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**MOTUOANE ENERGY GAS PRODUCTION RIGHT EIA
HYDROGEOLOGICAL BASELINE INVESTIGATION AND
GROUNDWATER IMPACT ASSESSMENT SCOPING REPORT**

December 2025

Conducted on behalf of:

Environmental Impact Management Services (Pty) Ltd

Compiled by:

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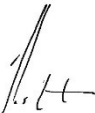
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This report has been drafted as per the latest requirements for specialist reports as set by the Department of Environmental Affairs and listed in Government Gazette No. 40713, dated 24 March 2017 and Government Gazette No. 40772 dated 07 April 2017 in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). We realise that a false declaration is an offence in terms of regulation 48 of the Environmental Impact Assessment Regulations, 2014 (as amended) promulgated in terms of the National Environmental Management Act, 107 of 1998 (NEMA) and is punishable in terms of section 49B of the NEMA.

I, JFW Mostert, hereby declare that:

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

- iv. Groundwater pollution as a result of wastewater spills and seepage from the wastewater management facilities.
- v. Mobilisation and maintenance of heavy vehicles and machinery on-site may cause hydrocarbon contamination of groundwater resources.
- vi. Poor storage and management of hazardous chemical substances on-site may cause groundwater pollution.
- vii. Leakage of harmful substances from tanks, pipelines or other equipment may cause groundwater pollution.
- viii. Leachate of contaminants used in the drilling mud sump(s) to the intergranular, potable aquifer(s) during the operational phase.

Potential impacts associated with the post-closure and decommissioning phase activities include the following:

- i. Migration of saline groundwater from the deep, fractured aquifer to the overlying, potable aquifer(s) during the borehole closure and decommissioning phase.
- ii. Migration of stray gas from the deep, fractured aquifer to the overlying, potable aquifer(s) borehole closure and decommissioning phase.
- iii. Poor quality leachate may emanate from the plant footprint area which may have a negative impact on groundwater quality.
- iv. Groundwater pollution as a result of wastewater spills and seepage from the wastewater management facilities.
- v. De-mobilisation of heavy vehicles and machinery as part of the decommissioning phase on-site may cause hydrocarbon contamination of groundwater resources.
- vi. Rehabilitation and decommissioning of related infrastructure may have a negative impact on groundwater and surface water quality.

The following recommendations are proposed following this investigation:

- i. It is recommended that this scoping report be incorporated into a detailed hydrogeological specialist investigation in order to verify sensitive environmental and groundwater receptors as well as confirm the proposed source-receptor-pathway mechanisms.
- ii. Sensitive groundwater and environmental receptors should be visited to obtain relevant groundwater information i.e., water levels, water application, water quality to aid in the formulation of a scientific baseline.
- iii. Pre-development monitoring can be considered in order to formulate a baseline to serve as benchmark going forward. Monitoring results should be evaluated and reviewed on a bi-annual basis by a registered hydrogeologist for interpretation and trend analysis and submitted to the Regional Head: Department of Water and Sanitation.
- iv. It should be considered to establish aquifer characterisation boreholes in order to obtain site representative hydraulic parameters for host classification and numerical groundwater model calibration purposes.
- v. Gathered groundwater data and information should be formulated into a conceptual groundwater model to be applied as basis for a numerical groundwater flow and pollution plume migration model. The latter should be calibrated with site specific groundwater data and used as management tool for mitigation and management scenarios.
- vi. Mitigation and management measures should be formulated and developed as part of the follow-up phase in order to minimize potential impacts of the proposed operations on sensitive environmental and groundwater receptors. Mitigation and management measures should be summarised in a water management plan which should be applicable to the construction, operational and decommissioning/post-closure phases of the project.
- vii. It is recommended that an integrated groundwater and surface water monitoring protocol and network be developed for implementation. It is imperative that monitoring be conducted to serve as an early warning and detection system.

List of Abbreviations

ABA	Acid Base Accounting
ASTM	American Society for Testing Materials
Avg	Average
AWD	Accelerated Weight Drop Seismic
BH	Borehole
CGS	Council for Geoscience
CMB	Chloride Mass Balance
CNG	Compressed Natural Gas
CV	Coefficient of Variation
b	Saturated Thickness
DMR	Department of Environmental Affairs
DEM	Digital Elevation Model
DRASTIC	DI Index
DWS	Department of Water Affairs
EC	Electrical Conductivity (mS/m)
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
E.N.	Electro Neutrality
ER	Exploration Right
ERA	Exploration Release Area
EPA	United States Environmental Protection Agency
ha	Hectares
GIS	Geographic Information Systems
GN	Government Notice
GQM	Groundwater Quality Management
i	Hydraulic gradient (dimensionless)
ICP-OES	Inductively coupled plasma optical emission spectrometer
ICP-	

MPRDA	Minerals and Petroleum Resources Development Act (Act 28 of 2002)
n	Porosity
NAWL	No Access to Water Level
NGA	National Groundwater Archive
NGDB	National Groundwater Database
NRMSD	Normalised Root Mean Square Deviation
NWA	National Water Act (Act 36 of 1998)
PR	Production Right
REV	Representative Elementary Value
RMSE	Root Mean Square Error
S	Storage coefficient
SANAS	South African National Accreditation System
SANS	South African National Standards
Sc	Specific Storage
SoW	Scope of Work
SRTM	Shuttle Radar Topography Mission
T	Transmissivity (m²/d)
TCP	Technical Cooperation Permit
TDS	Total Dissolved Solids
UNESCO	The United Nations Educational, Scientific and Cultural Organisation
USGS	United States Geological Survey
WGS	World Geodetic System
WM	With Mitigation
WOM	Without Mitigation
WRC	Water Research Commission
WUL	Water Use Licence

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Equation

2. METHODOLOGY

The groundwater impact assessment was undertaken by applying the methodologies as summarised below.

2.1. Desk study and review

This task entails the review of available geological and hydrogeological information including DWS supported groundwater databases (NGA/ Aquiworx), existing specialist reports, mine plans as well as climatic and other relevant groundwater data. Data collected was used to delineate various aquifer and hydrostratigraphic units, establish the vulnerability of local aquifers, aquifer classification as well as aquifer susceptibility.

2.2. Evaluation of potential environmental receptors

In order to evaluate the risk of groundwater contamination, potential sources of contamination should be identified, as well as potential pathways and receptors.

2.3. Hydrogeological baseline description

Based on the gathered desktop groundwater and site characterisation data a baseline description of the current status quo of the regional groundwater system including aquifer classification, aquifer unit delineation and vulnerability is formulated.

2.4. Development of a conceptual hydrogeological model

The hydrogeological conceptual model consists of a set of assumptions, which will aid in reducing the problem statement to a simplified and acceptable version. Data gathered during the desktop study and site investigation has been incorporated to develop a conceptual understanding of the regional hydrogeological system.

2.5. Groundwater impact assessment

Identification of preliminary and potential impacts and ratings related to new developments and/or listed activities are defined based on outcomes of the investigation. An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human and/or other related activities. Risk assessment involves the calculation of the magnitude of potential consequences (levels of impacts) and the likelihood (levels of probability) of these consequences to occur. Mitigation measures were recommended in order to render the significance of impacts identified.

Table 5-4 Quaternary catchment information: C42K.

Attribute	Quaternary catchment C42K
Water Management Area (WMA)	Vaal
Primary catchment	C
Secondary catchment	C2
Tertiary catchment	C42
Quaternary catchment	C42K
Major rivers	Sand and Doringrivier
Hydro-zone	E
Rainfall zone	C4C
Area (km ²)	668.0
Mean annual rainfall (mm)	521.2
Mean annual evaporation (mm)	1600.0
Mean annual runoff (mm)	23.8
Baseflow (mm)	2.9
Population	350.0
Total groundwater use (l/s)	27.9
Present Eco Status Category	Category C
Recharge (mm)	22.0
Average water level (mbgl)	39.3
Soil type	Sa - LmSa 25 SaLm - SaCLm 70
Groundwater General Authorization	75.0 m ³ /ha/a

Note: Catchment based information sourced from Aqwiworx 2016

Table 6-1 Recharge estimation (after van Tonder and Xu, 2000).

Recharge method/ Reference	Recharge (mm/a)	Recharge (% of MAP)	Weighted Average (High = 5; Low = 1)
Geology	22.00	4.10	1.00
Vegter	20.00	3.73	4.00
Harvest Potential	15.00	2.80	3.00
Baseflow	15.00	2.80	3.00
Qualified Opinion	17.50	3.27	3.00
Literature	17.80	3.32	3.00
Weighted average	17.52	3.27	17.00

Notes: Recharge per annum were calculated using a MAP of 535.98 mm/a.

9.4.3. Post-operational and decommissioning phase: Associated activities and impacts

Potential impacts associated with the post-closure and decommissioning phase activities include the following:

- i. Migration of saline groundwater from the deep, fractured aquifer to the overlying, potable aquifer(s) during the borehole closure and decommissioning phase.
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