.,		.00.000	60.00	1079.461	
INITIA	L N.I., PCT.	00	99.50					80.00	662.058	
								100.00	444.059	



3P POSSIBLE RESERVES THTRAY VIRGINIA METHANE AND HELLUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/22/2019
TIME : 18:07:57
DBS : MHA
SETTINGS : SET0319 ZAR
SCENARIO : MHA0319_3P

RESERVES AND ECONOMICS

				AB 0	F DATE: 03/2	119					
END	GROSS	GROSS	GROSS	NET	NET	NET	MPT	OIL	NET CHÁ	NET HELIUM	TOTAL
NO-YEAR	OIL	CH4	RELIUM	OIL	CHA	HELIUM		CE	PRICE	PRICE	NET SALES
190 1700	MBBLS	MACF		MBBLS		NOSCE		/BBL-			ZAR M\$
			- tmiest						and the same	Carrent Lives	
12-2019	0_000	0.000	0.000	0.000	0.000	0.00	ia .	0.000	0,00	0 0.000	0.000
					3,433						
12-2020	0.000	0.000		0.000		9.00	0	0.000	0.00		0.000
12-2021	0.000	796.867		0.000		23.01		0.000	268.80		261,748
12-2022	0.000	5973.727		0.000		132.4		0.000	293,76		1986.559
12-2023	0.000	60 64 . 950		0.000		129.21		0.000	319.68		2151.742
12-2024	0.000	5887.812	132.442	0.000	5299.066	125.44	2	0.000	348.48	0 3224.000	2251.044
	9.000	3400 DVD	400 000			44.		1. 444	240 26		0000 000
12-2025	0.000	5715,854				121.7		0.000	200,20		2357, 648
12-2025	0.000	5548-917		0.000		118.23		0.000	414.72		2470.725
12-2027	0.000	5386,852		D_000		114.76		0.000	452.16		2589_377
12-2026	0.000	5229.523		0.000		111.41		0.000	453.12		2527.517
12-2029	0.000	5076 788	114 .198	0.000	4569.137	109 26	13	0.000	453.12	0 3629.000	2462.892
12-2030	0.000	4928 516	110 863	0.000	4435 688	105.00		0.005	453,12	0 3716.000	2400 694
12-2030	0.000	4784.570		0.000		101.93		0.000	453.12		2339.170
12-2032	0.000	4544.832		0.000		98.96		0.000	453.12		2279.859
12-2033	0.000	4509,174	101,430	0.000	4058,201	96.07	0	0.000	453.12	0 3990.998	2222.303
s TOT	0.000	64548.384	1463.923	0.000	58092.716	1386.52	4 1	0.000	404.17	4 3477.108	28300.677
		which has	The second						400.00		****
AFTER	0.000	96769.664	2176.760	0,000	87093.256	2061.71		0.000	453.12	5203.585	50192.200
TOTAL	0.000	161318.008	3640.683	0.000	145185 968	3448.24	0 (0.000	433,53	6 4509.435	78492.877
END	NET	NET	NET	TOTAL	DIRECT OPER	ARANDOMM	nom grou	UTTY	FUTURE N	PE COMMENTER	CUM. DISC.
	OIL SALES		HELIUM SALES	TAX	EXPENSE	COST		STMENT			CASHFLOW
MV-ILME	ZAR MS		EAR MS		SAR MS	EAR MS-		R MS			6108 ZAR MS
	and high	- FWP ING-	- mer ton-	esert top-	- but tob	West total	200	W 190	e e e e	Elect total	GTAR PARK ETA
12-2019	0,000	0.000	0.000	0.000	0,000	0.0	00	0.000	0.0	90 0,000	0.000
12-2020	0.000	0.000	0.006	0.000	0.000	0.0	0.0	0.000	0.0	0.000	0.000
12-2021	0.000	192,500	69.248	0.000	10.948	0.0		43.055			
12-2022	0.000	1579.323		0.000	83,711	0.0		55.713			
12-2023	0,000	1744.969		0.000	86.689	0.0		0.000			
12-2024	0.000	1846.618	404.426	0.000		0.0		0.000			
12-2024	0.000	1040,010	404.420	0.000	65.542	0.0	00	0.000	2400 (2)	02 6760.7720	4435.525
12-2025	0.000	1955,658	401.991	0.000	85.000	0.0	D.O.	0.000	2272.6	8457.783	5337.107
12-2026	0.000	2071.134	399,590	0.000	84.168	0.0		0.000			
12-2027	0.000	2192.161	397.216	0.000	83.344	0.0		0.000			
12-2028	0.000	2132.654	394.862	0.000				0-000			
12-2029	0.000	2070.368		0,000	81,720	0.0		0.000			
12-2029	0.000	20 70 ,300	392,324	9.000	er. ikn	0.0	40	0.400	2302.1	11 101 10,332	9002.409
12-2030	0.000	2009,899	390.195	0.000	80.920	0.0	60	0.000	2319.1	75 20495,708	10340.325
12-2031	0.000	1951.197	387.973	0.000	80.128	0.0		0.000	2259.0		
12-2032	0.000	1894.210	385.647	0.000		0.0		0.000			
12-2033	0.000	1838.988	383.414	0.000	78.567	0.0		0.000	2143.7		
16-2000	5,500	1034,1000	242.444	0.000		4,.0			2145.7		12272.002
s TOT	0.000	23479.581	4821.092	0.000	1002.908	0.0	00 19	98.768	27099.00	5 27099.005	12203.092
AFTER	0.000	39463.694	10728.523	0.000	2204.703	21.0	13	0.000	47966,45	75065.516	15375.396
TOTAL	0.000	62943 273	15549.615	0.000	3207.611	21.0	13 30	768	75065.45	75065.516	16376.396
Torra		400,000,000		2000							
		OIL	GAS							W . EAR MS	
GROSS WE	LLS	0.0	76.0	LIE	E, YES.		49.83		0.00	75065.491	
GROSS UL	T., MB & HAF	0.000	161318.016	DIS	COUNT 4		10.00		5.00	30 030 .593	
	M., ME 6 MMF				ISCOUNTED PA	YOUT, YRS.			8.00	20481.051	
	S., ME & MMF				COUNTED PAYO		2.41		10.00	16376.398	
NET BES.			145185.968		MISCOUNTED NE				15.00	10301.596	
NET REVE			62943256,576		COUNTED NET/		107.06		20,00	7092.956	
INITIAL		0.000			E-OF-RETURN,		100.00		30.00	3929.091	
	N.I., PCT.	0.000			TIAL W.I., P		200.000		60.00	1184.796	
	1.00	2.200		2019	-0-0-0-0				EQ.00	668.892	
									100.00	416.410	



TOTAL PROVED * PROBABLE + POSSIBLE (3P) RESERVES
TETERA VIRGINIA METHANE
AND HELIUM GAS FIELDS
REPUBLIC OF SOUTH AFRICA
AS OF MARCH 1, 2019

DATE : 02/22/2019
TIME : 18:07:57
DBS : MHA
SETTINGS : SET0319 EAR
SCENARIO : MHA0319 3P

PERFECES AND ECONOMICS

				AS OF	DATE: 03/201	9				
		2000	*****	NET	NET	NET	NET OIL	NET CH4	NET HELIUM	TOTAL
END	GROSS	GROS5	GROSS	DIL	CB4	HELIUM	PRICE	PRICE	FRICE	NET SALES
MO-YEAR	OI I'	CH4	HELIUM	MBBLS	MMCF	NMCF		ZAR/MCF-	LAR/MCF-	ZAR MS
	MBBLS	MMCF	PERCE	MODLS	Carrier .			772.00		
12-2019	0.000	43,162	1.973	0.000	38.954	1.304	0.000	226.560	2863.000	12.559
	14 525	War 1975		0.000	788.789	21.492	0_000	246.720	2932.000	257.626
12-2020	0.000	876.610	22.695	0.000	5814.300	158.353	0.000	268.800	3001.999	2038.261
12-2021	0.000	6461.809	167.221	0.000	11009.675	270.240	0.000	293.760	3074.001	4064.922
12-2022	0.000	12232.955	265.318		1009.675	262.332	0.000	319.680	3147.999	4311.075
12-2023	0.000	12113,504	276.967	0.000		254.075	0.000	348,480	3224,000	4499,058
12-2024	0.000	11733.073	268.249	0.000	10559,923	254.075	0.000			
GO TAXA		11364,929	259.813	0.000	10228,583	246.084	0.000	380 160	3301.000	4700.822
12-2025	0.000		251 650	0.000	9907,929	238.353	0.000	414.720	3379.999	4914.648
12-2026	0.00	11008.652	243.750	0.000	9597,594	230.870	0.000	452.160	3461.000	5138.691
12-2027	0.000	10663 840	236.105	0.000	9297,242	223.630	0.000	453.120	3544.000	5005 308
12-2028	0.000	10330.123		0.000	9006.532	216,622	0.000	453.120	3629.000	4867,162
12-2029	0.000	10007,119	228 707	4.000	9000,332					
12-2030	0.000	9694.480	221.546	0.000	8725.149	209.840	0.000	453.120	3716.000	4733,304
12-2030	0.000	9391.855	214.616	0_000	8452.783	203.275	0.000	453,120	3906.000	4603.791
	0.000	9098.914	207,908	0.000	8189.133	196.922	0.000	453.120	3897 000	4478.054
12-2032		8815.337	201.415	0.000	7933.907	190.772	0.000	453,120	3990,999	4356.382
12-2033	0.000	8815.337	201.945	10.00			2.642		2350 407	57911.669
s Tor	0.000	133836.352	3087.330	0.000	120452.816	2924.164	0.000	397.550	3452.497	
AFTER	0.000	181913.392	4151.284	0.000	163724.000	3931.917	0.000	453.120	5187.713	94584.275
TOTAL	0.000	315749.760	7238,614	0.000	284176.832	6856.082	0.000	429,566	4447.632	152565.940
10180	0.000	925 (42.) ***					- Demis	DESCRIPTION ASSESSMENT	COMULATIVE	CUM. DISC.
END	NET	RET	NET	TOTAL	DIRECT OPER			FUTURE NET		CASHFLOW
	OIL SALES	CH4 SALES H	ELIUM SALES	TAX	EXPENSE	COST	INVESTMENT	CASHFLOW	CASHFLOW	
	EAR M9	ZAR MS	ZAR M\$	ZAR M\$	ZAR M\$	ZAR M8	EAR MS	ZAR M\$	ZAK MS	910% ZAR MS
	0.000	8.825	3.733	0.000	15,570	0.000	394,000	-397.013	-397.011	-366.919
12-2019	0.000	0.022	3, 135	3.435	. Secret					140 344
20 2000	0.000	194.510	63.026	5.000	36,287	0.000	538.050	-316.717		
12-2020	0.000	1562.984	475.377	0.000	153.072	0.000	1134.036	751.153		
12-2021		3234.202	830.719	0.000	269.161	0.000	352,852	3442.910		
12-2022	0.000	3485.251	825,822	0.000	289.073	0.000	303,081	3718 921	7199.261	4877.146
12-2023	0.000		819.137	0.000	290.302	0.000		4208,75	11408.017	7410.338
12-2024	0.000	3679.921	819.15/	0,000	230,002					1100 088
40 444	0.000	3888.499	812.325	0.000	290,633	0.000	0.000	4410.190		
12-2025		4109.015	805.632	0.000		0.000	0.000	4623.606		
12-2026	0.000		799.042	0.000	291.528	0.000	0.000	4847.162	25288.974	
12-2027	0.000	4339.547	792,543	0.000		0.000	0.000	4713.21		
12-2028	0.000	4212.765	786.121	0.000		0.000		4574.42	34576.622	17962.433
12-2029	0.000	4081.041	186.121	0.000	232.749				60000	
12-2030	0.000	3953.540	779.764	0.000	293.456	0.000		4439.84		
	0.000	3830.125	779.666	0.000	294.257	0.000		4309.53		
12-2031		3710.560	767-404	0.000	295,138	0.000	0.000	4182.92		
12-2032	0.000	3595,013	761.370	0.000		0.000	0.000	4060 284	51569.213	23012.841
100	11 105			0.000	3690.442	0.000	2722.019	51569.21	51569.213	23012.841
g TOT	0.000	47886.000	10095_669			10,000		40707 17	135196.639	30624.813
AFTER	0.000	74186.629	20397.660	0.000	10898.777	59.06				
TOTAL	0.000	122072.629	30495.329	0.000	14589.219	58.063	2722,019	135196.64	135196.639	30624.813
		OIL	GAS						W., ZAR MS	
					L (23)		49.63	0.00	135196.656	
GROSS WE	LLS	C.E			FE, YRS.				56387.305	
GROSS III	T., MB 6 MME	0.000	315848.352		SCOUNT *	and the same	10.00	5.00 8.00	38224.318	
GROSS CU	M., MB 6 MMB	0.000	98 611		DISCOUNTED PA		2.78			
GROSS RE	S., MB & MM	0.000		V	SCOUNTED PAYO		2.86	10.00	30624.813	
NET RES.		0.000			DISCOUNTED NE		50.67	15.00		
NET REVE		0.000	*********		SCOUNTED NET		14.72	20.00	13162.664	
	PRICE, \$	0.000	258 . 348		TE-OF-RETURN		100.00	30.00	7127,319	
	N.I., PCT.	0_000		IN	TIAL W.I.,	PCT. 1	00-000	60_00	1877.416	
THETTEN		0.1711	47.07					B0.00	896.050	
								100.00	419,962	



TOTAL CONTINGENT RESOURCES TETRAM VIRGINIA METHANE AND HELLUM GAS FIELDS REPUELIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/25/2019 TIME : 12:57:37 DBS : MRA SETTINGS : SET0319 LAR SCENARIO : MHAD319 C1

RESERVES AND ECONOMICS

END	GROSS	GROSS	GROSS	NET	WET	NET	NET OIL	NET CH4	NET RELITED	TOTAL	
MO-YEAR	DIL	CH4	HELIUM	OIL	CH4	MELTUM	FRICE	PRICE	PRICE	NET SALES	
N 8 (10 () 10	MBBT.3		WCF	MBBLS	MMCF	100026	ZAR/BBL-	ZAR/MCF-	ZAR/MCF-	ZAR MS	
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0,000	0.000	0.000	
12-2020	0.000	0.000	0,000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12-2021	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0,000	
12-2022	0.000	744,852	23,686	0.000	672.229	22.502		293,760	3073.999	266.645	
12-2023	0.000	3863,328	122,854	0.000		116.711		319.680	3147.997	1492,018	
12-2024	0.000	6981.964	222.026	0.000		210,925		348.480	3223.999	2875.877	
12-2025	0.000	9905.821	315.006	0.000	8940.024	299.255	0.000	*** ***	5415 465	1000 100	
12-2026	0.000	10518.258	334.481	0.000				380,160	3301.000	4386.478	
12-2027	0.000	10166.035	323.279	0.000		317.757		414.720	3380.007	5010,851	
12-2028	0.000	9825.575	312.453	0.000		307,116		452,160	3461.002	5211.424	
12-2029	0.000	9496.520	301,990	0.000		296,830	0.000	453,120	3544.007	5070.055	
12-2029	0.000	9096.520	301.990	0.000	8570.614	285,890	0.000	453.120	3629,003	4924.646	
12-2030	0.000	9178.490	291.877	0.000	8283,640	277.283	0_000	453,120	3716.000	4783.840	
12-2031	0.000	8871.130	262.102	0.000	8006,188	267.997		453.120	3806.004	4647.765	
12-2032	0.000	6574.038	272.655	0.000	7738.071	259.022		453,121	3896.995	4515.682	
12-2033	6.000	B286.900	263.524	0.000		250.348		453.120	3990,999	4387.997	
s TOT	0.000	96412.904	3065.933	0.000	87012.688	2912.636	0.000	427,177	3568.385	47563.264	
AFTER	0.000	166565,392	5296,789	0.000	150325.264	5031.940	0.000		5104 040	04101 145	
								453.120	5180.942	94185,546	
TOTAL	0.000	262978.304	8362.713	0.000	237337.952	7944.576	0.000	443.609	4589.748	141748.914	
END	NET	NET	NET	TOTAL	DIRECT OPER	ABANDONNEN	r EQUITY	FUTURE MET	CUMULATIVE	CUM. DISC.	
MO-YEAR	OIL SALES	CH4 SALES	RELIUM SALES	TAX	EXPENSE	COST	INVESTMENT		CASHFLOW	CASHFLOW	
	ZAR M8	ZAR MS	ZAR M8	ZAR MS	ZAR M9	ZAR M5	ZAR M9	ZAR MS-	EAR MS	010% ZAR MS	
12-2019	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0,000	
						0.00	0.000	0.000	0,000	1 200	
12-2020	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	
12-2021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0_000	
12-2022	0.000	197.474	69.171	0.000	24.764	0.00	506.727	-264.846	-264.846	-201.111	
12-2023	0.000	1114,613	367.405	0.000	99,384	0.00	875.768	505.866	241.020	121.643	ď.
12-2024	0.000	2195.850	680.023	0.000	168,369	0.00	585.162	2122.343	2363,363	1389,017	
12-2025	0.000	3998.638	987.841	9.000	234_137	0.000	503.957	3648.381	6011.745	3372.202	
12-2026	0.000	3936.827	1074.020	0.000	265.339	0.000					
12-2027	0.000	4148.492	1062.928	0.000	266.251	0.000		4945,166			
12-2028	0.000	4018.076	1051.969	0.000	256.203	0.000		4803.839			
12-2029	0.000	3863.518	1041.125	0.000		0.000		4658.408			
12.2022	0.000	3463.326	1041.123	0.000	150.230	0.000	0.000	4638,408	24843.037	11518.577	
12-2030	0.000	3753.466	1030.382	0.000	266.334	0.000	0_000	4517.511	29360.548	13053.424	
12-2031	0.000	3627.766	1019,996	0.000	266.513	0.000		4381.252		14406.650	
12-2032	0.000	3506.279	1009.407	0.000	266.767	0.000	0.000	4248.913	37990,711	15599.699	
12-2033	0.000	3388,849	999.137	0.000	267.100	0.000		4120.691			
S TOT	0.000	37169.648	10393.406	0.000	2657.391	0.000	2794.246	42111.603	42111.603	16651.611	
AFTER	0.000	68115.395	26070.194	0.000	9604.193	95 . 662			126597,308		
									4.55	100000000	
TOTAL	0.000	105285,239	36463.600	0.000	12261.584	95.662	2794.246	126597.317	126597.308	24344.011	
		OI I.	CH4					P.W. & P.	W., ZAR M9		
GROSS WEI		0.0	346.0	LIE	E, YRS.		49.83	0.00	126597.251		
GROSS ULT	C., MB & MAP	0.000	262978 .336		COUNT &		10.00	5.00	48886.030		
GROSS CUN	I., MB & MMF	0.000			ISCOUNTED PA		4.36	8.00	31470.490		
	., MB & NMF	0.000			COUNTED PAYO		4.46	10,00	24344.001		
NET RES.		0.000	237337.952		SCOUNTED NE		46,31	15.00	14014.331		
NET REVEN	TUE, ZAR MS	0.000	105285.247		COUNTED NET/		14.78	20.00	8802.710		
	PRICE, EAR	0.000			E-OF-RETURN,		00.00	30.00	4059.797		
INITIAL N		0.000			TIAL W.I., P		0.000	60.00	730.060		
	200			-			(24, 70)	60.00	299.159		
								100.00	136.396		
									190.000		



TOTAL CONTINGENT RESURCES TETRAM VIRGINIA METHAME AND HELLUM GAS FIELDS REPUBLIC OF SOUTH AFRICA AS OF MARCH 1, 2019 DATE : 02/25/2019
TIME : 13:38:08
DBS : MHA
SETTINGS : SET0319 ZAP.
SCENARIO : MHA0319 C2

PESTRUSS AND LCONOMICS

				AS OI	DATE: 03/20	19				
END MO-YEAR	GROSS OIL	GROSS CH4	GROSS HELIUM	NET OIL	NET CH4	NET HELIUM	NET OIL PRICE ZAR/BBL-	NET CH4 PRICE ZAR/MCF-	NET HELIUM PRICE EAR/MCF-	TOTAL NET SALES ZAR M\$
	MBBLS	MACF	NeCF	MBBLS		- Paul	Dray Dan	newd tees	100,000,000	F-258 3255
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2020	0.000	0.000	0.000	0.000	0,000	0.000	0.000	0.000	0.000	0.000
12-2020	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000
12-2022	0.000	1291,505	40.553	0.000	1165.584	38.526	0.000	293,760	3074,003	460.830
12-2022	0.000	6707.094	210.603	0.000	6053,142	200.072	0.000	319.680	3148.000	2564 891
12-2024	0.000	12140.336	381.222	0.000	10957_100	362.161	0.000	348,480	3224.004	4985.935
12-2024	0.000	22240.020	3,2,22					7.000.000		
12-2025	0.000	17253.902	541.773	0.000	15571.692	514.684	0.000	380.159	3301.000	7618.693
12-2026	0.000	18372.400	576, 893	0.000	16581.091	548.049	0.000	414,720	3379.996	8728.906
12-2027	0.000	17817.686	559.475	0.000	16080.440	531.501	0.000	452.160	3460_998	9110.458
12-2028	0.000	17279.686	542.581	0.000	15594.918	515.452	0.000	453.120	3544.003	8893.135
12-2029	0.000	16757.937	526,200	0.000	15124.026	499.689	0.000	453.120	3628,996	8667.100
		T TTT I I I I	444 (444		***** ***	484.796	0.000	453_121	3716.002	8447.586
12-2030	0.000	16251.945	510.312	0.000	14667.369	470.157	0.000	453.120	3806.007	8234.836
12-2031	0.000	15761 258	494.903	0.000	14224.520	455.962	0.000	453.119	3896.998	8027.691
12-2032	0.000	15285.362	479,960	0.000	13795.047		0.000	453,119	3990.999	7826.859
12-2039	0.000	14823.832	465,468	0.000	13378.523	442.194	0.000	453,115	3930.323	1020.000
s TOT	0.00	169743.456	5329,942	0.000	153193,456	5063.444	0.000	427.477	3570.738	83566.920
AFTER	0.000	313314.148	9838.084	0.000	282766.656	9346.180	0.000	453.120	5198.461	176713.023
TOTAL	0,000	483058.304	15168.026	0.060	435960.126	14409,624	0.000	444.109	4626,490	260279,943
					Sanda Laboratoria			FUTURE NET	CONTRACT ACTIVE	CUM. DISC.
END	NET	NET	NET	TOTAL	DIRECT OPER		EQUITY	CASHFLOW	CASHFLOW	CASHFLOW
MO-YEAR	OIL SALES	CH4 SALES R		TAX	EXPENSE	COST	INVESTMENT	ZAR MS		210% ZAR MS
Carachiner	ZAR M9	ZAR M5	XAR M\$	KAR MS	ZAR M\$	ZAR M8	ZAR M\$	EAN MA	- DAK MA	Gree win no
12-2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-21 64161	12 224	0.000	0.000	0.000	0,000	0.000	0.000	0.000	0.000	0.000
12-2020	0.000		0.000	0.000	0.000	0.000		0.000	0.000	0.000
12-2021	0.000	342.402	118.428	0.000	38.632	0.000	803.863	-381.668	-381.668	-284,430
12-2022	0.000	1935.069	629,828	0.000	162.762	0.000		1222.284	840.617	514.940
12-2023	0.000	3818.330	1167.607	0.000	285.316	0.000		3806,316	4646.933	2794.773
12-2024	0.000	3818.330	1101.00.	0.000	200.020					
12-2025	0.000	5919.726	1698,973	0.000	402.872	0.000	819.284	6396,550		
12-2026	0.000	6876.511	1852.404	0.000		0.000	321.632	7953,882		
12-2027	0.000	7270.935	1839.524	0.000	454.935	0.000	0.000	8655.510		
12-2028	0.000	70 66 361	1826.765	0.000	455.542	0.000	0.000	8437.587		
12-2029	0.000	6853.001	1814.097	0.000	456.256	0.000	0.000	8210.841	44301.304	20682.314
	2	122623635				3700		1000	-5000	23397.057
12-2030	0.000	6646,086	1801.503	0.000	457.073	0.000		7990.513		
12-2031	0.000	6445.418	1789,422	0.000	457,996	0.000		7776.849		
12-2032	0.000	6250.800	1776.882	0.000	459.026	0.000		7568.653		
12-2033	0.000	60 62 . 0 69	1764.798	0.000	460.166	0.000	0.000	7366.695	75004.019	29804,540
S TOT	0.000	65486.705	18080.231	0.000	4543.971	0.000	4018,932	75004.019	75004.019	29804.540
AFTER	0.000	128127.238	48585.757	0.000	16721.835	95.662	0.000	159895.454	234899,505	43970.753
TOTAL	0.000	193613.939	66665.988	0.000	21265.805	95 662	4018.932	234899.472	234899,505	43970.753
		OIL	CH4					P.W. 9 P.	W. , ZAR MS	
	363		*****		FE YRS		49,83	0.00	234899.374	
GROSS WE		0.4					10.00	5.00	89010.356	
GROSS UI	T., MB & MAG	0.000			SCOUNT *		4.15	8.00	56968.598	
	M., MB & MHE				SCOUNTED PAYO		4.19	10.00	43970,724	
	5., MB 6 MAGE				DISCOUNTED NE		59.45	15.00	25269.752	
NET RES.		0.000			SCOUNTED NET		18.42	20.00	15897.809	
	NUE, ZAR MS	0.000			TE-OF-RETURN		00.00	30.00	7392.546	
	PRICE, ZAR	0.000			ITIAL W.I., I		0.000	60.00	1390,090	
INITIAL	N.I., PCT.	0.00	33,000		COLD COLOR			80.00	594.842	
								100.00	286.907	



TOTAL CONTINGENT RESOURCES TETRA4 VIRGINIA METRANE AND RELIUM GAS FIELDS ESPUBLIC OF SOUTH AFRICA AS OF MARCE 1, 2019 DATE : 02/25/2019 TIME = 13:58:31 DRS = MIA SETTINGS : BET0319 EAR SCENARIO = MMA0319 C3

RESERVES AND ECONOMICS

Part						Ab U	E LIMITE: MOVE	119				
132-2020 0.000 0.0	MO	YEAR	OIL	CH4	RELIUM	OIL	CH4	HELIUM	PRICE	PRICE	PRICE	NET SALES
12-2022 0.006 0.006 0.006 0.007 0.008 0.00			MBBLS	MMCE	MEGICA	PER ETIS	PAPIL P	PROCE	ENK/BEL-	8/M/ MCF-	ZARO MCE-	EAR MA
12-2922 0.000 0.000 107772 57.56 0.000 1753.744 54.877 0.000 2.007.60 397.007 669.276 12-2023 0.000 1907.322 300.101 0.000 1851.121 255.050 0.000 315.610 397.007 3691.750 12-2024 0.000 1907.322 300.101 0.000 16091.370 2.000 0.000 0.000 315.610 327.007 377.077 377.072 317.2025 0.000 22524.448 772.776 0.000 2277.777 215.222 0.000 22524.448 772.776 0.000 2277.777 217.272 217	12-	2019	0.000	0.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12-2822 0.000 1887.772 57.766 0.000 1776.324 58.877 0.000 200.760 3770.017 682.776 12-2824 0.000 1776.284 543.494 0.000 1881.121 188.905 0.000 134.460 3747.027 3770.017 12-2824 0.000 1776.284 543.494 0.000 1881.121 188.905 0.000 348.460 3747.027 189.000 212-2826 0.000 2254.640 772.776 0.000 22549.780 78.241 0.000 484.400 3201.001 11947,992 12-2826 0.000 2254.400 772.776 0.000 22549.780 78.241 0.000 484.470 380.000 1277.792 199.90 0.000 2358.400 78.250.900 1277.792 199.90 0.000 22549.790 78.241 0.000 484.772 3889.000 1277.792 199.90 0.000 22549.790 78.241 0.000 22549.800 22549.790 78.241 0.000 22549.800 2536.376 78.341 0.000 22549.800 22549.800 78.241 0.000 22549.800 2536.376 78.241 0.000 22549.800	12-	2020	0.000	0.000	0.000	0.000	0.000	0_000	0.000	0.000	0.000	0.000
12-2225 0.000 9907.322 300.105 0.000 1809.507 250.500 0.000 310.00 247.936 3727.017 12-2225 0.000 1201.214 454.0 0.000 10029.507 316.225 0.000 340.00 1201.007 12-2225 0.000 1201.314 1201.00 0.000 3271.776 731.325 0.000 340.01 1107.002 12-2227 0.000 1201.319 823.546 0.000 3429.5776 712.318 0.000 452.161 3301.001 1107.002 12-2228 0.000 1201.319 823.546 0.000 2201.076 712.318 0.000 452.161 3301.001 1107.002 12-2228 0.000 1201.077.792 0.000 1201.077.792 0.000 1201.077.792 12-2229 0.000 1201.077.792 0.000 1201.077.792 0.000 1201.077.792 12-2229 0.000 1201.077.792 0.000 1201.077.792 12-2231 0.000 1201.077.792 0.000 1201.077.792 12-2231 0.000 1201.077.792 0.000 1201.077.792 12-2231 0.000 1201.077.793 0.000 1201.077.793 12-2232 0.000 1201.077.793 0.000 1201.077.793 12-2233 0.000 1201.077.896 669.247 0.000 1201.077.793 12-2235 0.000 1201.077.896 669.247 0.000 1201.077.793 12-2235 0.000 1201.077.896 669.247 0.000 1201.077.793 12-2235 0.000 1201.077.892 0.000 1201.077.893 0.000 1201.077.793 12-2235 0.000 1201.077.892 0.000 1201.077.893 0.000 1201.077.793 12-2235 0.000 1201.077.892 0.000 1201.077.893 0.000 1201.077.793 12-2235 0.000 1201.077.892 0.000 1201.077.893 0.000 1201.077.793 12-2235 0.000 1201.077.892 0.000 1201.077.893 0.000 1201.077.793 12-2235 0.000 1201.077.893 0.000 1201.077.793 12-2235 0.000 1201.077.893 0.000 0.000 1.000 0.00	12-	2021	0.000								0.000	
12-2222 0.000	12-	2022	0,000	1687.772	57.766	0.000	1703.714	54.877	7 0.000	293.760	3074.001	669,176
12-2225												
12-2225	12-	2024	0.000	17761.284	543.494	0.000	16029.567	516.320	0.000	348.480	3224.004	7250.596
12-2225	12-	2025	0.000	25254.048	772.776	0.000	22791.774	734,135	0,000	380,161	3301,001	11067,902
12-2028	12-	2026	0.000	26913.830	823.564	0.000	24289.750	782.386	0.000	414.720		12717.892
12-2129 0.000 24923,876 753.492 0.000 22223.978 713.216 0.000 453.120 3629.010 12677.491 12-2530 0.000 23904.774 731.884 0.000 29174.026 694.909 0.000 453.120 3716.010 12357.495 12-2531 0.000 22206.570 730.120 0.000 2933.902 674.6155 0.000 455.129 3716.010 12357.495 12-2532 0.000 22223.781 689.381 0.000 2933.230 654.912 0.000 455.129 3897.002 11765.121 12-2531 0.000 22924.781 689.381 0.000 2933.230 654.912 0.000 455.129 3897.002 11765.121 12-2532 0.000 229251.564 7627.995 0.000 22324.390 631.744 0.000 455.129 3897.002 11765.125 1 TOT 0.000 45956.995 13862.441 0.000 22326.290 13864.921 0.000 459.127 3931.03 11812.265 1 TOT 0.000 45956.995 13862.441 0.000 223699.488 7245.739 0.000 459.120 5205.646 AFFER 0.000 45956.995 13862.441 0.000 888547.712 20599.905 0.000 459.120 5205.646 AFFER 0.000 45956.995 13862.441 0.000 888547.712 20599.905 0.000 459.120 5205.646 AFFER 0.000 718612.48D 21989.305 70.000 888547.712 20599.905 0.000 6459.120 5205.646 AFFER 0.000 718612.48D 21989.305 70.000 888547.712 20599.905 0.000 0.000 459.120 5205.646 AFFER 0.000 718612.48D 21989.305 70.000 888547.712 20599.905 0.000 0.000 8590.000 0.0	12-	2027	0.000	26127.792	799.509	0.000	23580.316	759.534	0.000	452 161	3461.002	13290.814
12-2130 0.000 23904.724 731.484 0.000 221574.026 694.999 0.000 453.120 3716.010 12357.695 12-231 0.000 22326.570 730.120 0.000 22943.902 674.615 0.000 453.120 3805.997 12057.793 12-2633 0.000 22322.7878 689.981 0.000 22823.0 554.912 0.000 453.120 3897.002 11165.121 12-2633 0.000 21970.896 669.247 0.000 12788.390 631.744 0.000 455.110 3897.002 11165.121 12-2633 0.000 21970.896 669.247 0.000 12788.390 631.744 0.000 455.110 3991.003 11471.255	12-	2028	0.000	25364.704	776,159	0.000	22891,604	737.352	0.000	453,121	3543,998	12985_834
12-2931 0.000 2206.570 T10.120 0.000 29943.902 674.615 0.000 453.120 3805.997 12057.703 12-2923 0.000 21070.606 689.247 0.000 19738.390 635.784 0.000 453.120 3991.003 11461.265 5 TOT 0.000 249251.504 7627.095 0.000 224949.488 7245.739 0.000 427.567 3371.444 12055.465 APTER 0.000 469360.992 14962.441 0.000 62590.208 1364.321 0.000 443.277 4537.50 3800.2092 TOTAL 0.000 718612.480 21989.336 0.000 828507.712 20990.080 0.000 443.277 4537.50 38000.299 TOTAL 0.000 718612.480 21989.336 0.000 885507.712 20990.080 0.000 444.277 4537.50 38500.292 -END NET NET NET NET TAX DIRECTORE ADMINOMENT EQUITY DIVERSHET CAMPLION CLASSES NELLOS NELLO	12-	2029	0.000	24623.876	753.492	0.000	22223.078	715.816	0.000	453,120	3629.010	12667.411
12-2931 0.000 2206.570 T10.120 0.000 29943.902 674.615 0.000 453.120 3805.997 12057.703 12-2923 0.000 21070.606 689.247 0.000 19738.390 635.784 0.000 453.120 3991.003 11461.265 5 TOT 0.000 249251.504 7627.095 0.000 224949.488 7245.739 0.000 427.567 3371.444 12055.465 APTER 0.000 469360.992 14962.441 0.000 62590.208 1364.321 0.000 443.277 4537.50 3800.2092 TOTAL 0.000 718612.480 21989.336 0.000 828507.712 20990.080 0.000 443.277 4537.50 38000.299 TOTAL 0.000 718612.480 21989.336 0.000 885507.712 20990.080 0.000 444.277 4537.50 38500.292 -END NET NET NET NET TAX DIRECTORE ADMINOMENT EQUITY DIVERSHET CAMPLION CLASSES NELLOS NELLO	12-	20.90	0.000	23004 724	731 484	0.000	21574 025	694 909	0.000	453 120	3716 310	12357 895
12-2932 0.000 25282.780 689.287 0.000 26382.250 654.912 0.000 453.120 3991.002 11765.126 1												
12-293												
## STOT 0.000 249251.504 7627.095												
AFTER 0.000 469360.992 14362.441 0.000 423598.298 13644.321 0.000 453.120 5203.686 262941.590 TOTAL 0.000 718612.400 21989.536 0.000 688547.712 20899.960 0.000 444.257 4637.540 385000.243										10000		
TOTAL 0.000 718612.480 21989.536 0.000 688547.712 208990.95 0.000 444.257 4637.540 285000.242	5	TOT	0.000	249251.504	7627.095	0.000	224949.488	7245 739	0.600	427.567	3571.444	122058.646
No.		FTER	0.000	469360.992	14362,441	0.000	423598.208	13644.321	0.000	453.120	5203.684	262941.599
No. Park Colt Sales Cas Sales Reijum Sales Cas Colt	2	LATO	0.000	718612.480	21989.536	0_000	608547.712	20890.060	0.000	444.257	4637.540	385000.243
No. Park Colt Sales Cas Sales Reijum Sales Cas Colt	- F	ND	NET	NET	NET	TOTAL	DIRECT OPER	ABANDONMEN	T BOUTTY	SUPURE NET	COMPLATIVE	COM DISC
12-2019 0.000 0.												
12-2029												
12-2029		4224	2 000	10.000								
12-2021 0.000 50.463 166.693 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 12-2022 0.000 50.463 166.993 0.000 234.677 0.000 101.001 -455.978 -455.978 -366.693 12-2024 0.000 529.523 897.491 0.000 234.677 0.000 1482.929 2009.407 1523.429 953.757 12-2024 0.000 5385.982 1664.618 0.000 409.947 0.000 1203.446 5637.149 7160.577 4332.467 12-2025 0.000 8664.533 2423.382 0.000 581.875 0.000 321.632 11744.404 22269.900 15267.817 12-2027 0.000 10662.090 2628.739 0.000 653.806 0.000 0.000 1203.404 4096.932 20982.243 12-2029 0.000 10373.617 2613.174 0.000 653.806 0.000 0.000 12233.992 53237.924 26051.827 12-2029 0.000 10069.722 2507.704 0.000 656.012 0.000 0.000 1231.392 65249.305 30540.233 12-2029 0.000 10069.722 2507.704 0.000 656.012 0.000 0.000 12011.382 65249.305 30540.233 12-2029 0.000 10069.722 2507.704 0.000 656.012 0.000 0.000 12011.382 65249.305 30540.233 12-2030 0.000 9490.105 2567.512 0.000 658.778 0.000 0.000 12011.382 65249.305 30540.233 12-2030 0.000 9490.105 2567.512 0.000 650.375 0.000 0.000 11309.924 8834.705 38036.653 12-2032 0.000 9212.334 2552.192 0.000 660.375 0.000 0.000 11309.924 8834.705 38036.653 12-2032 0.000 9212.334 2552.192 0.000 660.375 0.000 0.000 11304.732 99453.526 41154.023 12-2033 0.000 9212.334 2552.192 0.000 660.375 0.000 0.000 11304.732 99453.526 41154.023 12-2033 0.000 9212.334 2552.192 0.000 660.375 0.000 0.000 11304.732 99453.526 41154.023 12-2033 0.000 9212.334 2552.192 0.000 660.375 0.000 0.000 11304.732 99453.526 41154.023 12-2033 0.000 9212.334 2552.192 0.000 660.375 0.000 0.000 1309.9216 8334.795 38036.653 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000 1309.9216 8334 1000 0.000	12-	2019	u.000	0.000	0.000	0.000	0.000	0.00	0 0,000	u.000	0.400	
12-2022 0.000 900.463 168.693 0.000 54.511 0.000 1101.001 -485.978 -485.978 -360.601 12-2023 0.000 289.523 897.491 0.000 234.677 0.000 1482.929 2009.407 1523.429 953.757 12-2024 0.000 5385.982 1664.628 0.000 409.947 0.000 1203.446 5637.149 7160.577 4332.467 12-2025 0.000 10073.455 2644.465 0.000 651.875 0.000 321.632 11744.404 22659.900 126267.817 12-2026 0.000 10073.455 2644.465 0.000 651.875 0.000 321.632 11744.404 22659.900 126267.817 12-2027 0.000 10662.090 2628.739 0.000 653.806 0.000 0.000 12637.347 40906.932 20992.243 12-2028 0.000 10372.671 2613.174 0.000 654.841 0.000 0.000 12833.992 53237.924 26651.367 12-2029 0.000 10969.722 2597.704 0.000 656.012 0.000 0.000 12011.382 65249.305 30540.233 12-2020 0.000 10969.722 2597.704 0.000 656.012 0.000 0.000 12011.382 65249.305 30540.233 12-2030 0.000 9775.629 2582.289 0.000 657.325 0.000 0.000 11309.954 8934.795 34056.045 12-2031 0.000 9490.105 2567.532 0.000 653.778 0.000 0.000 11309.954 8934.793 34515.411 12-2031 0.000 9490.105 2567.532 0.000 653.778 0.000 0.000 11309.954 8934.795 34056.046 12-2032 0.000 9212.934 2552.192 0.000 662.375 0.000 0.000 11304.732 99453.526 41154.023 12-2032 0.000 9212.934 2552.192 0.000 662.375 0.000 0.000 11304.732 99453.526 41154.023 12-2033 0.000 9618.978 25877.752 0.000 662.120 0.000 0.000 10019.150 10272.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 43915.653 10072.676 10072.878 10072.878 10072.878 10072.878 10072.878 10072.878 10072.878 10072.878 10072.878 10072.878 10072.878 10072.878 10072.878 10072.678 10072.878 10	12-	2020	0.000	0.000	0.000			0.00				
12-2023	12-	2021		0.000								
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APPENDIX 3: PETROLEUM RESOURCES MANAGEMENT SYSTEM

Preamble

Petroleum resources are the quantities of hydrocarbons naturally occurring on or within the Earth's crust. Resources assessments estimate quantities in known and yet-to-be-discovered accumulations. Resources evaluations are focused on those quantities that can potentially be recovered and marketed by commercial projects. A petroleum resources management system provides a consistent approach to estimating petroleum quantities, evaluating projects, and presenting results within a comprehensive classification framework.

International efforts to standardize the definitions of petroleum resources and how resources volumes are estimated began in the 1930s. Early guidance focused on Proved Reserves. Building on work initiated by the Society of Petroleum Evaluation Engineers (SPEE), the Society of Petroleum Engineers (SPE) published definitions for all reserves categories in 1987. In the same year, the World Petroleum Council (WPC), then known as the World Petroleum Congress, independently published reserves definitions that were strikingly similar. In 1997, the two organizations jointly released a single set of definitions for reserves that could be used worldwide. In 2000, the American Association of Petroleum Geologists (AAPG), SPE, and WPC jointly developed a classification system for all petroleum resources. This was followed by supplemental application evaluation guidelines (2001), standards for estimating and auditing reserves information (2001, revised 2007), and a glossary of terms used in resources definitions (2005). In 2007, the SPE/WPC/AAPG/SPEE Petroleum Resources Management System (PRMS) was issued and subsequently supported by the Society of Exploration Geophysicists (SEG). The document is referred to by the abbreviated term SPE-PRMS, with the caveat that the full title, including clear recognition of the co-sponsoring organizations, has been initially stated. In 2011, the SPE/WPC/AAPG/SPEE/SEG published Guidelines for the Application of the PRMS (referred to as Application Guidelines).

The PRMS definitions and the related classification system are now in common use internationally to support petroleum project and portfolio management requirements. PRMS is referenced for national reporting and regulatory disclosures in many jurisdictions and provides the commodity-specific specifications for petroleum under the United Nations Framework Classification for Resources (UNFC) to support petroleum project and portfolio management requirements. The definitions provide a measure of comparability, reduce the subjective nature of resources estimation, and are intended to improve clarity in global communications regarding petroleum resources.

Technologies employed in petroleum exploration, development, production, and processing continue to evolve and improve. The SPE Oil and Gas Reserves Committee works closely with related organizations to maintain the definitions and guidelines to keep current with evolving technology and industry requirements.



This document consolidates, builds on, and replaces prior guidance. Appendix A is a glossary of terms used in the PRMS and replaces those published in 2007. It is expected that this document will be supplemented with industry education programs, best practice reporting standards, and future updates to the 2011 Application Guidelines.

This updated PRMS provides fundamental principles for the evaluation and classification of petroleum reserves and resources. If there is any conflict with prior SPE and PRMS guidance, approved training, or the Application Guidelines, the current PRMS shall prevail. It is understood that these definitions and guidelines allow flexibility for entities, governments, and regulatory agencies to tailor application for their particular needs; however, any modifications to the guidance contained herein must be clearly identified. The terms "shall" or "must" indicate that a provision herein is mandatory for PRMS compliance, while "should" indicates a recommended practice and "may" indicates that a course of action is permissible. The definitions and guidelines contained in this document must not be construed as modifying the interpretation or application of any existing regulatory reporting requirements.

1.0 Basic Principles and Definitions

- 1.0.0.1 A classification system of petroleum resources is a fundamental element that provides a common language far communicating bath the confidence of a project's resources maturation status and the range of potential outcomes to the various entities. The PRMS provides transparency by requiring the assessment of various criteria that allow for the classification and categorization of a project's resources. The evaluation elements consider the risk of geologic discovery and the technical uncertainties together with a determination of the chance of achieving the commercial maturation status of a petroleum project.
- 1.0.0.2 The technical estimation of petroleum resources quantities involves the assessment of quantities and values that have an inherent degree of uncertainty. Quantities of petroleum and associated products can be reported in terms of volumes (e.g., barrels or cubic meters), mass (e.g., metric tonnes) or energy (e.g., Btu or Joule). These quantities are associated with exploration, appraisal, and development projects at various stages of design and implementation. The commercial aspects considered will relate the project's maturity status (e.g., technical, economical, regulatory, and legal) to the chance of project implementation.
- 1.0.0.3 The use of a consistent classification system enhances comparisons between projects, groups of projects, and total company portfolios. The application of PRMS must consider both technical and commercial factors that impact the project's feasibility, its productive life, and its related cash flows.

1.1 Petroleum Resources Classification Framework

1.1.0.1 Petroleum is defined as a naturally occurring mixture consisting of hydrocarbons in the gaseous, liquid, or solid state. Petroleum may also contain non-hydrocarbons, common examples of which are carbon dioxide, nitrogen, hydrogen sulfide, and sulfur. In rare cases, non-hydrocarbon content can be greater than 50%.



- 1.1.0.2 The term resources as used herein is intended to encompass all quantities of petroleum naturally occurring within the Earth's crust, both discovered and undiscovered (whether recoverable or unrecoverable), plus those quantities already produced. Further, it includes all types of petroleum whether currently considered as conventional or unconventional resources.
- 1.1.0.3 Figure 1.1 graphically represents the PRMS resources classification system. The system classifies resources into discovered and undiscovered and defines the recoverable resources classes: Production, Reserves, Contingent Resources, and Prospective Resources, as well as Unrecoverable Petroleum.

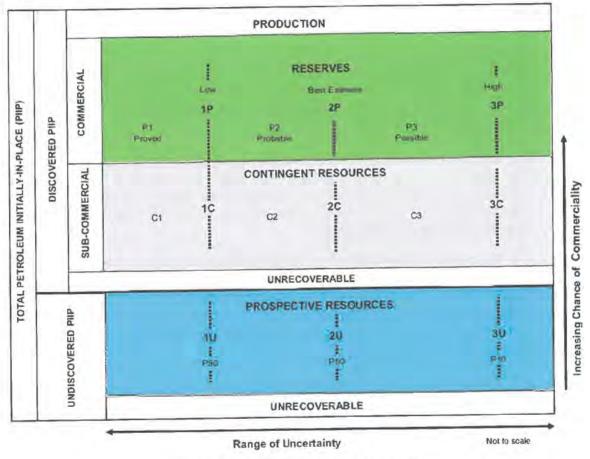


Figure 1.1—Resources classification framework

- 1.1.0.4 The horizontal axis reflects the range of uncertainty of estimated quantities potentially recoverable from an accumulation by a project, while the vertical axis represents the chance of commerciality, Pc, which is the chance that a project will be committed for development and reach commercial producing status.
- 1.1.1.5 The following definitions apply to the major subdivisions within the resources classification:



- A. Total Petroleum Initially-In-Place (PIIP) is all quantities of petroleum that are estimated to exist originally in naturally occurring accumulations, discovered and undiscovered, before production.
- **B.** Discovered PIIP is the quantity of petroleum that is estimated, as of a given date, to be contained in known accumulations before production.
- C. Production is the cumulative quantities of petroleum that have been recovered at a given date. While all recoverable resources are estimated, and production is measured in terms of the sales product specifications, raw production (sales plus non-sales) quantities are also measured and required to support engineering analyses based on reservoir voidage (see Section 3.2, Production Measurement).
- 1.1.0.6 Multiple development projects may be applied to each known or unknown accumulation, and each project will be forecast to recover an estimated portion of the initially-in-place quantities. The projects shall be subdivided into commercial, sub-commercial, and undiscovered, with the estimated recoverable quantities being classified as Reserves, Contingent Resources, or Prospective Resources respectively, as defined below.
 - A. 1. Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must satisfy four criteria: discovered, recoverable, commercial, and remaining (as of the evaluation's effective date) based on the development project(s) applied.
 - 2. Reserves are recommended as sales quantities as metered at the reference point. Where the entity also recognizes quantities consumed in operations (CiO) (see Section 3.2.2), as Reserves these quantities must be recorded separately. Non-hydrocarbon quantities are recognized as Reserves only when sold together with hydrocarbons or CiO associated with petroleum production. If the non-hydrocarbon is separated before sales, it is excluded from Reserves.
 - Reserves are further categorized in accordance with the range of uncertainty and should be subclassified based on project maturity and/or characterized by development and production status.
 - B. Contingent Resources are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations, by the application of development project(s) not currently considered to be commercial owing to one or more contingencies. Contingent Resources have an associated chance of development. Contingent Resources may include, for example, projects for which there are currently no viable markets, or where commercial recovery is dependent on technology under development, or where evaluation of the accumulation is insufficient to clearly assess commerciality. Contingent Resources are further categorized in accordance with the range of uncertainty associated with the estimates and should be subclassified based on project maturity and/or economic status.



- C. Undiscovered PIIP is that quantity of petroleum estimated, as of a given date, to be contained within accumulations yet to be discovered.
- D. Prospective Resources are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects. Prospective Resources have both an associated chance of geologic discovery and a chance of development. Prospective Resources are further categorized in accordance with the range of uncertainty associated with recoverable estimates, assuming discovery and development, and may be sub-classified based on project maturity.
- E. Unrecoverable Resources are that portion of either discovered or undiscovered PIIP evaluated, as of a given date, to be unrecoverable by the currently defined project(s). A portion of these quantities may become recoverable in the future as commercial circumstances change, technology is developed, or additional data are acquired. The remaining portion may never be recovered because of physical/chemical constraints represented by subsurface interaction of fluids and reservoir rocks.
- 1.1.0.7 The sum of Reserves, Contingent Resources, and Prospective Resources may be referred to as remaining recoverable resources." Importantly, these quantities should not be aggregated without due consideration of the technical and commercial risk involved with their classification. When such terms are used, each classification component of the summation must be provided.
- 1.1.0.8 Other terms used in resource assessments include the following:
 - A. Estimated Ultimate Recovery (EUR) is not a resources category or class, but a term that can be applied to an accumulation or group of accumulations (discovered or undiscovered) to define those quantities of petroleum estimated, as of a given date, to be potentially recoverable plus those quantities already produced from the accumulation or group of accumulations. For clarity, EUR must reference the associated technical and commercial conditions for the resources; for example, proved EUR is Proved Reserves plus prior production.
 - B. Technically Recoverable Resources (TRR) are those quantities of petroleum producible using currently available technology and industry practices, regardless of commercial considerations. TRR may be used for specific Projects or for groups of Projects, or, can be an undifferentiated estimate within an area (often basin-wide) of recovery potential.
- 1.1.0.9 Whenever these terms are used, the conditions associated with their usage must be clearly noted and documented.

1.2 Project-Based Resources Evaluations

1.2.0.1 The resources evaluation process consists of identifying a recovery project or projects associated with one or more petroleum accumulations, estimating the quantities of PIIP, estimating that portion of those in-place quantities that can be recovered by each project, and classifying the project(s) based on maturity status or chance of commerciality.



1.2.0.2 The concept of a project-based classification system is further clarified by examining the elements contributing to an evaluation of net recoverable resources (see Figure 1.2).

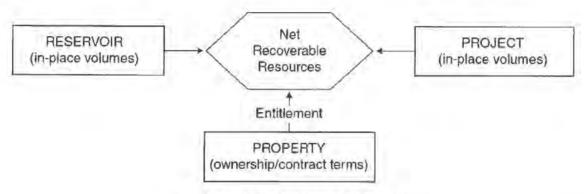


Figure 1.2—Resources evaluation

- 1.2.0.3 The reservoir (contains the petroleum accumulation): Key attributes include the types and quantities of PIIP and the fluid and rock properties that affect petroleum recovery.
- 1.2.0.4 The project: A project may constitute the development of a well, a single reservoir, or a small field; an incremental development in a producing field; or the integrated development of a field or several fields together with the associated processing facilities (e.g., compression). Within a project, a specific reservoir's development generates a unique production and cashflow schedule at each level of certainty. The integration of these schedules taken to the project's earliest truncation caused by technical, economic, or the contractual limit defines the estimated recoverable resources and associated future net cash flow projections for each project. The ratio of EUR to total PIIP quantities defines the project's recovery efficiency. Each project should have an associated recoverable resources range (low, best, and high estimate).
- 1.2.0.5 The property (lease or license area): Each property may have unique associated contractual rights and obligations, including the fiscal terms. This information allows definition of each participating entity's share of produced quantities (entitlement) and share of Investments, expenses, and revenues for each recovery project and the reservoir to which it is applied. One property may encompass many reservoirs, or one reservoir may span several different properties. A property may contain both discovered and undiscovered accumulations that may be spatially unrelated to a potential single field designation.
- **1.2.0.6** An entity's net recoverable resources are the entitlement share of future production legally accruing under the terms of the development and production contract or license.
- 1.2.0.7 In the context of this relationship, the project is the primary element considered in the resources classification, and the net recoverable resources are the quantities derived from each project. A project represents a defined activity or set of activities to develop the petroleum accumulation(s) and the decisions taken to mature the resources to reserves. In general, it is recommended that an individual project has assigned to it a specific maturity level sub-class (See Section 2.1.3.5, Project Maturity Sub-Classes) at which a decision is made whether or not



to proceed (i.e., spend more money) and there should be an associated range of estimated recoverable quantities for the project (See Section 2.2.1, Range of Uncertainty). For completeness, a developed field is also considered to be a project.

- 1.2.0.8 An accumulation or potential accumulation of petroleum is often subject to several separate and distinct projects that are at different stages of exploration or development. Thus, an accumulation may have recoverable quantities in several resources classes simultaneously. When multiple options for development exist early in project maturity, these options should be reflected as competing project alternatives to avoid double counting until decisions further refine the project scope and timing. Once the scope is described and the timing of decisions on future activities established, the decision steps will generally align with the project's classification. To assign recoverable resources of any class, a project's development plan, with detail that supports the resource commercial classification claimed, is needed.
- 1.2.0.9 The estimates of recoverable quantities must be stated in terms of the production derived from the potential development program even for Prospective Resources. Given the major uncertainties involved at this early stage, the development program will not be of the detail expected in later stages of maturity. In most cases, recovery efficiency may be based largely on analogous projects. In-place quantities for which a feasible project cannot be defined using current or reasonably forecast improvements in technology are classified as Unrecoverable.
- 1.2.0.10 Not all technically feasible development projects will be commercial. The commercial viability of a development project within a field's development plan is dependent on a forecast of the conditions that will exist during the time period encompassed by the project (see Section 3.1, Assessment of Commerciality). Conditions include technical, economic (e.g., hurdle rates, commodity prices), operating and capital costs, marketing, sales route(s), and legal, environmental, social, and governmental factors forecast to exist and impact the project during the time period being evaluated. While economic factors can be summarized as forecast costs and product prices, the underlying influences include, but are not limited to, market conditions (e.g., inflation, market factors, and contingencies), exchange rates, transportation and processing infrastructure, fiscal terms, and taxes.
- 1.2.0.11 The resources being estimated are those quantities producible from a project as measured according to delivery specifications at the point of sale or custody transfer (see Section 3.2.1, Reference Point) and may permit forecasts of CiO quantities (see Section 3.2.2., Consumed in Operations). The cumulative production forecast from the effective date forward to cessation of production is the remaining recoverable resources quantity (see Section 3.1.1, Net Cash-Flow Evaluation).
- 1.2.0.12 The supporting data, analytical processes, and assumptions describing the technical and commercial basis used in an evaluation must be documented in sufficient detail to allow, as needed, a qualified reserves evaluator or qualified reserves auditor to clearly understand each project's basis for the estimation, categorization, and classification of recoverable resources quantities and, if appropriate, associated commercial assessment.

2.0 Classification and Categorization Guidelines



2.0.0.1 To consistently characterize petroleum projects, evaluations of all resources should be conducted in the context of the full classification system shown in Figure 1.1. These guidelines reference this classification system and support an evaluation in which projects are "classified" based on their chance of commerciality, Pc (the vertical axis labeled Chance of Commerciality), and estimates of recoverable and marketable quantities associated with each project are "categorized" to reflect uncertainty (the horizontal axis). The actual workflow of classification versus categorization varies with individual projects and is often an iterative analysis leading to a final report. Report here refers to the presentation of evaluation results within the entity conducting the assessment and should not be construed as replacing requirements for public disclosures under guidelines established by regulatory and/or other government agencies.

2.1 Resources Classification

2.1.0.1 The PRMS classification establishes criteria for the classification of the total PIIP. A determination of a discovery differentiates between discovered and undiscovered PIIP. The application of a project further differentiates the recoverable from unrecoverable resources. The project is then evaluated to determine its maturity status to allow the classification distinction between commercial and sub-commercial projects. PRMS requires the project's recoverable resources quantities to be classified as either Reserves, Contingent Resources, or Prospective Resources.

2.1.1 Determination of Discovery Status

- 2.1.1.1 A discovered petroleum accumulation is determined to exist when one or more exploratory wells have established through testing, sampling, and/or logging the existence of a significant quantity of potentially recoverable hydrocarbons and thus have established a known accumulation. In the absence of a flow test or sampling, the discovery determination requires confidence in the presence of hydrocarbons and evidence of producibility, which may be supported by suitable producing analogs (see Section 4.1.1, Analogs). In this context, "significant" implies that there is evidence of a sufficient quantity of petroleum to justify estimating the in-place quantity demonstrated by the well(s) and for evaluating the potential for commercial recovery.
- 2.1.1.2 Where a discovery has identified recoverable hydrocarbons, but is not considered viable to apply a project with established technology or with technology under development, such quantities may be classified as Discovered Unrecoverable with no Contingent Resources. In future evaluations, as appropriate for petroleum resources management purposes, a portion of these unrecoverable quantities may become recoverable resources as either commercial circumstances change or technological developments occur.

2.1.2 Determination of Commerciality

2.1.2.1 Discovered recoverable quantities (Contingent Resources) may be considered commercially mature, and thus attain Reserves classification, if the entity claiming commerciality has demonstrated a firm intention to proceed with development. This means the entity has satisfied the internal decision criteria (typically rate of return at or above the weighted average).



cost-of-capital or the hurdle rate). Commerciality is achieved with the entity's commitment to the project and all of the following criteria:

- A. Evidence of a technically mature, feasible development plan.
- B. Evidence of financial appropriations either being in place or having a high likelihood of being secured to implement the project.
- C. Evidence to support a reasonable time-frame for development.
- D. A reasonable assessment that the development projects will have positive economics and meet defined investment and operating criteria. This assessment is performed on the estimated entitlement forecast quantities and associated cash flow on which the investment decision is made (see Section 3.1.1, Net Cash-Flow Evaluation).
- E. A reasonable expectation that there will be a market for forecast sales quantities of the production required to justify development. There should also be similar confidence that all produced streams (e.g., oil, gas, water, C02) can be sold, stored, re-injected, or otherwise appropriately disposed.
- F. Evidence that the necessary production and transportation facilities are available or can be made available.
- G. Evidence that legal, contractual, environmental, regulatory, and government approvals are in place or will be forthcoming, together with resolving any social and economic concerns.
- 2.1.2.2 The commerciality test for Reserves determination is applied to the best estimate (P50) forecast quantities, which upon qualifying all commercial and technical maturity criteria and constraints become the 2P Reserves. Stricter cases [e.g., low estimate (P90)] may be used for decision purposes or to investigate the range of commerciality (see Section 3.1.2, Economic Criteria). Typically, the low- and high-case project scenarios may be evaluated for sensitivities when considering project risk and upside opportunity.
- 2.1.2.3 To be included in the Reserves class, a project must be sufficiently defined to establish both its technical and commercial viability as noted in Section 2.1.2.1. There must be a reasonable expectation that all required internal and external approvals will be forthcoming and evidence of firm intention to proceed with development within a reasonable time-frame. A reasonable time-frame for the initiation of development depends on the specific circumstances and varies according to the scope of the project. While five years is recommended as a benchmark, a longer time-frame could be applied where justifiable; for example, development of economic projects that take longer than five years to be developed or are deferred to meet contractual or strategic objectives. In all cases, the justification for classification as Reserves should be clearly documented.
- 2.1.2.4 While PRMS guidelines require financial appropriations evidence, they do not require that project financing be confirmed before classifying projects as Reserves. However, this may



be another external reporting requirement. In many cases, financing is conditional upon the same criteria as above. In general, if there is not a reasonable expectation that financing or other forms of commitment (e.g., farm-outs) can be arranged so that the development will be initiated within a reasonable time-frame, then the project should be classified as Contingent Resources. If financing is reasonably expected to be in place at the time of the final investment decision (FID), the project's resources may be classified as Reserves.

2.1.3 Project Status and Chance of Commerciality

- 2.1.3.1 Evaluators have the option to establish a more detailed resources classification reporting system that can also provide the basis for portfolio management by subdividing the chance of commerciality axis according to project maturity. Such sub-classes may be characterized qualitatively by the project maturity level descriptions and associated quantitative chance of reaching commercial status and being placed on production.
- 2.1.3.2 As a project moves to a higher level of commercial maturity in the classification (see Figure 1.1 vertical axis), there will be an increasing chance that the accumulation will be commercially developed and the project quantities move to Reserves. For Contingent and Prospective Resources, this is further expressed as a chance of commerciality, Pc, which incorporates the following underlying chance component(s):
 - A. The chance that the potential accumulation will result in the discovery of a significant quantity of petroleum, which is called the "chance of geologic discovery," Pg.
 - B. Once discovered, the chance that the known accumulation will be commercially developed is called the "chance of development," Pd.
- **2.1.3.3** There must be a high degree of certainty in the chance of commerciality, Pc, for Reserves to be assigned; for Contingent Resources, Pc = Pd; and for Prospective Resources, Pc is the product of Pg and Pd.
- 2.1.3.4 Contingent and Prospective Resources can have different project scopes (e.g., well count, development spacing, and facility size) as development uncertainties and project definition mature.

2.1.3.5 Project Maturity Sub-Classes

2.1.3.5.1 As Figure 2.1 illustrates, development projects and associated recoverable quantities may be subclassified according to project maturity levels and the associated actions (i.e., business decisions) required to move a project toward commercial production.



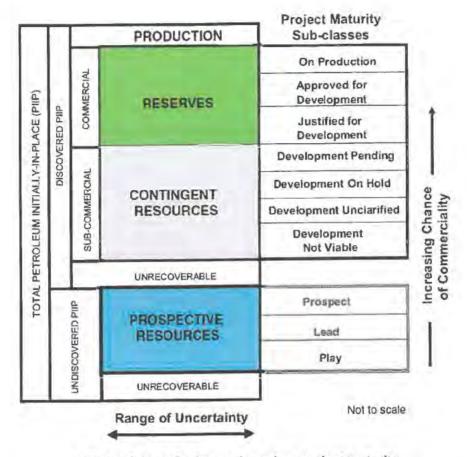


Figure 2.1—Sub-classes based on project maturity

- 2.1.3.5.2 Maturity terminology and definitions for each project maturity class and sub-class are provided in Table I. This approach supports the management of portfolios of opportunities at various stages of exploration, appraisal, and development. Reserve sub-classes must achieve commerciality while Contingent and Prospective Resources sub-classes may be supplemented by associated quantitative estimates of chance of commerciality to mature.
- 2.1.3.5.3 Resources sub-class maturation is based on those actions that progress a project through final approvals to implementation and initiation of production and product sales. The boundaries between different levels of project maturity are frequently referred to as project "decision gates."
- 2.1.3.5.4 Projects that are classified as Reserves must meet the criteria as listed in Section 2.1.2, Determination of Commerciality. Projects sub-classified as Justified for Development are agreed upon by the managing entity and partners as commercially viable and have support to advance the project, which includes a firm intent to proceed with development. All participating entities have agreed to the project and there are no known contingencies to the project from any official entity that will have to formally approve the project.



- 2.1.3.5.5 Justified for Development Reserves are reclassified to Approved for Development after a FID has been made. Projects should not remain in the Justified for Development sub-class for extended time periods without positive indications that all required approvals are expected to be obtained without undue delay. If there is no longer the reasonable expectation of project execution (i.e., historical track record of execution, project progress), the project shall be reclassified as Contingent Resources.
- 2.1.3.5.6 Projects classified as Contingent Resources have their sub-classes aligned with the entity's plan to manage its portfolio of projects. Thus, projects on known accumulations that are actively being studied, undergoing feasibility review, and have planned near-term operations (e.g., drilling) are placed in Contingent Resources Development Pending, while those that do not meet this test are placed into either Contingent Resources On Hold, Unclarified, or Not Viable.
- 2.1.3.5.7 Where commercial factors change and there is a significant risk that a project with Reserves will no longer proceed, the project shall be reclassified as Contingent Resources.
- 2.1.3.5.8 For Contingent Resources, evaluators should focus on gathering data and performing analyses to clarify and then mitigate those key conditions or contingencies that prevent commercial development. Note that the Contingent Resources sub-classes described above and shown in Figure 2.1 are recommended; however, entities are at liberty to introduce additional sub-classes that align with project management goals.
- 2.1.3.5.9 For Prospective Resources, potential accumulations may mature from Play, to Lead and then to Prospect based on the ability to identify potentially commercially viable exploration projects. The Prospective Resources are evaluated according to chance of geologic discovery, Pg, and chance of development, Pd, which together determine the chance of commerciality, Pc. Commercially recoverable quantities under appropriate development projects are then estimated. The decision at each exploration phase is whether to undertake further data acquisition and/or studies designed to move the Play through to a drillable Prospect with a project description range commensurate with the Prospective Resources subclass.

2.1.3.6 Reserves Status

- 2.1.3.6.1 Once projects satisfy commercial maturity (criteria given in Table 1), the associated quantities are classified as Reserves. These quantities may be allocated to the following subdivisions based on the funding and operational status of wells and associated facilities within the reservoir development plan (Table 2 provides detailed definitions and guidelines):
 - A. Developed Reserves are quantities expected to be recovered from existing wells and facilities.
 - Developed Producing Reserves are expected to be recovered from completion intervals that are open and producing at the time of the estimate.
 - Developed Non-Producing Reserves include shut-in and behind-pipe reserves with minor costs to access.



- B. Undeveloped Reserves are quantities expected to be recovered through future significant investments.
- 2.1.3.6.2 The distinction between the "minor costs to access" Developed Non-Producing Reserves and the "significant investment" needed to develop Undeveloped Reserves requires the judgment of the evaluator taking into account the cost environment. A significant investment would be a relatively large expenditure when compared to the cost of drilling and completing a new well. A minor cost would be a lower expenditure when compared to the cost of drilling and completing a new well.
- 2.1.3.6.3 Once a project passes the commercial assessment and achieves Reserves status, it is then included with all other Reserves projects of the same category in the same field for estimating combined future production and applying the economic limit test (see Section 3.1, Assessment of Commerciality).
- 2.1.3.6.4 Where Reserves remain Undeveloped beyond a reasonable time-frame or have remained Undeveloped owing to postponements, evaluations should be critically reviewed to document reasons for the delay in initiating development and to justify retaining these quantities within the Reserves class. While there are specific circumstances where a longer delay (see Section 2.1.2, Determination of Commerciality) is justified, a reasonable time-frame to commence the project is generally considered to be less than five years from the initial classification date.
- 2.1.3.6.5 Development and Production status are of significant importance for project portfolio management and financials. The Reserves status concept of Developed and Undeveloped status is based on the funding and operational status of wells and producing facilities within the development project. These status designations are applicable throughout the full range of Reserves uncertainty categories (1 P, 2P, and 3P or Proved, Probable, and Possible). Even those projects that are Developed and On Production should have remaining uncertainty in recoverable quantities.

2.1.3.7 Economic Status

- 2.1.3.7.1 Projects may be further characterized by economic status. All projects classified as Reserves must be commercial under defined conditions (see Section 3.1, Assessment of Commerciality Assessment), Based on assumptions regarding future conditions and the impact on ultimate economic viability, projects currently classified as Contingent Resources may be broadly divided into two groups:
 - A. Economically Viable Contingent Resources are those quantities associated with technically feasible projects where cash flows are positive under reasonably forecasted conditions but are not Reserves because it does not meet the commercial criteria defined in Section 2.1.2.
 - **B**. Economically Not Viable Contingent Resources are those quantities for which development projects are not expected to yield positive cash flows under reasonable forecast conditions.



- 2.1.3.7.2 The best estimate (or P50) production forecast is typically used for the economic evaluation for the commercial assessment of the project. The low case, when used as the primary case for a project decision, may be used to determine project economics. The economic evaluation of the project high case alone is not permitted to be used in the determination of the project's commerciality.
- 2.1.3.7.3 For Reserves, the best estimate production forecast reflects a specific development scenario recovery process, a certain number and type of wells, facilities, and infrastructure.
- 2.1.3.7.4 The project's low-case scenario is tested to ensure it is economic, which is required for Proved Reserves to exist (see Section 2.2.2, Category Definitions and Guidelines). It is recommended to evaluate the low case and the high case (which will quantify the 3P Reserves) to convey the project downside risk and upside potential. The project development scenarios may vary in the number and type of wells, facilities, and infrastructure in Contingent Resources, but to recognize Reserves, there must exist the reasonable expectation to develop the project for the best-estimate case.
- 2.1.3.7.5 The economic status may be identified independently of, or applied in combination with, project maturity sub-classification to more completely describe the project. Economic status is not the only qualifier that allows defining Contingent or Prospective Resources sub-classes. Within Contingent Resources, applying the project status to decision gates (and/or incorporating them in a plan to execute) more appropriately defines whether the project is placed into the sub-class of either Development Pending versus On Hold, Not Viable, or Unclarified.
- 2.1.3.7.6 Where evaluations are incomplete and it is premature to clearly define the associated cash flows, it is acceptable to note that the project economic status is "undetermined."

2.2 Resources Categorization

- 2.2.0.1 The horizontal axis in the resources classification in Figure 1.1 defines the range of uncertainty in estimates of the quantities of recoverable, or potentially recoverable, petroleum associated with a project or group of projects. These estimates include the uncertainty components as follows:
 - A. The total petroleum remaining within the accumulation (in-place resources).
 - **B**. The technical uncertainty in the portion of the total petroleum that can be recovered by applying a defined development project or projects (i.e., the technology applied).
 - C. Known variations in the commercial terms that may impact the quantities recovered and sold (e.g., market availability; contractual changes, such as production rate tiers or product quality specifications) are part of project's scope and are included in the horizontal axis, while the chance of satisfying the commercial terms is reflected in the classification (vertical axis).
- 2.2.0.2 The uncertainty in a project's recoverable quantities is reflected by the 1P, 2P, 3P, Proved (P1), Probable (P2), Possible (P3), 1C, 2C, 3C, C1, C2, and C3; or 1U, 2U, and 3U



resources categories. The commercial chance of success is associated with resources classes or sub-classes and not with the resources categories reflecting the range of recoverable quantities.

- 2.2.0.3 There must be a single set of defined conditions applied for resource categorization. Use of different commercial assumptions for categorizing quantities is referred to as "split conditions" and are not allowed. Frequently, an entity will conduct project evaluation sensitivities to understand potential implications when making project selection decisions. Such sensitivities may be fully aligned to resource categories or may use single parameters, groups of parameters, or variances in the defined conditions.
- 2.2.0.4 Moreover, a single project is uniquely assigned to a sub-class along with its uncertainty range. For example, a project cannot have quantities classified in both Contingent Resources and Reserves, for instance as 1C, 2P, and 3P. This is referred to as "split classification."

2.2.1 Range of Uncertainty

- 2.2.1.1 Uncertainty is inherent in a project's resources estimation and is communicated in PRMS by reporting a range of category outcomes. The range of uncertainty of the recoverable and/or potentially recoverable quantities may be represented by either deterministic scenarios or by a probability distribution (see Section 4.2, Resources Assessment Methods).
- 2.2.1.2 When the range of uncertainty is represented by a probability distribution, a low, best, and high estimate shall be provided such that:
 - A. There should be at least a 90% probability (P90) that the quantities actually recovered will equal or exceed the low estimate.
 - B. There should be at least a 50% probability (P50) that the quantities actually recovered will equal or exceed the best estimate.
 - C. There should be at least a 10% probability (P10) that the quantities actually recovered will equal or exceed the high estimate.
- 2.2.1.3 In some projects, the range of uncertainty may be limited, and the three scenarios may result in resources estimates that are not significantly different. In these situations, a single value estimate may be appropriate to describe the expected result.
- 2.2.1.4 When using the deterministic scenario method, typically there should also be low, best, and high estimates, where such estimates are based on qualitative assessments of relative uncertainty using consistent interpretation guidelines. Under the deterministic incremental method, quantities for each confidence segment are estimated discretely (see Section 2.2.2, Category Definitions and Guidelines).
- 2.2.1.5 Project resources are initially estimated using the above uncertainty range forecasts that incorporate the subsurface elements together with technical constraints related to wells and facilities. The technical forecasts then have additional commercial criteria applied (e.g.,



economics and license cutoffs are the most common) to estimate the entitlement quantities attributed and the resources classification status: Reserves, Contingent Resources, and Prospective Resources.

2.2.1.6 While there may be significant chance that sub-commercial and undiscovered accumulations will not achieve commercial production, it is useful to consider the range of potentially recoverable quantities independent of such likelihood when considering what resources class to assign the project quantities.

2.2.2 Category Definitions and Guidelines

- 2.2.2.1 Evaluators may assess recoverable quantities and categorize results by uncertainty using the deterministic incremental method, the deterministic scenario (cumulative) method, geostatistical methods, or probabilistic methods (see Section 4.2, Resources Assessment Methods). Also, combinations of these methods may be used.
- 2.2.2.2 Use of consistent terminology (Figures 1.1 and 2.1) promotes clarity in communication of evaluation results. For Reserves, the general cumulative terms low/best/high forecasts are used to estimate the resulting 1P/2P/3P quantities, respectively. The associated incremental quantities are termed Proved (P1), Probable (P2) and Possible (P3). Reserves are a subset of, and must be viewed within the context of, the complete resources classification system. While the categorization criteria are proposed specifically for Reserves, in most cases, the criteria can be equally applied to Contingent and Prospective Resources. Upon satisfying the commercial maturity criteria for discovery and/or development, the project quantities will then move to the appropriate resources sub-class. Table 3 provides criteria for the Reserves categories determination.
- 2.2.2.3 For Contingent Resources, the general cumulative terms low/best/high estimates are used to estimate the resulting 1C/2C/3C quantities, respectively. The terms C1, C2, and C3 are defined for incremental quantities of Contingent Resources.
- 2.2.2.4 For Prospective Resources, the general cumulative terms low/best/high estimates also apply and are used to estimate the resulting 1U/2U/3U quantities. No specific terms are defined for incremental quantities within Prospective Resources.
- 2.2.2.5 Quantities in different classes and sub-classes cannot be aggregated without considering the varying degrees of technical uncertainty and commercial likelihood involved with the classification(s) and without considering the degree of dependency between them (see Section 4.2.1, Aggregating Resources Classes).
- 2.2.2.6 Without new technical information, there should be no change in the distribution of technically recoverable resources and the categorization boundaries when conditions are satisfied to reclassify a project from Contingent Resources to Reserves.
- 2.2.2.7 All evaluations require application of a consistent set of forecast conditions, including assumed future costs and prices, for both classification of projects and categorization of estimated quantities recovered by each project (see Section 3.1, Assessment of Commerciality).



- 2.2.2.8 Tables 1, 2, and 3 present category definitions and provide guidelines designed to promote consistency in resources assessments. The following summarize the definitions for each Reserves category in terms of both the deterministic incremental method and the deterministic scenario method, and also provides the criteria if probabilistic methods are applied. For all methods (incremental, scenario, or probabilistic), low, best and high estimate technical forecasts are prepared at an effective date (unless justified otherwise), then tested to validate the commercial criteria, and truncated as applicable for determination of Reserves quantities.
 - A. Proved Reserves are those quantities of Petroleum that, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be commercially recoverable from known reservoirs and under defined technical and commercial conditions. If deterministic methods are used, the term "reasonable certainty" is intended to express a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability that the quantities actually recovered will equal or exceed the estimate.
 - B. Probable Reserves are those additional Reserves which analysis of geoscience and engineering data indicate are less likely to be recovered than Proved Reserves but more certain to be recovered than Possible Reserves. It is equally likely that actual remaining quantities recovered will be greater than or less than the sum of the estimated Proved plus Probable Reserves (2P). In this context, when probabilistic methods are used, there should be at least a 50% probability that the actual quantities recovered will equal or exceed the 2P estimate.
 - C. Possible Reserves are those additional Reserves that analysis of geoscience and engineering data suggest are less likely to be recoverable than Probable Reserves. The total quantities ultimately recovered from the project have a low probability to exceed the sum of Proved plus Probable plus Possible (JP) Reserves, which is equivalent to the highestimate scenario. When probabilistic methods are used, there should be at least a 10% probability that the actual quantities recovered will equal or exceed the 3P estimate. Possible Reserves that are located outside of the 2P area (not upside quantities to the 2P scenario) may exist only when the commercial and technical maturity criteria have been met (that incorporate the Possible development scope). Standalone Possible Reserves must reference a commercial 2P project (e.g., a lease adjacent to the commercial project that may be owned by a separate entity), otherwise stand-alone Possible is not permitted.
- 2.2.2.9 One, but not the sole, criterion for qualifying discovered resources and to categorize the project's range of its low/best/high or P90/P50/P10 estimates to either 1C/2C/3C or 1P/2P/3P is the distance away from known productive area(s) defined by the geoscience confidence in the subsurface.
- 2.2.2.10 A conservative (low-case) estimate may be required to support financing. However, for project justification, it is generally the best-estimate Reserves or Resources quantity that passes qualification because it is considered the most realistic assessment of a project's recoverable quantities. The best estimate is generally considered to represent the sum of Proved and



Probable estimates (2P) for Reserves, or 2C when Contingent Resources are cited, when aggregating a field, multiple fields, or an entity's resources.

2.2.2.11 It should be noted that under the deterministic incremental method, discrete estimates are made for each category and should not be aggregated without due consideration of associated confidence. Results from the deterministic scenario, deterministic incremental, geostatistical and probabilistic methods applied to the same project should give comparable results (see Section 4.2, Resources Assessment Methods). If material differences exist between the results of different methods, the evaluator should be prepared to explain these differences.

2.3 Incremental Projects

- 2.3.0.1 The initial resources assessment is based on application of a defined initial development project, even extending into Prospective Resources. Incremental projects are designed to either increase recovery efficiency, reduce costs, or accelerate production through either maintenance of or changes to wells, completions, or facilities or through infill drilling or by means of improved recovery. Such projects are classified according to the resources classification framework (Figure 1.1). with preference for applying project maturity sub-classes (Figure 2.1). Related incremental quantities are similarly categorized on the range of uncertainty of recovery. The projected recovery change can be included in Reserves if the degree of commitment is such that the project has achieved commercial maturity (See Section 2.1.2, Determination of Commerciality). The quantity of such incremental recovery must be supported by technical evidence to justify the relative confidence in the resources category assigned.
- 2.3.0.2 An incremental project must have a defined development plan. A development plan may include projects targeting the entire field (or even multiple, linked fields), reservoirs, or single wells. Each incremental project will have its own planned timing for execution and resource quantities attributed to the project. Development plans may also include appraisal projects that will lead to subsequent project decisions based on appraisal outcomes.
- 2.3.0.3 Circumstances when development will be significantly delayed and where it is considered that Reserves are still justified should be clearly documented. If there is no longer the reasonable expectation of project execution (i.e., historical track record of execution, project progress), forecast project incremental recoveries are to be reclassified as Contingent Resources (see Section 2.1.2, Determination of Commerciality).

2.3.1 Workovers, Treatments, and Changes of Equipment

2.3.1.1 Incremental recovery associated with a future workover, treatment (including hydraulic fracturing stimulation), re-treatment, changes to existing equipment, or other mechanical procedures where such projects have routinely been successful in analogous reservoirs may be classified as Developed Reserves, Undeveloped Reserves, or Contingent Resources, depending on the associated costs required (see Section 2.1.3.2, Reserves Status) and the status of the project's commercial maturity elements.



2.3.1.2 Facilities that are either beyond their operational life, placed out of service, or removed from service cannot be associated with Reserves recognition. When required facilities become unavailable or out of service for longer than a year, it may be necessary to reclassify the Developed Reserves to either Undeveloped Reserves or Contingent Resources. A project that includes facility replacement or restoration of operational usefulness must be identified, commensurate with the resources classification.

2.3.2 Compression

2.3.2.1 Reduction In the backpressure through compression can increase the portion of in-place gas that can be commercially produced and thus included in resources estimates. If the eventual installation of compression meets commercial maturity requirements, the incremental recovery is included in either Undeveloped Reserves or Developed Reserves, depending on the investment on meeting the Developed or Undeveloped classification criteria. However, if the cost to implement compression is not significant, relative to the cost of one new well in the field, or there is reasonable expectation that compression will be implemented by a third party in a common sales line beyond the reference point, the incremental quantities may be classified as Developed Reserves. If compression facilities were not part of the original approved development plan and such costs are significant, it should be treated as a separate project subject to normal project maturity criteria.

2.3.3 Infill Drilling

2.3.3.1 Technical and commercial analyses may support drilling additional producing wells to reduce the well spacing of the initial development plan, subject to government regulations. Infill drilling may have the combined effect of increasing recovery and accelerating production. Only the incremental recovery (i.e. recovery from infill wells less the recovery difference in earlier wells) can be considered as additional Reserves for the project; this incremental recovery may need to be reallocated.

2.3.4 Improved Recovery

- 2.3.4.1 Improved recovery is the additional petroleum obtained, beyond primary recovery, from naturally occurring reservoirs by supplementing the natural reservoir energy. It includes secondary recovery (e.g., waterflooding and pressure maintenance), tertiary recovery processes (thermal, miscible gas injection, chemical injection, and other types), and any other means of supplementing natural reservoir recovery processes.
- 2.3.4.2 Improved recovery projects must meet the same Reserves technical and commercial maturity criteria as primary recovery projects.
- 2.3.4.3 The judgment on commerciality is based on pilot project results within the subject reservoir or by comparison to a reservoir with analogous rock and fluid properties and where a similar established improved recovery project has been successfully applied.
- 2.3.4.4 Incremental recoveries through improved recovery methods that have yet to be established through routine, commercially successful applications are included as Reserves



only after a favorable production response from the subject reservoir from either (a) a representative pilot or (b) an installed portion of the project, where the response provides support for the analysis on which the project is based. The improved recovery project's resources will remain classified as Contingent Resources Development Pending until the pilot has demonstrated both technical and commercial feasibility and the full project passes the Justified for Development "decision gate."

2.4 Unconventional Resources

- 2.4.0.1 The types of in-place petroleum resources defined as conventional and unconventional may require different evaluation approaches and/or extraction methods. However, the PRMS resources definitions, together with the classification system, apply to all types of petroleum accumulations regardless of the in-place characteristics, extraction method applied, or degree of processing required.
 - A. Conventional resources exist in porous and permeable rock with pressure equilibrium. The PIIP is trapped in discrete accumulations related to a local geological structure feature and/or stratigraphic condition. Each conventional accumulation is typically bounded by a down dip contact with an aquifer, as its position is controlled by hydrodynamic interactions between buoyancy of petroleum in water versus capillary force. The petroleum is recovered through wellbores and typically requires minimal processing before sale.
 - B. Unconventional resources exist in petroleum accumulations that are pervasive throughout a large area and are not significantly affected by hydrodynamic influences (also called "continuous-type deposit"). Usually there is not an obvious structural or stratigraphic trap. Examples include coalbed methane (CBM), basin-centered gas (low permeability), tight gas and tight oil (low permeability), gas hydrates, natural bitumen (very high viscosity oil), and oil shale (kerogen) deposits. Note that shale gas and shale oil are sub-types of tight gas and tight oil where the lithologies are predominantly shales or siltstones. These accumulations lack the porosity and permeability of conventional reservoirs required to flow without stimulation at economic rates. Typically, such accumulations require specialized extraction technology (e.g., dewatering of CBM, hydraulic fracturing stimulation for tight gas and tight oil, steam and/or solvents to mobilize natural bitumen for in-situ recovery, and in some cases, surface mining of oil sands). Moreover, the extracted petroleum may require significant processing before sale (e.g., bitumen upgraders).
- 2.4.0.2 For unconventional petroleum accumulations, reliance on continuous water contacts and pressure gradient analysis to interpret the extent of recoverable petroleum is not possible. Thus, there is typically a need for increased spatial sampling density to define uncertainty of in-place quantities, variations in reservoir and hydrocarbon quality, and to support design of specialized mining or in-situ extraction programs. In addition, unconventional resources typically require different evaluation techniques than conventional resources.
- 2.4.0.3 Extrapolation of reservoir presence or productivity beyond a control point within a resources accumulation must not be assumed unless there is technical evidence to support it.



Therefore, extrapolation beyond the immediate vicinity of a control point should be limited unless there is clear engineering and/or geoscience evidence to show otherwise.

- 2.4.0.4 The extent of the discovery within a pervasive accumulation is based on the evaluator's reasonable confidence based on distances from existing experience, otherwise quantities remain as undiscovered. Where log and core data and nearby producing analogs provide evidence of potential economic viability, a successful well test may not be required to assign Contingent Resources. Pilot projects may be needed to define Reserves, which requires further evaluation of technical and commercial viability.
- 2.4.0.5 A fundamental characteristic of engagement in a repetitive task is that it may improve performance over time. Attempts to quantify this improvement gave rise to the concept of the manufacturing progress function commonly called the "learning curve." The learning curve is characterized by a decrease in time and/or costs, usually in the early stages of a project when processes are being optimized. At that time, each new improvement may be significant. As the project matures, further improvements in time or cost savings are typically less substantial. In oil and gas developments with high well counts and a continuous program of activity (multi-year), the use of a learning curve within a resources evaluation may be justified to predict improvements in either the time taken to carry out the activity, the cost to do so, or both. While each development project is unique, review of analogs can provide guidance on such predictions and the range of associated uncertainty in the resulting recoverable resources estimates (see also Section 3.1.2 Economic Criteria).

3.0 Evaluation and Reporting Guidelines

- 3.0.0.1 The following guidelines are provided to promote consistency in project evaluations and reporting. "Reporting" in this document refers to the presentation of evaluation results within the entity conducting the evaluation and should not be construed as replacing requirements for public disclosures established by regulatory and/or other government agencies or any current or future associated accounting standards.
- 3.0.0.2 Reserves and resources evaluations are based on a set of defined conditions that are used to classify and categorize a project's expected recoverable quantities. The defined conditions include the factors that impact commerciality, such as decision hurdle rates; commodity prices; operating and capital costs; technical subsurface parameters; marketing, sales route(s); environmental, governmental, legal, and social factors; and timing issues. These factors are forecast for the project over time, and evaluators must clearly identify and document the assumptions used in the evaluation because these assumptions can directly impact the project quantities eligible for classification as Reserves or Resources. A project with Contingent Resources may not yet have all defined conditions addressed, and reasonable assumptions should be made and documented.
- 3.0.0.3 Hydrocarbon evaluations recognize production and transportation practices that involve methods of extraction other than through the flow of fluids from wells to surface facilities, such as surface mining of bitumen or in-situ conversion processes.



3.1 Assessment of Commerciality

3.1.0.1 Commercial assessments are conducted on a project basis and are based on the entity's view of future conditions. The forecast commercial conditions, technical feasibility, and the entity's decision to commit to the project are several of the key elements that underpin the project's resources classification. Commercial conditions include, but are not limited to, assumptions of an entity's investment hurdle criteria; financial conditions (e.g., costs, prices, fiscal terms, taxes); partners' investment decision(s); organization capabilities; and marketing, legal, environmental, social, and governmental factors. Project value may be assessed in several ways (e.g., cash flow analysis, historical costs, comparative market values, key economic parameters) (see Section 2.1.2, Determination of Commerciality). The guidelines herein apply only to assessments based on cash-flow analysis. Moreover, modifying factors that may additionally influence investment decisions, such as contractual or political risks, should be recognized so the entity may address these factors if they are not included in the project analysis.

3.1.1 Net Cash-Flow Evaluation

- 3.1.1.1 Project-based resource economic evaluations are based on estimates of future production and the associated net cash-flow schedules for each project as of an effective date. These net cash flows should be discounted using a defined discount rate, and the sum of the future discounted cash flows is termed the net present value (NPV) of the project. The calculation shall be based upon an appropriately defined reference point (see Section 3.2.1, Reference Point) and should reflect the following:
 - A. The forecast production quantities over identified time periods.
 - **B.** The estimated costs and schedule associated with the project to develop, recover, and produce the quantities to the reference point, including abandonment, decommissioning, and restoration (ADR) costs, based on the entity's view of the expected future costs.
 - **C.** The estimated revenues from the quantities of production based on the evaluator's view of the prices expected to apply to the respective commodities in future periods, taking into account any sales contracts or price hedges specific to a property, including that portion of the costs and revenues accruing to the entity.
 - **D**. Future projected production- and revenue-related taxes and royalties expected to be paid by the entity.
 - E. A project life that is limited to the period of economic interest or a reasonably certain estimate of the life expectancy of the project, which is typically truncated by the earliest occurrence of either technical, license, or economic limit.
 - F. The application of an appropriate discount applicable to the entity at the time of the evaluation.

3.1.2 Economic Criteria



- 3.1.2.1 Economic determination of a project is tested assuming a zero percent discount rate (i.e., undiscounted). A project with a positive undiscounted cumulative net cash flow is considered economic. Production from the project is economic when the revenue attributable to the entity interest from production exceeds the cost of operation. A project's production is economically producible when the net revenue from an ongoing producing project exceeds the net expenses attributable to a certain entity's interest. The ADR costs are excluded from the economically producibility determination. A project is commercial when it is economic and it meets the criteria discussed in Section 2.1.2.
- 3.1.2.2 Economic viability is tested by applying a forecast case that evaluates cash-flow estimates based on an entity's forecasted economic scenario conditions (including costs and product price schedules, inflation indexes, and market factors). The forecast made by the evaluator should reflect and document assumptions the entity assesses as reasonable to exist throughout the life of the project. Inflation, deflation, or market adjustments may be made to forecast costs and revenues.
- 3.1.2.3 Forecasts based solely on current economic conditions are estimated using an average of those conditions (including historical prices and costs) during a specified period. The default period for averaging prices and costs is one year. However, if a step change has occurred within the previous 12-month period, the use of a shorter period reflecting the step change must be justified. In developments with high well counts and a continuous program of activity, the use of a learning curve within a resources evaluation may be justified to predict improvements in either time taken to carry out the activity, the cost to do so, or both, if confirmed by operational evidence and documented by the evaluator. The confidence in the ability to deliver such savings must be considered in developing the range of uncertainty in production and NPV estimates.
- 3.1.2.4 All costs, including future ADR liabilities, are included in the project economic analysis unless specifically excluded by contractual terms. ADR is not included in determining the economic producibility or for determining the point the project reaches the economic limit (see Section 3.1.3, Economic Limit). ADR costs are included for project economics but are not included in judging economic producibility or determining the economic limit (see Section 3.1.3, Economic Limit). ADR costs may also be reported for other purposes, such as for a property sale/acquisition evaluation, future field planning, accounting report of future obligations, or as appropriate to the circumstances for which the resource evaluation is conducted. The entity is responsible for providing the evaluator with documentation to ensure that funds are available to cover forecast costs and ADR liabilities in line with the contractual obligations.
- 3.1.2.5 Figure 3.1 illustrates a net cash-flow profile for a simple project. The project's cumulative net cash flow exceeds the ADR liability, thereby satisfying the economic viability required to consider a project's quantities as Reserves. The project's economic production (i.e., economic producibility) is truncated at the economic limit when the maximum cumulative net cash flow is achieved, before consideration of ADR.



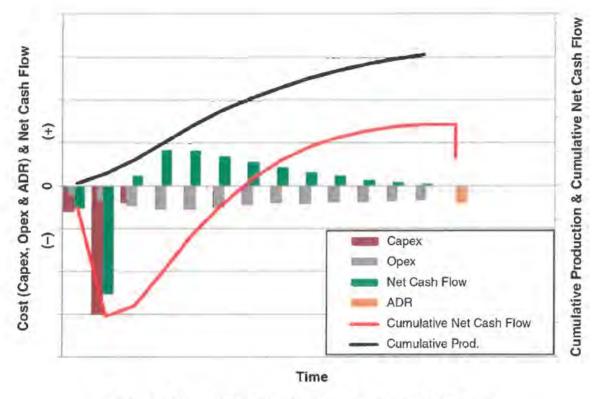


Figure 3.1—Undeveloped project economic forecast

- 3.1.2.6 Alternative economic scenarios may also be considered in the decision process and, in some cases, may supplement reporting requirements. Evaluators may examine a constant case in which current economic conditions are held constant without inflation or deflation throughout the project life.
- 3.1.2.7 Evaluations may also be modified to accommodate criteria regarding external disclosures imposed by regulatory agencies. For example, these criteria may include a specific requirement that, if the recovery were confined to the Proved Reserves estimate, the constant case should still generate a positive cash flow. External reporting requirements may also specify alternative guidance on the definition of current conditions or defined criteria with which to evaluate Reserves.
- 3.1.2.8 There may be circumstances in which the project meets criteria to be classified as Reserves using the best estimate (2P) forecast but the low case is not economic and fails to qualify for Proved Reserves. In this circumstance, the entity may record 2P and 3P estimates and no Proved Reserves. As costs are incurred in future years (i.e. become sunk costs) and development proceeds, the low estimate may eventually become economic and be reported as Proved Reserves. Some entities, according to internal policy or to satisfy regulatory reporting requirements, will defer reclassifying projects from Contingent Resources to Reserves until the low estimate case is economic.



3.1.3 Economic Limit

- 3.1.3.1 The economic limit is defined as the production rate at the time when the maximum cumulative net cash flow occurs for a project. The entity's entitlement production share, and thus net entitlement resources, includes those produced quantities up to the earliest truncation occurrence of either technical, license, or economic limit.
- 3.1.3.2 In this evaluation, operating costs should include only those costs that are incremental to the project for which the economic limit is being calculated (i.e., only those cash costs that will actually be eliminated if project production ceases). Operating costs should include fixed property-specific overhead charges if these are actual incremental costs attributable to the project and any production and property taxes, but for purposes of calculating the economic limit, should exclude depreciation, ADR costs, and income tax as well as any overhead that is not required to operate the subject property. Operating costs may be reduced, and thus project life extended, by various cost-reduction and revenue-enhancement approaches, such as sharing of production facilities, pooling maintenance contracts, or marketing of associated nonhydrocarbons (see Section 3.2.4, Associated Non-Hydrocarbon Components).
- 3.1.3.3 For a given project, no future development costs can exist beyond the economic limit date. ADR costs are not included in the economic limit calculations, even though they may be reported for other purposes.
- 3.1.3.4 Interim negative project net cash flows may be accommodated in periods of development capital spending, low product prices, or major operational problems provided that the longer-term cumulative net-cash-flow forecast determined from the effective date becomes positive. These periods of negative cash flow will qualify as Reserves if the following positive periods more than offset the negative.
- 3.1.3.5 In some situations, entities may choose to initiate production below or continue production past the economic limit. Production must be economic to be considered as Reserves, and the intent to or act of producing sub-economic resources does not confer Reserves status to those quantities. In these instances, the production represents a movement from Contingent Resources to Production. However, once produced such quantities can be shown in the reconciliation process for production and revenue accounting as a positive technical revision to Reserves. No future sub-economic production can be Reserves.

3.2 Production Measurement

- 3.2.0.1 In general, all petroleum production from the well or mine is measured to allow for the evaluation of the extracted quantities' recovery efficiency in relation to the PIIP. The marketable product, as measured according to delivery specifications at a defined reference point, provides the basis for sales production quantities. Other quantities that are not sales may not be as rigorously measured at the reference point(s) but are as important to take into account.
- 3.2.0.2 The operational issues in this section should be considered in defining and measuring production. While referenced specifically to Reserves, the same logic would be applied to



projects forecast to develop Contingent and Prospective Resources conditional on discovery and development.

3.2.1 Reference Point

- 3.2.1.1 Reference point is a defined location within a petroleum extraction and processing operation where the produced quantities are measured or assessed. A reference point is typically the point of sale to third parties or where custody is transferred to the entity's midstream or downstream operations. Sales production and estimated Reserves are normally measured and reported in terms of quantities crossing this point over the period of interest.
- 3.2.1.2 The reference point may be defined by relevant accounting regulations to ensure that the reference point is the same for both the measurement of reported sales quantities and for the accounting treatment of sales revenues. This ensures that sales quantities are stated according to the delivery specifications at a defined price. In integrated projects, the appropriate price at the reference point may need to be determined using a netback calculation.
- 3.2.1.3 Sales quantities are equal to raw production less non-sales quantities (those quantities produced at the wellhead but not available for sales at the reference point). Non-sales quantities include petroleum consumed as lease fuel, flared, or lost in processing, plus non-hydrocarbons that must be removed before sale (including water). Each of these may be allocated using separate reference points but, when combined with sales, should sum to raw production. Sales quantities may need to be adjusted to exclude components added in processing but not derived from raw production. Raw production measurements are necessary and form the basis of many engineering calculations (e.g., material balance and production performance analysis) based on total reservoir voidage. Substances added to the production stream for various reasons, such as diluents added to enhance flow properties, are not to be counted as Production, sales quantities, Reserves, or Resources.

3.2.2 Consumed In Operations (CIO)

- 3.2.2.1 CiO (also termed lease fuel) is that portion of produced petroleum consumed as fuel in production or plant operations before the reference point.
- 3.2.2.2 Although Reserves are recommended to be sales quantities (see Section 1.1), the CiO quantities may be included as Reserves or Resources; when included these quantities must be stated and recorded separately from the sales portion. Entitlement rights for the fuel usage must be in place to recognize CiO as Reserves. Flared gas and oil and other petroleum losses must not be included in either product sales or Reserves but once produced are included in produced quantities to account for total reservoir voidage.
- **3.2.2.3** The CiO quantities must not be included in the project economics because there is neither a cost incurred for purchase nor a revenue stream to recognize a sales quantity. The CiO fuel replaces the requirement to purchase fuel from external parties and results in lower operating costs. All actual costs for facilities-related equipment, the costs of the operations , and any purchased fuel must be included as an operating expense in the project economics.



3.2.3 Wet or Dry Natural Gas

- 3.2.3.1 The Reserves for wet or dry natural gas should be considered in the context of the specifications of the gas at the agreed reference point. Thus, for gas that is sold as wet gas, the quantity of the wet gas would be reported, and there would be no reporting of any associated hydrocarbon liquids extracted downstream of the reference point. It would be expected that the corresponding enhanced value of the wet gas would be reflected in the sales price achieved for such gas.
- 3.2.3.2 When liquids are extracted from the gas before sale and the gas is sold in dry condition, then the dry gas quantity and the extracted liquid quantities, whether condensate and/or natural gas liquids (NGLs), must be accounted for separately in resources assessments at the agreed reference point(s).

3.2.4 Associated Non-Hydrocarbon Components

- 3.2.4.1 In the event that non-hydrocarbon components are associated with production, the reported quantities should reflect the agreed specifications of the petroleum product at the reference point. Correspondingly, the accounts will reflect the value of the petroleum product at the reference point. If it is required to remove all or a portion of non-hydrocarbons before delivery, the Reserves and Production should reflect only the marketable product recognized at the reference point.
- 3.2.4.2 Even if an associated non-hydrocarbon component, such as helium or sulfur, removed before the reference point is subsequently separately marketed, these quantities are included in the voidage extraction quantities (e.g., raw production) from the reservoir but are not included in Reserves. The revenue generated by the sale of non-hydrocarbon products may be included in the project's economic evaluation.

3.2.5 Natural Gas Re-Injection

- 3.2.5.1 Natural gas production can be re-injected into a reservoir for a number of reasons and under a variety of conditions. Gas can be re-injected into the same reservoir or into other reservoirs located on the same property for recycling, pressure maintenance, miscible injection, or other enhanced oil recovery processes. In cases where the gas has no transfer of ownership and with a development plan that is technically and commercially mature, the gas quantity estimated to be eventually recoverable can be included as Reserves.
- 3.2.5.2 If injected gas quantities are included as Reserves, these quantities must meet the criteria in the definitions, including the existence of a viable development, transportation, and sales marketing plan. Gas quantities should be reduced for losses associated with the reinjection and subsequent recovery process. Gas quantities injected into a reservoir for gas disposal with no committed plan for recovery are not classified as Reserves. Gas quantities purchased for injection and later recovered are not classified as Reserves.

3.2.6 Underground Natural Gas Storage



- 3.2.6.1 Natural gas injected into a gas storage reservoir, which will be recovered later (e.g., to meet peak market demand periods) should not be included as Reserves.
- 3.2.6.2 The gas placed in the storage reservoir may be purchased or may originate from prior native production. It is important to distinguish injected gas from any remaining native recoverable quantities in the reservoir. On commencing gas production, allocation between native gas and injected gas may be subject to local regulatory and accounting rulings. Native gas production would be drawn against the original field Reserves. The uncertainty with respect to original field quantities remains with the native reservoir gas and not the injected gas.
- 3.2.6.3 There may be occasions in which gas is transferred from one lease or field to another without a sale or custody transfer occurring. In such cases, the re-injected gas could be included with the native reservoir gas as Reserves.
- **3.2.6.4** The same principles regarding separation of native resources from injected quantities would apply to underground liquid storage.

3.2.7 Mineable Oil Sand

3.2.7.1 Mineable oil sands that meet the criteria listed in Section 2.1.2 can be considered as a potentially economic material and therefore Reserves. Mining operations may result in mined materials being stockpiled rather than processed. Stockpiled mined oil sands should be included in Reserves only when the project to recover and blend the stockpile has achieved technical and commercial maturity. The project's quantities are not included in Production until measured at the reference point.

3.2.8 Production Balancing

- 3.2.8.1 Reserves estimates must be adjusted for production withdrawals. This may be a complex accounting process when the allocation of Production among project participants is not aligned with their entitlement to Reserves. Production overlift or underlift can occur in oil production records because participants may need to lift their production in parcel sizes or cargo quantities to suit available shipping schedules agreed upon by the parties. Similarly, an imbalance in gas deliveries can result from the participants having different operating or marketing arrangements that prevent gas quantities sold from being equal to the entitlement share within a given time period.
- 3.2.8.2 Based on production matching the internal accounts, annual production should generally be equal to the liftings actually made by the entity and not on the production entitlement for the year. However, actual production and entitlements must be reconciled in Reserves assessments. Resulting imbalances must be monitored over time and eventually resolved before project abandonment.

3.2.9 Equivalent Hydrocarbon Conversion

3.2.9.1 The industry sometimes simplifies communication of Reserves, Resources, and Production quantities with the term "barrel of oil equivalent" (BOE). The term allows for



consolidation of multiple product types into a single equivalent product. In instances where natural gas is the predominate product, liquids may be converted to gas equivalence (i.e. one thousand cubic feet (MCF) volume= 1 McfGE (MCF gas equivalent)).

- 3.2.9.2 Oil, condensate, bitumen and synthetic crude oil can be summed together without conversion (i.e., 1 bbl volume = 1 BOE). NGLs may need to be converted, depending on the actual composition. Natural gas must be converted to report on a BOE basis.
- 3.2.9.3 The presentation of Reserve or Resources quantities should be made in the appropriate units for each individual product type reported (e.g. barrels, cubic meters, metric tonnes, joules, etc.). If BOE's or McfGE's are presented, they must be provided as supplementary information to the actual liquid or gas quantities with the conversion factor(s) clearly stated.

3.3 Resources Entitlement and Recognition

- 3.3.0.1 While assessments are conducted to establish estimates of the total PIIP and that portion recovered by defined projects, the allocation of sales quantities, costs, and revenues impacts the project economics and commerciality. This allocation is governed by the applicable contracts between the mineral lease owners (lessors) and contractors (lessees) and is generally referred to as entitlement.
- 3.3.0.2 Evaluators must ensure that, to their knowledge, the recoverable resource entitlements from all participating entities sum to the total recoverable resources.
- 3.3.0.3 The ability for an entity to recognize Reserves and Resources is subject to satisfying certain key elements. These include (a) having an economic interest through the mineral lease or concession agreement (i.e., right to proceeds from sales); (b) exposure to market and technical risk; and (c) the opportunity for reward through participation in exploration, appraisal, and development activities. Given the complexities of some agreements, there may be additional elements that must be considered in determining entitlement and the recognition of Reserves and Resources.
- 3.3.0.4 For publicly traded companies, securities regulators may set criteria regarding the classes and categories that can be "recognized" in external disclosures. For national interests, the reporting of 100% quantities without concession agreement constraints is typically specified.

3.3.1 Royalty

3.3.1.1 Royalty refers to a type of entitlement interest in a resources project that is free and clear of the costs and expenses of development and production to the royalty interest owner as opposed to a working interest where an entity has cost exposure. A royalty is commonly retained by a resources owner (lessor/ host) when granting rights to a producer (lessee/contractor) to develop and produce the resources. Depending on the specific terms defining the royalty, the payment obligation may be expressed in monetary terms as a portion of the proceeds of production in-cash or as a right to take a portion of production in-kind. The royalty terms may also provide the option to switch between forms of payment at the discretion of the royalty owner.



In either case, royalty quantities must be deducted from the lessee's entitlement to resources so that only net revenue interest quantities are recognized.

- 3.3.1.2 In some agreements, production taxes imposed by the host government may be referred to as royalties. These payment obligations are expressed in monetary terms and are typically linked to production rates, quantities produced, cost recovery, the value of production (price sensitive), or the profits derived from it. These payments are not associated with an interest retained by the lessor/host. Thus, such payment obligations are effectively a production tax instead of a royalty. In such cases, the production and underlying resources are controlled by the lessee/contractor who may (subject to contractual terms and/or regulatory guidance) elect to report these obligations as a tax without a corresponding reduction in lessor/ contractor's entitlement.
- 3.3.1.3 Conversely, if an entity owns a royalty or equivalent interest of any type in a project, the related quantities can be included in resources entitlements and should not be included in entitlements of others.

3.3.2 Production-Sharing Contract Reserves

- 3.3.2.1 Production-sharing contracts (PSCs) of various types are used in many countries instead of conventional tax-royalty systems. Under the PSC terms, producers have an entitlement to a portion of the production. This net entitlement, often referred to as entitlement, occurs when a net economic interest is held by an entity and is estimated using a formula based on the contract terms incorporating costs and profits. The terms of the PSC provide the remuneration to the host government/lessor that would be accomplished by the royalty in other agreements.
- 3.3.2.2 Ownership of the production is retained by the host government; however, the contractor may receive title to the prescribed share of the quantities when produced or at point of sale and may claim that share as their Reserves.
- 3.3.2.3 Risk service contracts (RSCs) are similar to PSCs, but the producers may be paid in cash rather than in production. As with PSCs, the Reserves claimed are based on the entity's economic interest as risk is borne by the contractor. Care needs to be taken to distinguish between an RSC and a pure service contract. Reserves can be claimed in an RSC, whereas no Reserves can be claimed for pure service contracts because there is insufficient exposure to petroleum exploration, development, and market risks and the producers act as contractors.
- 3.3.2.4 Unlike conventional tax-royalty agreements, the cost recovery system in production-sharing, risk-service, and other related contracts typically reduce the production share and hence Reserves entitlement to a contractor in periods of high price and increase quantities in periods of low price. While this ensures cost recovery, it also introduces significant price-related volatility in annual Reserves estimates under cases using a constant case. The terms governing cost recovery in a particular PSC may require special treatment of items such as taxes, overhead, and ADR to determine entitlement.
- 3.3.2.5 The treatment of taxes and the accounting procedures used can also have a significant impact on the Reserves recognized and production reported from these contracts.



3.3.3 Contract Extensions or Renewals

- 3.3.3.1 As production-sharing or other types of agreements approach the specified end date, extensions may be obtained through contract negotiation, by the exercise of options to extend, or by other means.
- 3.3.3.2 Reserves cannot be claimed for those quantities that will be produced beyond the expiration date of the current agreement unless there is reasonable expectation that an extension, a renewal, or a new contract will be granted. Such reasonable expectation may be based on the status of renewal negotiations and historical treatment of similar agreements by the license-issuing jurisdiction. Otherwise, forecast production beyond the contract term must be classified as Contingent Resources with an associated reduced chance of commercialization. Moreover, it may not be reasonable to assume that the fiscal terms in a negotiated extension will be similar to existing terms.
- 3.3.3.3 Similar logic should be applied where gas sales agreements are required to ensure adequate markets. Reserves should not be claimed for quantities that will be produced beyond those specified in the current agreement or that do not have a reasonable expectation to be included in either contract renewals or future agreements.



APPENDIX 4: WELL DATABASE

Well Name	UWI	Label	Easting	Northing	RL	Hole Angle	Total Depth
HDR 1	VR1239	HDR01	27610.29	3112421.65	1294.00	90.00	484.00
Burning Cross	VR1187	1307	27976.6	3111368.3	1287.60	90.00	1092.33
EX 1	VR0512	EX01				90.00	
Highpipe	VR0846	2057	25854.4	3108505.8	1323.17	90.00	1627.00
HZON 1	VR2352	HZON01				90.00	
MDR 5			27251	3111658.5	1219.52	90.00	350.00
ML 1	VR1126	1370	24573	3132720.1	1410.95	90.00	1237.75
Retreat	VR0091	DW54403	34874.4	3129059.8	1372.37	90.00	513.70
ST 23	VR0588	ST23	25671.9	3120629.3	1340.77	90.00	1866.95
SPG 3 \ Lucky	VR1162	SPG03	25320.9	3130173.8		90.00	
Squatter	VR0848	2089	25852.4	3109095.8	1317.36	90.00	1750.60
Tewie-1400	VR0453	1400	25187.6	3123069.8	1357.15	90.00	1459.55
Burning Flame	VR0854	2190	22134.5	3108509.2	1344.08	90.00	1411.40
DBE 1	VR0489	DBE1	23747.2	3118794.8	1344.99	90.00	1090.00
SP3	VR1026	SAP11	16593.4	3101476.4	1362.54	90.00	
Flame 1	VR0858	2278	21345.5	3109501.8	1335.32	90.00	1287.50
Sand	VR1191	1629	26806.6	3110762.9	1296.20	90.00	2163,24
BN 56120A	VR0037	Dumidi	32288.3	3111882.8	1300.10	90.00	356.00



APPENDIX 5: ABBREVIATIONS

This appendix contains a list of abbreviations found in MHA Petroleum Consultants, Inc. reports, as well as a table comparing Imperial and Metric units. Two conversion tables, used to prepare this report, are also provided.

AOF absolute open flow

ARTC Alberta Royalty Tax Credit BOE barrels of oil equivalent bopd barrels of oil per day bwpd barrels of water per day

Cr Crown

DCQ daily contract quantity
DSU drilling spacing unit

FH Freehold

GCA gas cost allowance

GOR gas-oil ratio

GORR gross overriding royalty LPG liquid petroleum gas

Mcfpd thousands of cubic feet per day
MPR maximum permissive rate
MRI maximum rate limitation

NC 'new' Crown

NCI net carried interest NGL natural gas liquids NORR net overriding royalty NPI net profits interest

OC 'old' Crown

ORRI overriding royalty interest P&NG petroleum and natural gas PSU production spacing unit

PVT pressure-volume-temperature
TCGSL TransCanada Gas Services Limited

UOCR Unit Operating Cost Rates for operating gas cost allowance

WI working interest



	Imperial Units			Metric Units
M (10 ³) MM (10 ⁸) B (10 ⁹) T (10 ¹²)	one thousand million one billion one trillion	Prefixes	k (10 ³) M (10 ⁸) T (10 ¹²) (10 ¹⁸)	one thousand million one billion E one trillion G
in, It	inches feet mile	Length	(10 ⁶) cm m	one milliard centimetres metres kilometres
ft ² ac	square feet acres	Area	m² ha	square metres
cf or ft ³ scf gal Mcf Mcfpd MMcfpd MMcfpd Bcf bbl Mbbl stb bbl/d	standard cubic feet gallons thousand cubic feet thousand cubic feet per day million cubic feet per day billion cubic feet (10 ⁸) barrels thousand barrels stock tank barrel barrels per day	Volume	m³ L stm³ m³/d	cubic metres cubic metre stock tank cubic metres cubic metre per day
Btu	British thermal units	Energy	J MJ/m³ TJ/d	joules megajoules per cubic metre (10 ⁶) terajoule per day (10 ⁵)
oz Ib ton It	pounds ton long tons thousand long tons	Mass	g kg t	gram Kilograms tonne
psi psia psig	pounds per square inch absolute pounds per square inch gauge	Pressure	Pa kPa	pascals kilopascals (10 ³)
°F °R	degrees Fahrenheit degrees Rankine	Temperature	°c K	degrees Celsius Kelvin
13.				



	Imperial Units			Metric Units
sec	second	Time	s	second
min	minute		min	minute
hr	hour		h	hour
day	day		d	day
wk	week			week
mo	month			month
yr	year		a	annum



Conversion	n Factors -	- Metric to Imperial	
12 - 12 (0.3) (0.45°0)	. 5 00040	hamala /hhli / © CA ^O E) water	
cubic metres (m³) (@ 15°C)	x 6.29010	= barrels (bbl) (@ 60°F), water	
m³ (@ 15°C)	x 6.3300	= bbl (@ 60°F), Ethans	
m³ (@ 15°C)	x 6.30001	= bbl (@ 60°F), Propane	
m³ (@ 15°C)	x 6.29683	= bbl (@ 60°F), Butanes	
m³ (@ 15°C)	x 6.29287	= bbl (@ 60°F), oll, Penlanes Plus	
m³ (@ 101.325 kPaa, 15°C)	x 0.0354937	= thousands of cubic feet (Mcf) (@ 14.65 psia, 60°F)	
1,000 cubic metres (10 ³ m ³) (@ 101.325 kPaa, 15°C)	x 35.49373	= Mcf (@ 14.65 psia, 60°F)	
hectares (ha)	x 2.4710541	= acres	
1,000 square metres (10 ³ m ²)	x 0.2471054	= acres	
10,000 cubic metres (ha·m)	x 8.107133	= acre feet (ac-ft)	
m ² /10 ³ m ³ (@ 101.325 kPaa, 15° C)	x 0.0437809	= Mcf/Ac.ft. (@ 14.65 psia, 60°F)	
joules (j)	x 0.000948213	= B(u	
megajoules per cubic metre (MJ/m³) (@ 101.325 kPaa,	x 26.714952	= British thermal units per standard cubic fool (Btu/sc	
15°C)		(@ 14.65 psia, 60°F)	
dollars per gigajoule (\$/GJ)	x 1.054615	= S/Mcf (1,000 Btu gas)	
metres (m)	x 3.28084	= feet (ft)	
kilometres (km)	x 0.6213712	= miles (mi)	
dollars per 1,000 cubic metres (\$/10 ^a m ³)	x 0.0288951	= dollars per thousand cubic feet (\$/Mcf) (@ 15.025 psla) B.C.	
(\$/10 ³ m ³)	x 0.02817399	= S/Mcf (@ 14.65 psia) Alta.	
dollars per cubic metre (\$/m³)	x 0.158910	= dollars per barrel (\$/bbl)	
gas/oil ratio (GOR) (m³/m³)	x 5.640309	= GOR (scf/bbl)	
kilowatts (kW)	x 1.341022	= horsepower	
kilopascals (kPa)	x 0.145038	= psi	
tonnes (t)	x 0.9842064	= long tons (LT)	
kilograms (kg)	x 2.204624	= pounds (lb)	
litres (L)	x 0.2199692	= gallons (Imperial)	
iires (L)	x 0.264172	= gallons (U.S.)	
cubic metres per million cubic metres (m3/106m3) (Ca)	x 0.177496	= barrels per million cubic feet (bbl/MMcf) (@ 14.65 psia)	
m³/10 ⁶ m³) (C₄)	x.0.1774069	= bbl/MMcf (@ 14.65 psia)	
m³/10 ⁶ m³) (C ₅₊)	x 0.1772953	= bbl/MMcf (@ 14.65 psia)	
ionnes per million cubic metres (V10°m") (sulphur)	x 0.0277290	= LT/MMcf (@ 14.65 psia)	
millilitres per cubic meter (mL/m²) (C ₅₊)	x 0.0061974	= gallons (Imperial) per thousand cubic feet (gal (Imp)/Mcf)	
(mL/m³) (C ₅₊)	x 0.0074428	= gallons (U.S.) per thousand cubic feet (gal (U.S.)/Mcf)	
Kelvin (K)	x 1.8	= degrees Rankine (°R)	
millipascal seconds (mPa·s)	x 1.0	= centipolse	



Conversion Factor	s — Imper	ial to Metric
	0.45000	Library (1951/C) 45°C) victor
barrels (bbl) (@ 60°F)	x 0.15898	= cubic metres (m³) (@ 15°C), water
bbi (@ 60°F)	x 0.15798	= m³ (@ 15°C), Ethane
bbi (@ 60°F)	x 0.15873	= m ³ (@ 15°C), Propane
bbl (@ 60°F)	x 0.15881	= m ³ (@ 15°C), Butanes
bbl (@ 60°F)	x 0.15891	= m ³ (@ 15°C), oil, Pentanes Plus
thousands of cubic feet (Mcf) (@ 14.65 psla, 60°F)	x 28.17399	= m ³ (@ 101.325 kPaa, 15°C)
Mcf (@ 14.65 psia, 60° F)	x 0.02817399	= 1,000 cubic metres (10 ³ m ³) (@ 101.325 kPaa, 15°C)
acres	x 0.4046856	= hectares (ha)
acres	x 4,046856	= 1,000 square metres (10 ³ m ²)
acre feet (ac-fl)	x 0.123348	= 10,000 cubic metres (10 ⁴ m ³) (ha·m)
Mcf/ac-ft (@ 14.65 psia, 60°F)	x 22,841028	= 10 ³ m ³ /m ³ (@ 101.325 kPaa, 15°C)
Btu	x 1054.615	= joules (J)
British thermal units per standard cubic foot (Btu/Scf) (@ 14.65 psia,	x 0.03743222	= megajoules per cubic metre (MJ/m³) (@ 101.325 kPaa
60°F)		15°C)
\$/Mcf (1,000 Btu gas)	x 0.9482133	= dollars per gigajoule (\$/GJ)
\$/Mcf (@ 14.65 psia, 60°F) Alta.	x 35.49373	= \$/10 ³ m ³ (@ 101.325 kPaa, 15°C)
\$/Mcf (@ 15.025 psis, 60°F), B.C.	x 34.607860	= \$/10 ³ m ³ (@ 101.325 kPas, 15°C)
feet (fi)	x 0.3048	= metres (m)
miles (mi)	x 1.609344	= kilometres (km)
\$/bbl	x 6.29287	= \$/m ³ (average for 30°-50° API)
GOR (scf/bbl)	x 0.177295	= gas/oil ratio (GOR) (m³/m³)
horsepower	x 0.7456999	= kilowatts (kW)
psi	x 6.894757	= kilopascals (kPa)
long tons (LT)	x 1.016047	= fonnes (t) pounds
(lb)	x 0.453592	= kilograms (kg)
gallóns (Impeñal)	x 4,54609	= litres (L) (.001 m²)
gallons (U.S.)	x 3.785412	= litres (L) (.001 m ³)
barrels per million cubic feet (bbl/MMcf) (@ 14.65 psia) (C ₅)	x 5.6339198	= cubic metres per million cubic metres (m³/10°m³)
bbl/MMcf (C ₄)	x 5.6367593	$=(m^3/10^6m^3)$
bbl/MMcf (Cs+)	x 5.6403087	$=(m^3/10^6m^3)$
LT/MMcf (sulphur)	x 36.063298	= tonnes per million cubic metres (t/10 ⁸ m³)
gallons (Imperial) per thousand cubic feet (gal (Imp)/Mcf) (C ₅₊)	x 161.3577	= millilitres per cubic meter (mL/m³)
gallons (U.S.) per thousand cubic feet (gal (U.S.)/Mcf) (C ₆ ,)	x 134.3584	= (mL/m ²)
degrees Rankine (°R)	x 0,555556	= Kelvin (K)
centipoises	x 1.0	= millipascal seconds (mPa's)



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1. INTRODUCTION

In accordance with the requirements of section 86(2) of the Mineral and Petroleum Resource Development Act (MPRDA, Act Number 28 of 2002) and clause 15.1 of the granted, executed Production Right, Tetra4 (hereby referred to as Tetra4) submits its annual progress report. The report details the production progress made during the period of April 2017 – April 2018 only. In addition, the report describes the next, successive work programme to be undertaken for the 2019-2020 period as well.

1.1 License holder summary information

Tetra4 is the License Holder of a Production Right located within the Free State Provinces of South Africa. Details of the License Holder are provided in Table 1.

Table 1: License Holder details

Tetra4 Operations

Relevant Details

Tottu+ Operations	Rolovant Botans
Name of entity holding Production Right:	Tetra4 (Pty) Ltd
Company registration number:	2005/012157/07
Production Right reference number:	12/4/07/2/2 PR
MPTRO reference number:	15/2013
Location of production operations:	Virginia, Free State Province
Extent of Production Right	187 000 hectares
Duration of Production Right:	30 years
Remaining Renewal Periods:	1 X 30 years
Commodity:	Gas
Geographic origin of employees	Virginia, Free State Province
	Johannesburg, Gauteng Province
Operations office contact details	Tel: (057) 217 1100
	Fax: (057) 217 1101
	92 Gawie Theron Street, Virginia, 9430
Operations office contact person:	Robert Katzke (<u>robertk@tetra4.com</u>)
Head office physical address:	1 Bompas Road, Dunkeld West, Johannesburg,
	2196
Head office contact details:	Tel: (010) 045 6010
	Fax: (010) 045 6001
	Postnet Suite 610, Private Bag X10030,
	Randburg, 2125
Head office contact person:	Khalid Patel (khalidp@tetra4.com)

1.2 Approved PWP

A summary of the approved Production Work Programme (PWP) is indicated in Table 2 below. On 15 June 2015, Tetra4 submitted an application in terms of section 102 of the MPRDA to formally amend the approved PWP. The proposed amendment to the PWP included the drilling of an additional 20 exploration wells within the boundary of the granted Production Right as part of the revised phased approach to executing the PWP.

On 06 February 2017, the Petroleum Agency South Africa (PASA) approved and granted the proposed amendment to the PWP. The amendment was formalized on 04 April 2017 with the execution and registration of the deed of amendment. The amendment is included in Table 2 and underlined.

Table 2: Approved PWP inclusive of Amendment

Phase	Activity	Anticipated Expenditure
	Initial development	
1	1307 and HDR 1 hookup	ZAR 16 500 000.00
	Road access and hard standing	ZAR 2 500 000.00
Sub-total		ZAR 19 000 000.00
	Secondary development	
	EX01 and SPG03 hookup	ZAR 16 500 000.00
	Road access and hard standing	ZAR 2 500 000.00
2	Drilling 2 percussion production wells	ZAR 11 000 000.00
	Site rental	ZAR 100 000.00
	Surveys	ZAR 60 000.00
	Servitude costs	ZAR 20 000.00
Sub-total		ZAR 30 180 000.00
	Production expansion	
	Drilling 12 percussion production wells	ZAR 66 000 000.00
	Site rental	ZAR 600 000.00
3	Survey	ZAR 60 000.00
	Servitude costs	ZAR 120 000.00
	<u>Drilling 20 combination percussion/diamond wells</u>	ZAR 6 000 000.00
Sub-total		ZAR 72 780 000.00
Grand-total	(Phase 1 + Phase 2 + Phase 3)	ZAR 121 960 000.00

Figure 1 below indicates the locality and extent of the Production Right held in both the Free State Province.

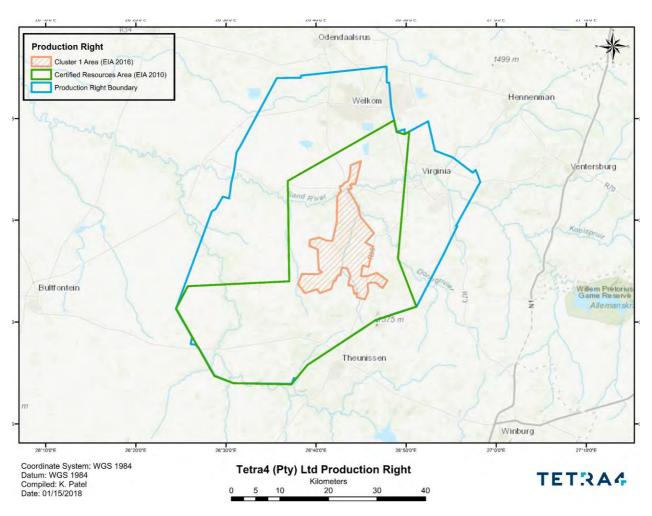


Figure 1: Location and extent of Production Right

2. ANNUAL PRODUCTION WORK PROGRESS (2018-2019)

2.1 Production right progress – drilling and geology

During the 2018-year period, Tetra4 drilled one (1) exploration well named T4WN01. The purpose of the exploration well was to delineate the extent of a geologically modelled sandstone body located on the eastern edge of the Production Right. The exploration drilling of well T4WN01 was initiated in November of 2017 and concluded in November 2018. The exploration well was drilled to a depth of 499 m (total vertical depth) into the Dwyka lithological formation. Core samples obtained were sent through to a third party to determine the permeability and porosity of samples.

Numerous operational issues occurred during the drilling resulting in significant delays in completion of the exploration well. Of these issues, the most significant identified include the results of a CBL undertaken which indicated a poor bond between the 6inch casing installed and formation. As a result of this, exploration drilling was suspended and corrective actions identified in consultation with a qualified well engineer.

As a result, corrective action in the form of the installation of an additional 4inch casing and cementation with specialized, precision grouting developed by the BASF (Pty) was identified as the preferred and most feasible corrective action. The detailed corrective action proposal was submitted to the PASA on 10 April 2018 and formally approved on 24 April 2018. Corrective actions, as per the report, were then implemented. At present, the exploration is suspended.

During the course of 2018, Tetra4 appointed Shango Solutions (Pty) Ltd to begin extending as well as refining the geological block model across the Production Right. In addition, Shango were tasked to identify several additional drilling targets, also to delineate the extent of the sandstone play. In addition to the refinement and extension of geological block modelling, Tetra4 also appointed a geotechnical consultancy during the 2018-year period to assist with the modelling of lithological formation permeability, porosity and compressive rock strength.

2.2 Production right progress – gas gathering and gas processing

During the 2018-year period, Tetra4 prepared two detailed tenders for the Cluster 1 Gas Production Project. The tenders were drafted according to the FIDIC Silver Book contracting philosophy and split between gas gathering (pipeline and compressors) and processing plant (LNG/Lhe).

The Request for Proposal (RFP) was drafted internally and reviewed by external engineering partners. The RFP was issued to the market in October 2018, with initial clarifications sent by Tetra4 to all bidders in December 2018. The awarding of contracts is anticipated to be concluded by end June 2019.

3. PRODUCTION EXPENDITURE INCURRED (2017-2018)

3.1 Production Right

Table 3 below outlines the production expenditure incurred during the 2018-year period.

Table 3: Production Right Expenditure Incurred

Quarterly Expenditure

Cumulative Expenditure 2018

2018 Quarters	Expenditure Committed in PWP	Expenditure end 2018
Jan – Mar 2018		ZAR 6 902 424.08
Apr – Jun2018	ZAR 121 000 000.00	ZAR 10 355 819.00
Jul – Sep 2018		ZAR 6 945 046.00
Oct – Dec 2018		ZAR 10 003 122.32
TOTAL:		ZAR 34 206 411.45

The majority of the production expenses incurred during 2018 relate to compression plant maintenance, equipment replacement, geological and geotechnical modelling as well as front end engineering and design for the gas gathering and processing plant tenders.

4. ANNUAL PRODUCTION WORK PROGRAMME (2019-2020)

4.1 Production Right

Table 4 below outlines the proposed PWP and production costs for the April 2019 – April 2020 period. During this period, expenditure will be reserved and prioritized for completion of Cluster 1 including the gas gathering network and processing plant.

Table 4: Updated Production Right PWP for 2018-2019

Period	Production Activity	Expenditure
2019 - 2020	Cluster 1 gas gathering network (pipelines)	R 120 000 000.00
	Exploration drilling	R 11 000 000.00
Total		R 131 000 000. 00

Only once the Cluster 1 gas gathering network and processing plant have been constructed and operated according to design requirements will Tetra4 begin further production related activities such as exploration drilling within the Production Right. If the anticipated budget for the period of 2019–2020 of the PWP is not completely utlised but the goals of the work programme realized, the budget will be adjusted accordingly. Any remaining budget will be allocated to the next budget period if required.

5. ENVIRONMENTAL COMPLIANCE AND REHABILIATION

5.1 Production Right

Environmental compliance is enforced through monthly internal audits undertaken by the on site Environmental Officer (EO) and submitted to the PASA. The production operations are audited against the environmental management actions stipulated in the approved Environmental

Management Programmes (EMPR). For the period of 2018, the average compliance score obtained is 95%.

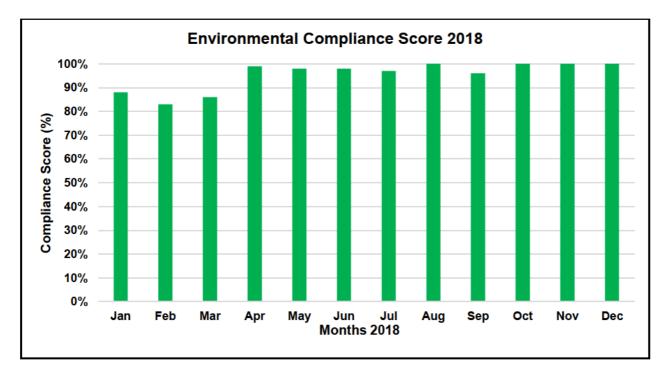


Figure 2: Environmental compliance score 2018

6. CONCLUSION

A summary of the proposed PWP for the period of 2019 - 2020 for the Production Right held by Tetra4 is provided in Table 5 below. For the period of 2018, Tetra4 achieved an average environmental compliance score of 95% and updated its financial provisions to reflect the exploration drilling of well T4WN01. Proposed production expenditure for the period of 2019 to 2020 is prioritized for the construction and operation of the gas gathering network and processing plant for Cluster 1 only.

Table 5: PWP Summary Period 2018-2019

Period	Production Activity	Expenditure
2019 - 2020	Cluster 1 gas gathering network (pipelines)	R 120 000 000.00
	Exploration drilling	R 11 000 000.00
Total		R 131 000 000. 00

TETRA4 PROPRIETARY LIMITED: MAINTENANCE POLICY FOR LIQUEFACTION FACILITY

With reference to the operation of the liquefaction facility - the liquefaction facility is currently in the design and procurement phase of work. While the final facility will operate as a single plant operated by Tetra4; the design, procurement, construction and commissioning of the project being structured as follows:

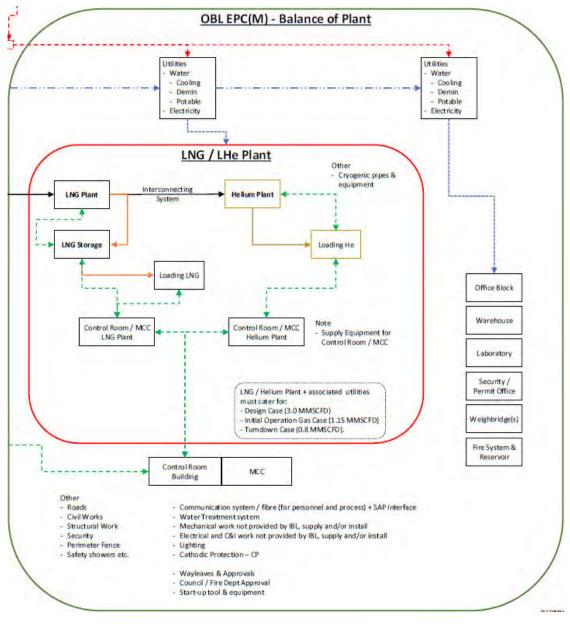


Figure 1:Project Structure

In the above image, all components within the red block (Figure 1) are managed by Tetra4's equipment supplier under a dedicated engineering and procurement supply contract ("IBL

Modules"). The balance of plant items within the green block (Figure 1) are managed by Tetra4's contractor under a separate engineering, procurement and construction contract ("OBL Modules").

The major IBL and OBL modules as defined by Figure 1 are summarised in the table below (the operation of which is defined as per item 2(c) of this application).

Table 1: IBL/OBL Modules to be Supplied

IBL Modules	OBL Modules
Feed gas regulation module	Instrument air supply module
Natural gas booster compressor module	Nitrogen supply module
Mixed refrigerant compressor module	Cooling water module
Nitrogen compressor module	Demin water treatment module
Helium compressor module	Potable water regulation module
MDEA tower, pump, and storage modules	Conduction oil module
Molecular sieve module	Gas blending
LNG/LHe/LN ₂ storage modules	Fire system
LNG/LHe/LN ₂ Coldbox modules	

Tetra4 has the responsibility to receive, review and accept all engineering design, procurement, fabrication, and commissioning documentation for each of the modules (as well as the specific equipment contained therein).

However, Tetra4 does not undergo any detailed design or procurement outside of the EP Contract (red block Figure 1) and EPC Contract (green block Figure 1) and therefore has no influence over the recommended maintenance practices associated with the equipment modules.

Instead, recommended maintenance practices (for specific equipment) will be provided to Tetra4 by the Original Equipment Suppliers (OEMs) for review prior to establishment of the plant. The EP Contract (red block Figure 1) and EPC Contract (green block Figure 1) both make provisions this by stating that:

"The following documents are to be available for the entire commissioning team prior to their establishment on Site:

- Operating Manuals;
- Maintenance Manuals;
- Commissioning Procedures Manual (agree with Employer);

Commissioning Instructions (including OHS Act/MHSA requirements).

On completion of commissioning, the Operating Manual and Maintenance Manual are to be taken to "As-Built" status and re-issued to the Employer."

With the intention being that Tetra4 receives, reviews, and accepts the required documentation, and finally consolidates the specific operation and maintenance manuals into a single comprehensive document for the entire liquefaction facility. The completion of the consolidated operations and maintenance policy will coincide with hand-over of the liquefaction facility from the Contractor to Tetra4. The liquefaction facility's IBL Modules are designed to operate for 330 days a year (90% availability) to provide plant outages required to conduct maintenance. Furthermore, the liquefaction facility's OBL Modules are designed to operate for 345 days a year (95% availability) to ensure continued operation of critical OBL Modules during minor IBL Module downtime. The design and selection of equipment for both EP and EPC scope is being completed based on these availability requirements.

The equipment-specific operations and maintenance manuals will be provided alongside the end-of-job documentation once equipment is shipped. Based on the anticipated project timelines, this information should be submitted between September 2020 and March 2021 (as the equipment modules fabrication and testing progresses). This information will be shared as it is received. Furthermore, the details of both the EP and EPC Contracts as discussed herein can be provided for review upon request, as far as it relates to the supply of maintenance and operations manuals.