DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT

NO. 6806 **7 November 2025**

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998
(ACT NO. 107 OF 1998)

CONSULTATION ON THE PROPOSED REGULATIONS FOR THE EXPLORATION AND PRODUCTION OF ONSHORE PETROLEUM RESOURCES REQUIRING FRACTURING TECHNOLOGY

I, Dion Travers George, Minister of Forestry, Fisheries and the Environment, hereby consult on the intention to make regulations pertaining to the exploration and production of onshore petroleum resources requiring fracturing technology under sections 44(1)(a) and (1)(aA), read with sections 24(5)(b)(x), 24(5)(h) and section 50A, of the National Environmental Management Act, 1998 (Act No. 107 of 1998) in the Schedule hereto.

This Notice contains a revised version of the documents contained in Government Notice No. 2273 published on 11 July 2022 in Government *Gazette* No. 47112 for public comment and reflects the incorporation of amendments made based on the first call for public comment.

Members of the public are invited to submit written comments or input, within 30 days from the date of the publication of this notice in the Government *Gazette*, or a notification in a newspaper, whichever occurs last, to any of the following addresses:

By post to: Department of Forestry, Fisheries and the Environment
The Director-General
Attention: Mr Simon Moganetsi
Private Bag X447
PRETORIA
0001

By hand at: Reception, Environment House, 473 Steve Biko Road, Arcadia, Pretoria.
By e-mail: Smoganetsi@dffe.gov.za.

Any enquiries in connection with the Notice can be directed to Mr Simon Moganetsi by phone at 012 399 9309 or by mail at Smoganetsi@dffe.gov.za.
A hard copy of any notice or document associated with this Government *Gazette* can be requested from Ms M Masondo at email: mmasondo@dffe.gov.za or collected at the Department's physical address as indicated above. The documents can be downloaded from the Department's website at https://www.dffe.gov.za/projectprogrammes/environmental_management_instruments and the

Government Notice can be downloaded from the Department's website at https://www.dffe.gov.za/legislation/gazetted_notices

Comments or input received after the closing date may be disregarded.

The Department of Forestry, Fisheries and the Environment complies with the Protection of Personal Information Act, 2013 (Act No. 4 of 2013). Comments received and responses thereto are collated into a comments and responses report which will be made available to the public as part of the consultation process. If a commenting party has any objection to his or her name, or the name of the represented company/ organisation, being made publicly available in the comments and responses report, such objection should be highlighted in bold as part of the comments submitted in response to this Government Notice.

DR D T GEORGE
MINISTER OF FORESTRY, FISHERIES AND THE ENVIRONMENT

SCHEDULE

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CHAPTER 1

DEFINITIONS, PURPOSE AND APPLICATION OF THESE REGULATIONS

Definitions

1. In these Regulations, any word or expression to which a meaning has been assigned in the Act shall have the meaning so assigned, and unless the context indicates otherwise—

"additive" means a chemical or mixture of chemicals that are added to the base fluid to change its properties;

"API standard" means the relevant American Petroleum Institute Standards;

"applicant" means a person who applies for an exploration right or a production right in terms of the Mineral and Petroleum Resources Development Act, 2002 and which exploration or production requires fracturing technology and a person who applies for an environmental authorisation in terms of the Act, for an exploration, fracturing or production activity intending to or using fracturing technology;

"baseline monitoring" means the monitoring of key indicators to establish reference conditions of the potentially affected environment prior to fracturing to form the basis for determining a change over time;

"baseline monitoring plan" means the plan identified in regulation 8(2)(b);

"blowout" means an uncontrolled release of hydrocarbons from a well after pressure control systems have failed;

"casing" means piping positioned in a wellbore and cemented in place to prevent soil or rock from caving in and isolates fluids from the surrounding geological formations;

"competent person" has meaning assigned to it in the Mineral and Petroleum Resources Development Regulations, 2004;

"closure certificate" means the certificate contemplated in section 43 of the Mineral and Petroleum Resources Development Act, 2002;

"conductor casing" means the casing that provides structural support for the well, wellhead and completion equipment, and provides hole stability for initial drilling operations;

"consolidated assessment report" means the report containing the environmental information as contemplated in the Minimum Information Requirements for Baseline Monitoring for Onshore Exploration Operations and the Minimum Information Requirements for the Exploration and Production of Onshore Petroleum Using Fracturing Technology;

"days" means calendar days, but if the last day of the period falls on a Saturday, Sunday or public holiday, that period must be extended to the end of the next day which is not a Saturday, Sunday or public holiday;

"decommissioning" means the planned shutdown of an exploration or production well with the plugging of wells, removal of well equipment, production tanks and associated installations, site rehabilitation and

monitoring and where relevant the final decommissioning and closure of the exploration or production operation;

"designated agency" means the agency designated in terms of section 70 of the Mineral and Petroleum Resources Development Act, 2002;

"environmental authorisation" means the authorisation issued by a competent authority for a listed activity or specified activity required in terms of section 24 of the Act;

"Environmental Impact Assessment Regulations" means the Regulations published in terms of sections 24(5) and 44 of the Act;

"exploration right" means a right contemplated in section 80 of the Mineral and Petroleum Resources Development Act, 2002 for onshore exploration;

"flow back" means fracturing additives and other fluids that return to the surface after fracturing has been completed;

"Financial Provisioning Regulations" means the Financial Provisioning Regulations published in terms of section 44(1)(aE), (aF), (aG), (aH) read with sections 24(5)(b)(ix), 24(5)(d), 24N, 24P, 24PA and 24R of the Act;

"fracturing" means an intervention performed on a well to increase production by improving the flow of petroleum from the drainage area into the well bore and includes re-fracturing;

"fracturing fluid" means the mixture of the base fluid and the fracturing additives used to stimulate the free flow of a petroleum reserve;

"government waterwork" means a waterwork owned or controlled by the Minister responsible for water affairs and includes the land on which it is situated and includes any borehole, structure, earthwork or equipment installed or used for or in connection with water use and includes water storage dams, water transfer schemes and flood attenuation works;

"holder" means a person who holds an exploration or production right issued in terms of the Mineral and Petroleum Resources Development Act, 2002 for which the exploration or production operation requires the use of fracturing and a person who holds an environmental authorisation in terms of the Act, for an exploration or production activity which requires or uses fracturing technology;

***"*independent"** means—

(a) that a person has no business, financial, personal or other interest in the activity or application in respect of which that person is appointed in terms of these Regulations excluding normal and fair remuneration for work performed in connection with such tasks; or

(b) that there are no circumstances that may compromise the objectivity of that person in performing such work;

"intermediate casing" means a casing that seals off intermediate rock formations that may have different pressures than deeper or shallower rock formations;

"Karoo Central Astronomy Advantage Area" means the area declared in terms of the Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007) published under Government Notice No. 198 in Government *Gazette* No. 37434 of 12 March 2014;

"liquid waste" means water that has been contaminated with waste products from the hydraulic fracturing operation that can pass through a 0.45-micron filter at a pressure differential of 0,5MPa;

"Mineral and Petroleum Resources Development Act, 2002" means the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);

"Minimum Information Requirements for Baseline Monitoring for Onshore Exploration Operations" means the minimum information requirements for the baseline monitoring that is to be undertaken prior to fracturing operations being undertaken in an onshore exploration operation published in terms of section 24(5)(h) of the Act;

"Minimum Information Requirements for the Exploration and Production of Onshore Petroleum Using Fracturing Technology" means the minimum information requirements for the impact assessment for onshore exploration and production using fracturing technology published in terms of section 24(5)(h) of the Act;

"month" means calendar month;

"municipal wellfield" means a water resource used by water services institutions to provide water supply services as defined in the Water Services Act, 1997 (Act No. 108 of 1997) and includes future potential identified water resources;

"National Water Act, 1998" means the National Water Act, 1998 (Act No. 36 of 1998);

"national web based environmental screening tool" means the online spatial application contemplated in the Environmental Impact Assessment Regulations available at https://screening.environment.gov.za/screeningtool;

"petroleum" has the meaning assigned to it in the Mineral and Petroleum Resources Development Act, 2002;

"process water" means all water related to exploration and production, including flow back, and contaminated storm-water;

"production casing" means a casing installed through the production zone to isolate the formation and to install the production equipment;

"production right" means a right contemplated in section 84 of the Mineral and Petroleum Resources Development Act, 2002 for onshore production which requires fracturing;

"production well" means a well drilled for the purpose of producing petroleum;

"proppant" means sand or a natural or man-made material that is used during well fracturing to prop open the artificially created or enhanced fractures;

"SANAS" means the South African National Accreditation System;

"spring" means a point where subsurface water emerges at surface, usually as a result of topographical, lithological or structural controls;

"temporary suspension" means a well where either drilling, testing or production activities have temporarily ceased and temporary plugs have been inserted into the well;

"the Act" means the National Environmental Management Act, 1998 (Act No. 107 of 1998);

"usable water" means water which is within the SANS 241-1:2015 Drinking Water Specification or within the South African Water Quality Guidelines Volume 4 Agricultural Use: Irrigation;

"waste" has the meaning assigned to it in the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) and includes flow back, fracturing fluids, and process water as well as well drilling waste;

"watercourse" has the meaning assigned to it in the National Water Act, 1998;

"water use license" means a water use licence issued in terms of the National Water Act, 1998 for the exploration or production of onshore naturally occurring hydrocarbons that require fracturing;

"well" means a drilled hole used for the purpose of exploration or production of petroleum resources;

"well engineer" means an engineer in the field of petroleum engineering or a related geological field involved in either the design, construction, maintenance, completion and plugging of exploration or production wells, with a minimum of ten years' experience in the field/discipline in question, who has the appropriate accreditation from the relevant institution; and

"well integrity" means the application of technical, operational and organisational solutions to reduce the risk of uncontrolled release of formation fluids throughout the life of a well.

Purpose of these Regulations

2. The purpose of these Regulations is to—

(a) set general and specific requirements, practices and standards for the identification, assessment, avoidance and management of environmental impacts associated with all phases of exploration and production of onshore petroleum resources requiring the use of fracturing technology;
(b) prohibit certain activities related to the exercising of an exploration or production right for onshore petroleum requiring the use of fracturing technology;
(c) identify geographical areas in which exploration or production operations for onshore petroleum requiring the use of fracturing technology are prohibited or restricted;
(d) provide for the preparation and implementation of a baseline monitoring plan prior to the commencement of exploration operations which will require the use of fracturing technology;
(e) set general and specific requirements for ongoing environmental monitoring of exploration and production operations using fracturing technology;
(f) give effect to the coordination between decision-making authorities on the requirements for baseline monitoring, public participation, impact assessment requirements and integrated operational monitoring; and

(g) facilitate the submission of a consolidated assessment report to support the application for a water use licence and an environmental authorisation, through the implementation of minimum information requirements.

Application of these Regulations

3. These Regulations apply throughout the Republic of South Africa to all exploration and production operations of onshore petroleum resources intending to and using fracturing technology.

CHAPTER 2

PROHIBITIONS AND RESTRICTIONS

Prohibited Activities

4. The following activities are prohibited in the exercising of an exploration or production right for onshore petroleum resources using fracturing technology:

(a) in areas where the rainfall is under 400mm per annum, the abstraction of water except from deep saline aquifers, for any purpose in the exploration or production operation other than for drinking, domestic use or the preparation of slurry for cement mixtures on which tests will be conducted;
(b) the disposal of process water from the exploration or production operation without at least one reuse;
(c) the discharge or disposal of fracturing fluids, process water or any other component of process water–

(i) into a water resource without treatment to limits which comply to the water quality discharge limits contemplated in Appendix 4;
(ii) onto land through irrigation without treatment to limits which comply to the water quality irrigation limits contemplated in Appendix 4;
(iii) to a government waste water treatment works; or
(iv) underground, including through the use of re-injection wells;

(d) the disposal to landfill, of sludge with a moisture content of >40% or that liberates moisture under pressure in landfill conditions and which has not been stabilised by treatment;
(e) the storage of process water for reuse or disposal in pits, retention dams or pollution control dams;
(f) the storage of drill cuttings, sludge and waste other than in above ground tanks or leakproof skips;
(g) the use of groundwater monitoring boreholes for abstraction purposes; and
(h) the use of substances identified in Appendix 2 as additives to fracturing fluids.

Prohibited areas

5. The exploration and production of petroleum resources, including directional drilling are prohibited within–

(a) heritage sites and sites containing heritage resources, objects or structures defined in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) or the Kwa-Zulu Natal Amafa and Research Institute Act, 2018 (Act No. 5 of 2018);
(b) areas identified in terms of section 48(1)(a) and (c) of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003);
(c) the Sutherland Central Astronomy Advantage Area identified in figure 1 of Government Notice No. 199 published in Government *Gazette* No. 37434 on 12 March 2014;
(d) the Karoo Central Astronomy Advantage Area 3 described in paragraph 3(4) of the schedule and identified in figure 1 of Government Notice No. 198 published in Government *Gazette* No. 37434 on 12 March 2014;
(e) ten kilometres of the protection corridors containing the Square Kilometre Array radio astronomy stations identified in Annexure A to Schedule A of Government Notice No. 1411 published in Government *Gazette* No, 41321 on 15 December 2017;
(f) five kilometres of any government waterworks and dams with a safety risk;
(g) within a strategic water source area as identified on the national web based environmental screening tool and within five kilometres of the edge of such strategic water source areas;
(h) five kilometres from the edge of towns and highly populated areas; and
(i) five kilometres from the edge of a thermal or cold spring.

Restricted areas

6. (1) Subject to subregulation (2) the exploration and production of a petroleum resource using fracturing may not take place in the following geographical areas:

(a) within five kilometres from the edge of an existing or proposed municipal wellfield, including its aquifer, water supply boreholes and groundwater supply infrastructure;
(b) in the area located outside of the Karoo Central Astronomy Advantage Area 3, but within the boundaries of the Karoo Central Astronomy Advantage Area 1 described in paragraph 3(2) and 3(4) of the Schedules and identified in figure 1 of Government Notice No. 198 published in Government *Gazette* No. 37434 on 12 March 2014.

(2) The competent authority may authorise the activities contemplated in subregulation (1), based on a motivation and supporting evidence that demonstrate that environmental impacts can be avoided or adequately mitigated in the geographical areas contemplated in subregulation (1), and subject to approval from the relevant authority responsible for the management of the areas contemplated in subregulation(1), which approval must be obtained prior to submitting the applications for environmental authorisation contemplated in subregulation 8(1), 8(7) and 8(13)(a):

CHAPTER 3

REQUIREMENTS FOR THE EXPLORATION OR PRODUCTION OF ONSHORE PETROLEUM REQUIRING THE USE OF FRACTURING

Environmental obligation of an applicant or holder

7. Every applicant and holder has an obligation to—

(a) identify, assess, avoid and if avoidance is not possible, to mitigate, manage and monitor all potential environmental impacts that may arise from exercising an exploration or production right for onshore petroleum requiring the use of fracturing technology;
(b) determine the pre-fracturing baseline conditions through the preparation of a baseline monitoring plan for approval by the competent authority;
(c) through assessment, determine the possible changes to the pre-fracturing conditions and the severity of the changes, identify avoidance and mitigation measures and report on the acceptability of the changes in the documentation submitted as part of the application process for environmental authorisation;
(d) through all phases of the operations, monitor and assess any changes to the baseline environmental attributes and determine and report on the associated risk through ongoing monitoring and reporting;
(e) ensure that all materials used and procedures adhere to international best practises and standards;
(f) decommission all exploration and production wells, remove any structures and rehabilitate the area used for exploration and production operations, as well as any area affected by the operations, monitor the continued integrity of the decommissioning and rehabilitation and report on the findings;
(g) provide funding for the decommissioning, rehabilitation and closure of the exploration and production operations as prescribed in the Financial Provisioning Regulations;
(h) be in possession of all relevant rights, permits, authorisations, approvals, consents and licences prior to the exercising of an exploration or production right; and
(i) meet the design, construction and testing standards identified in regulations 10, 11, 12, 13 and Appendix 1.

Submission of applications and implementation of monitoring plans

8. (1) On acceptance of an application for an exploration right in terms of section 79 of the Mineral and Petroleum Resources Development Act, 2002, an applicant must submit to the competent authority an application for an environmental authorisation, for an onshore seismic survey which requires an exploration right, contemplated in activity 21C of the Environmental Impact Assessment Regulations Listing Notice 1 of 2014.

(2) At the intervals contemplated in the Environmental Impact Assessment Regulations an applicant must submit to the competent authority for approval –

(a) a consolidated assessment report and environmental management programme which comply with the Minimum Information Requirements for Baseline Monitoring for Onshore Exploration Operations;
(b) a baseline monitoring plan which complies with the Minimum Information Requirements for Baseline Monitoring for Onshore Exploration;
(c) the relevant plans, reports, templates or spreadsheets contemplated in the Financial Provisioning Regulations; and
(d) proof of the arrangements made to secure the financial provision.

(3) The competent authority must obtain the concurrence of the Minister responsible for water affairs prior to approving any baseline monitoring plan contemplated in subregulation (2)(b).

(4) The holder must submit to the competent authority, prior to commencement of exploration operations contemplated in subregualtion (8)(1), proof of the availability of the financial provision;

(5) On commencement of the exploration operation contemplated in subregulation (8)(1), the holder must–

(a) commence with the implementation of the baseline monitoring plan; and
(b) continue the required monitoring for a period of no less than twenty four months.

(6) On completion of the implementation of the baseline monitoring plan, the holder must prepare a baseline monitoring report which details the outcome of the monitoring programme.

(7) Prior to the commencement of exploration operations which require the use of fracturing technology, an applicant must submit to the competent authority an application for environmental authorisation for activity 20A of the Environmental Impact Assessment Regulations Listing Notice 2 of 2014.

(8) After the submission of the application contemplated in subregulation (7), at the intervals contemplated in the Environmental Impact Assessment Regulations, an applicant must submit to the competent authority for approval a scoping report which complies with Part 1 of the requirements of the Minimum Information Requirements for the Exploration and Production of Onshore Petroleum Using Fracturing Technology.

(9) After the acceptance of the scoping report, the applicant must, at intervals contemplated in the Environmental Impact Assessment Regulations, submit to the competent authority for approval, a consolidated assessment report which–

(a) has considered the results of the baseline monitoring report contemplated in subregulation (6);
(b) complies with the Minimum Information Requirements for the Exploration and Production of Onshore Petroleum Using Fracturing Technology; and
(c) includes the following appendices:
    i. the environmental management programme which must include a “chance find protocol”;
    ii. an integrated operational monitoring plan for all identified environmental themes;
    iii. an integrated water and wastewater management plan;
    iv. an emergency and spill contingency plan;
    v. a solid waste management plan;
    vi. a preliminary well layout including a buffer to allow for movement of the well pad without the need for an amendment to the environmental authorisation;
    vii. a well design based on the geological information obtained through the drilling of the stratigraphic wells;
    viii. the drillilng fluid to be used;
    ix. a list of fracturing fluids to be used;
    x. the relevant plans and reports contemplated in the Financial Provisioning Regulations; and
    xi. proof of the arrangements made to secure the financial provision.

(10) The holder must, prior to commencement, submit proof of the availability of the financial provision.

(11) Prior to the commencement of the exploration and fracturing operation contemplated in subregulation (7), the holder must commence with the implementation of the approved programmes and plans, contemplated in subregulation (9)(c)(i) to (v).

(12) Throughout the exploration operation contemplated in subregulation (7), the holder must provide the monitoring results in the form of integrated operational monitoring reports, which comply with the approved integrated operational monitoring plan contemplated in subregulation 9(c)(ii), to the competent authority, designated agency and the Minister responsible for water affairs at intervals which comply with the approved integrated operational monitoring plan.

(13) On acceptance of the application for a production right in terms of section 83 of the Mineral and Petroleum Resources Development Act, 2002, the applicant must submit to the competent authority—

(a) an application for an environmental authorisation for the onshore production of petroleum contemplated in activity 20 of the Environmental Impact Assessment Regulations Listing Notice 2 of 2014; and
(b) at the intervals indicated in the Environmental Impact Assessment Regulations, a scoping report which complies with the Minimum Information Requirements for the Exploration and Production of Onshore Petroleum Using Fracturing Technology.

(14) On acceptance of the scoping report contemplated in subregulation (13)(b), the applicant must submit to the competent authority, at the intervals contemplated in the Environmental Impact Assessment Regulations, a consolidated assessment report which–

(a) includes and has considered the results of the baseline monitoring report as contemplated in subregulation (6) and the integrated operational monitoring plan as contemplated in subregulation 9(c)(ii);
(b) complies with the Minimum Information Requirements for the Exploration and Production of Onshore Petroleum Using Fracturing Technology; and
(c) includes the following appendices;
    i. the environmental management programme which must include a “chance find protocol”;
    ii. an integrated operational monitoring plan for all identified environmental themes;
    iii. an integrated water and wastewater management plan;
    iv. an emergency and spill contingency plan;
    v. a solid waste management plan;
    vi. a well layout including a buffer to allow for movement of the well pad without the need for an amendment to the environmental authorisation;
    vii. a well design based on the geological information obtained through the drilling of the exploration wells;
    viii. the drilling fluid to be used;
    ix. a list of fracturing fluids to be used;
    x. the relevant plans and reports contemplated in the Financial Provisioning Regulations; and
    xi. proof of the arrangements made to secure the financial provision.

(15) On commencement of the production operation the holder must commence with the implementation of the approved programmes and plans contemplated in subregulation (14)(c)(i) to (v).

(16) Prior to commencement of the production operations the holder must submit proof of the availability of the financial provision.

(17) Throughout the production operation, the holder must provide the monitoring results in the form of integrated operational monitoring reports, which comply with the approved integrated operational monitoring plan contemplated in subregulation (14)(c)(ii), to the competent authority, designated agency and the Minister responsible for water affairs at intervals which comply with the approved integrated operational monitoring plan.

CHAPTER 4

STANDARDS FOR THE EXPLORATION AND PRODUCTION OF ONSHORE PETROLEUM REQUIRING THE USE OF FRACTURING TECHNOLOGY

Responsibility of the applicant or holder to meet standards

9. (1) An applicant or holder of an exploration or production right for onshore petroleum resources using fracturing technology must meet the design, construction and testing standards identified in regulations 10, 11, 12, 13 and Appendix 1.

(2) Should the applicant or holder wish to deviate from a standard requirement identified in Appendix 1 the applicant or holder must submit for approval of the designated agency—

(a) an explanation and detailed design of the proposed alternative;
(b) a comparative technical assessment of the proposed alternative to that contemplated in Appendix 1; and
(c) an indication of how the proposed alternative will provide a comparative or higher level of safety or environmental protection compared with those contemplated Appendix 1.

(3) Any deviation, motivation, design or comparative assessment contemplated in subregulation (2) must be prepared by a well engineer.

Well design and construction

10. (1) All wells must be—

(a) designed by a well engineer and the accreditation of the well engineer must be displayed in the site office of the exploration or production operation; and
(b) designed, constructed and tested as contemplated in the Well Construction Standard contained in Appendix 1.

Cement requirements and compression tests

11. (1) Standards contemplated in Appendix 1 apply to-

(a) all cement used in the operation; and
(b) compression tests.

Casing string tests

12. The holder must undertake casing string tests according to the standard as contemplated in Appendix 1.

Blowout prevention

13. (1) The holder must install blowout prevention equipment, which meet the standard as contemplated in Appendix 1 to all wells operating under pressure.

(2) A well engineer must be present at the well site when blowout prevention equipment is installed and when it is tested.

(3) The holder must ensure that testing of blowout prevention equipment for a drilling or completion operation takes place prior to drilling below the last cemented casing seat.

(4) The holder must maintain a record of the pressure tests which contains the number and location of the well tested, the date of testing and the results signed off by the well engineer.

Well examination

14. (1) The holder must subject the design, construction, operation, and decommissioning of exploration and production wells to an independent well examination undertaken by an independent well engineer and send the endorsement from the well examination to the designed agency.

(2) The results of the well examination tests must at all times demonstrate that the pressure boundary of the well is controlled throughout the life of the well.

(3) The holder must keep a well file, which can be an electronic filing system, which identifies the—

(a) coordinates of the well;
(b) number of the well;
(c) design of the well;
(d) pressure test results; and
(e) the trade name of the fracturing additives used including the monthly amount of additives used per well.

A holder's responsibility to obtain the approval of the designated agency

15. (1) The holder must—

(a) submit test data showing the competency of a proposed cement mixture that meets the requirements of the current AI "API RP 10 B-2 Recommended Practises for Testing Well cements", to the designated agency for approval not less than 5 days prior to the commencement of the cementing operation;
(b) in collaboration with specialist contractors, prior to casting any well casing, submit to the designated agency for approval a programme for cement placement operations;
(c) prior to commencing with fracturing operations, submit for approval by the designated agency-

i. the final well layout;
ii. the final well design;
iii. the results of casing string tests and the formation pressure integrity testing; and

iv. a well examination plan which includes-

(aa) confirmation of groundwater and aquifer isolation;
(bb) measures to address fracture containment;
(cc) measures to manage seismicity risks;
(dd) details of the process water management programme;
(ee) fracturing programme;
(ff) programme for well pressure testing;
(gg) a programme for independent well examination; and
(hh) a programme for final decommissioning and post-decommissioning monitoring.

(2) The designated agency must obtain the concurrence of the Minister responsible for water affairs prior to the approving the commencement of fracturing operations contemplated in subregulation (1)(c).

A holder's responsibility to notify and provide information to the designated agency and the Minister responsible for water affairs

16. (1) The holder must—

(a) ensure that verification inspections, by the designated agency, are undertaken for the following actions before commencement:
i. setting of a casing;
ii. commencing with cementing of casings;
iii. formation pressure integrity testing;
iv. conducting a blowout prevention test; and
v. mechanical integrity testing.

(b) notify the designated agency at least 5 days prior to undertaking any activity contemplated in subregulation (1)(a) to facilitate the verification inspection;
(c) submit to the designated agency, a copy of the well file which meets the requirements contemplated in regulation 14(3) monthly for information purposes;
(d) submit to the designated agency within 5 days after the testing was undertaken, the records and overall summary of the blowout prevention testing for information;
(e) submit to the designated agency within 5 days after the testing was undertaken for information, the records and overall summary of the mechanical integrity tests which information must include:
i. type and volumes of water sources for fracturing operations;
ii. volumes and rates of fracturing fluid pumped into the target zone; and
iii. volumes and release of flowback received during and after each fracturing event.

(f) notify the competent authority, the designated agency the Minister responsible for water affairs and the heritage authority, in writing, at least fourteen days before commencing with the exercising of the exploration or production right, which notification must indicate the proposed date of commencement.

Post-fracturing well report

17. (1) The holder must, within 90 days after fracturing has been completed, compile a detailed post-fracturing well report for each well fractured and submit the report for review and archiving to the designated agency and the Minister responsible for water affairs.

(2) A post-fracturing well report must include as a minimum-

(a) the location of the well, position in co-ordinates and well number;
(b) the actual fracturing fluid compositions, concentrations and total volumes used;
(c) the actual surface and downhole treating pressure range;
(d) the maximum injection treating pressure;
(e) the actual or calculated fracture geometry;
(f) annuli and offset well pressure monitoring records;
(g) confirmation that wellbore integrity was maintained throughout the operation;
(h) the results of chemical testing of flow-back and process water;
(i) the chemical composition of gases released from wells;
(j) an explanation of operational or design variations to the pre-fracturing design;
(k) data and information concerning any related induced seismic events, in a format as provided by the designated agency;
(l) steps taken as a result of any identified induced seismic events or activity; and
(m) plans to continue micro-seismic monitoring.

CHAPTER 5

OPERATIONS AND MANAGEMENT

Management of operations

18. (1) A holder must—

(a) appoint a well engineer to be responsible for the day-to-day management of the operations; and
(b) ensure that the equipment used in fracturing operations is fit for purpose and must meet relevant standards as contemplated in Appendix 1.

(2) A holder may only commence with fracturing operations after the designated agency has approved the requirements contemplated in regulation 15 and all the relevant rights, permits, authorisations, approvals, consents and licences have been obtained.

(3) A holder must immediately suspend fracturing operations if-

(a) directed by the designated agency or competent authority, in writing to do so; or
(b) an anomalous pressure or flow condition is occurring in a way that indicates that the mechanical integrity of the well has been compromised and that continued operations pose a risk to the environment.

(4) A holder must notify the designated agency and the Minister responsible for water affairs, telephonically and then electronically, within 24 hours of suspending fracturing as a result of circumstances contemplated in subregulation (3) to allow for inspection.

(5) Remedial action must be undertaken immediately and the designated agency must be satisfied with the remedial actions prior to issuing a written consent for the recommencement of operations.

(6) The designated agency may only issue a written consent for recommencement of operations as contemplated in subregulation (5) in concurrence with the Minister responsible for water affairs.

Powers and duties of the designated agency

19. (1) The designated agency must provide approvals or request additional information within 5 days of receiving information for approval, unless there is a requirement for concurrence with the Minister responsible for water affairs, in which case the approval or request for additional information is required within 10 days after the concurrence request is made.

(2) Where the concurrence of the Minister responsible for water affairs is required and not provided within the timeframe contemplated in subregulation (1), it will be deemed that approval is given;

(3) The designated agency may, where necessary, require—

(a) a specific cement mixture to be used in a well or an area if evidence of local conditions indicates that specific cement is necessary; or
(b) the installation of an additional cemented casing string or strings in the well.

(4) The designated agency may at the cost of the holder, appoint an independent and competent person to undertake well examination.

Disclosure of information

20. (1) The holder must upload on its website, which must be publicly accessible—

(a) all monitoring and reporting information including the audit reports;
(b) all well information contained in the well file contemplated in regulation 14(3);
(c) the following documentation regarding fracturing fluids as considered through the consolidated assessment report as well as any additions as authorised by the designated agency during fracturing operations:
    i. the hazard status of the substance;
    ii. material safety data sheet information for substances;
    iii. anticipated volumes of fracturing fluid, including proppant, base carrier fluid and each chemical additive to be used within the operation per year for the duration of the fracturing operations;
    iv. the trade name of each additive and its general purpose in the fracturing process;
    v. each chemical intentionally added to the base fluid, including the chemical make up, and if applicable the actual concentration to be used in percentage or by mass; and
    vi. the possible risk of the chemicals and additives to the environment and water resources.

Temporary well suspension, well decommissioning and monitoring

21. (1) The holder must—

(a) decommission an exploration or production well within 180 days after the final use thereof;

(b) where temporary suspension of an exploration well is required, suspend such well for a period not exceeding 180 days from the day on which the exploration well was suspended;
(c) where temporary suspension of a production well is required, suspend such well for a period not exceeding 360 days from the day on which the production well was suspended;
(d) ensure that wells are temporarily suspended or decommissioned as contemplated in the "Onshore Well Decommissioning Guidelines" issued by the Petroleum Agency South Africa, document number: Agency - TC – 001;
(e) prepare a final rehabilitation, decommissioning and closure plan for incorporation into the initial and ongoing reviews of the final rehabilitation, decommissioning and closure plan contemplated in the Financial Provisioning Regulations;
(f) monitor decommissioned wells in compliance with the final rehabilitation, decommissioning and closure plan contemplated in subregulation (1)(e); and
(g) submit the results of the monitoring to the designated agency and the Minister responsible for water affairs on the first working day of each quarter, unless there are identified anomalies, spikes or exceedances of requirements, in which case such anomalies, spikes, or exceedances must be reported within 12 hours of identification.

(2) A holder may only suspend a well—

(a) after obtaining the approval of the designated agency; and
(b) for a period determined by the designated agency, which period may not exceed the timeframes as contemplated in subregulation 21(1)(b) and (c).

CHAPTER 6

GENERAL

General

22. (1) Any water or air quality analysis must be undertaken by a third party using international or SANAS accredited facilities and according to national and international analytical methods.

(2) The results of the analysis must include as a minimum a detailed description of the sampling and testing conducted, including duplicate samples, the chain of custody of the sample and quality control of the testing.

(3) The holder must—

(a) at any time allow the competent authority, designated agency, the Department responsible for water affairs or any other government department or agency which administers any law relating to matters affecting the environment, access to the operation and any relevant documentation to conduct any activities associated with compliance monitoring and enforcement and independent verification;
(b) ensure that the raw data used for any analysis is tabulated, retained, and made available to any relevant authority or stakeholder on request; and
(c) submit the results of any pressure test or strength tests to the designated agency within 7 days of the results being obtained.

(4) Waste containing radioactive materials must be managed in accordance with the National Radioactive Waste Disposal Institute Act, 2008 (Act No. 53 of 2008).

Offences

23. A holder commits an offence if that person contravenes or fails to comply with regulation 4, 5, 6, 8(5)(a), 8(5)(b), 8(11), 8(12), 8(15), 8(17), 9, 10, 12, 13, 14(1), 14(3), 15(1), 16(1)(a), 16(1)(f), 17(1), 18(1), 18(2), 18(3), 18(4),18(5), 20 or 21 of these Regulations.

Penalties

24. Penalties contemplated in section 49B(1) of the Act apply to offences contemplated in these Regulations.

Transitional arrangements

25. (1) Once the Upstream Petroleum Resources Development Bill is passed and brought into operation, any reference to the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) must be construed as a reference to the Upstream Petroleum Resources Development Bill.

(2) Once the Upstream Petroleum Resources Development Bill is passed and brought into operation, and until such time that amendments are made to the Act, the Environmental Impact Assessment Regulations, 2014 and associated Listing Notices, and these Regulations, a reference in these Regulations to−

(a) an exploration right must be construed as a reference to the exploration phase of the petroleum right contemplated in the Upstream Petroleum Resources Development Bill, including all terms and renewals of the exploration phase, of the petroleum right;
(b) a production right must be construed as a reference to the production phase of the petroleum right contemplated in the Upstream Petroleum Resources Development Bill, including all terms and renewals of the production phase, of the petroleum right.

Short title

26. These Regulations are called the Regulations for the Exploration and Production of Onshore Petroleum Resources Requiring Fracturing Technology, 2025.

APPENDIX 1

WELL CONSTRUCTION STANDARDS

1. General

(1) A holder must ensure that a well design is informed by a risk assessment, and is constructed, equipped, commissioned, operated, modified, maintained, suspended and decommissioned in a manner that provides for the control of the well at all times.

(2) The holder must plan for multi-well pads and horizontal drilling technologies in order to optimise the spacing between neighbouring wells and minimize cumulative surface impacts of the operation.

(3) Where an API standard is prescribed, the most current standard is to be used.

2. Objective of well design

The overall objective of a well design is to–

(a) isolate aquifer and permeable zones by employing environmentally protective well casings;
(b) protect groundwater and prevent the migration of polluted water into groundwater, the exploration or production well and the disturbing of deep saline aquifers; and
(c) protect against casing deformation and cement degradation.

3. Well construction

(1) A well must be cased according to current industry standards published by the API "5CT Specification for Casing and Tubing" and the casing thread compound and the use must conform to the API RP 5A3.

(2) A casing installed must have a minimum yield pressure designed to withstand at least 1.2 times the maximum pressure to which the casing may be subjected during drilling, production and fracturing operations.

(3) Casings may not be–

(a) pitted, patched, bent, corroded, crimped;
(b) the threads may not be worn or damaged; and
(c) reconditioned.

(4) Casings must pass the approved hydrostatic pressure and drift test pursuant to API "5CT Specification for Testing and Tubing".

(5) Conductor casing must be set and cemented to a surface to-

(a) isolate shallow aquifers;
(b) stabilize unconsolidated sediments; and
(c) provide a base for equipment to divert shallow natural gas.

(6) Surface casings for exploration or production wells must be-

(a) set to a depth of at least 60m below the base of the deepest water which is usable or at least 100m above the top of the expected petroleum bearing zone, whichever comes first;

(b) installed and be fully cemented to the surface where intermediate casings are not installed;
(c) centralised at the shoe, above and below a stage collar or diverting tool, and through water zones;
(d) centralised in each segment of the wellbore to provide sufficient casing standoff and to foster effective circulation of cement to isolate aquifers, flow-zones, voids, lost circulation zones and hydrocarbon production zones; and
(e) cemented to a surface.

(7) Intermediate casings for exploration and production wells used to isolate usable water -

(a) must be set at least 30 meters below the base of the deepest water found which is usable and must be cemented to the surface to protect unexpected usable water found below the surface casing shoe;
(b) where intermediate casing is set solely to protect usable water encountered below the surface casing shoe and where cementing to the surface is technically infeasible and may result in lost circulation, cement must be brought to a minimum of 180 meters above the shallowest zone of usable water use encountered below the surface casing shoe; and
(c) may not be used as a production string in the well in which it is installed and must not be perforated for purposes of conducting fracturing treatment through it.

(8) A production casing must be set and be fully cemented to 150 meters above the top of the perforated zone.

(9) The location and depths of petroleum bearing zones or usable water zones that are open to the wellbore above the casing shoe, must be confirmed by coring, electric logs, testing or such data from an offset well on the same well pad.

(10) Casings must be centralised in each segment of the wellbore to provide sufficient casing standoff and foster effective circulation of cement to isolate critical zones including aquifers, flow-zones, voids, lost circulation zones and hydrocarbon production zones.

(11) In non-deviated holes, a pipe centraliser must be placed every fourth joint from the collar cement shoe to the ground surface or to the bottom of the collar.

(12) The designated agency may require additional centralisation where necessary in order to ensure the adequacy of the integrity of the well design.

4. Cement requirements and compression testing

(1) Fracturing operations must be isolated from usable water and other permeable zones by ensuring complete cement isolation in each casing annulus.

(2) Cementation of casings must be done by the pump and plug method with a minimum of 25% excess cement and the using of appropriate loss circulation material.

(3) Cement placed in the well bore must meet the standards of API “10 A Specification for cements and materials for well cementing” or ASTM “C150/C150M Standard Specification for Portland Cement”.

(4) Foamed cement slurry must be prepared to minimise its free water content in accordance with API "RP 10B-4 Recommended Practice on Preparation and Testing of Foamed Cement Slurries at Atmospheric Pressure".

(5) Water used for preparing the slurry for the cement mixtures on which tests will be conducted as contemplated in subparagraph (4) must be distilled water or usable water.

(6) Tests contemplated in subparagraph (5) must be conducted using the equipment and procedures established in the current API "RP 10 B-2 Recommended Practise for Testing Well Cements".

(7) The cement used for well construction must have a compressive strength of at least 8273.71kPa (1.200 psi) and the free water separation must be no more than 6 millilitres per 250 millilitres of cement, tested in accordance with the API TR 10TR3.

(8) Cement compressive strength tests must be performed on all cement that will be used in casing strings before its use to ensure that it meets the required strength as contemplated in paragraph (10) and where it does not comply with the standards, the tests must be redone.

(9) After the cement is placed behind the casing, time must be allowed for the cement to set until the cement achieves a calculated compressive strength of at least 3447.38 kPa (500psi) before the casing is disturbed in any way, including installation of a blow-out preventer.

(10) A holder must run a radial cement bond evaluation log and monitor the annular pressure to verify that there is adequate cement bond quality on all casing strings and must carry out remedial cementing if the cement bond is not adequate for drilling ahead.

(11) A copy of the cement job log for a cemented casing string in the well must be maintained in the well file as submitted as required in regulation 14(3).

5. Casing string tests

(1) After the setting and cementing of a casing string, except the conductor casing, and prior to further drilling, the casing string must be tested with water, mud, brine or drilling mud to at least the maximum anticipated treatment pressure but no less than 1.512 kPa per 0.3048 meter (0.22 psi per foot) of casing string length or 10342.12 kPa (1,500 psi), whichever is greater, for a minimum of 30 minutes with less than a 10% pressure loss.

(2) The pressure test must not exceed 70% of the minimum internal yield and if the pressure declines more than 10%, or if there are other indications of a leak, corrective action must be taken before conducting further drilling and fracturing operations.

(3) The pressure under which the well is subjected during the fracturing operations must not exceed the test pressure.

(4) A fracturing string used in the operations must be either strung into a production liner or run with a packer set at least 30 meters below the deepest cement top and must be tested to not less than the maximum anticipated treating pressure minus the annulus pressure applied between the fracturing string and the production or immediate casing.

(5) The pressure test must be considered successful if the pressure applied has been held for a minimum of 30 minutes with no more than 5% pressure loss.

6. Formation pressure integrity test

(1) A holder must, after a successful casing string test, conduct a formation pressure integrity test below the surface casing and below the intermediate casing.

(2) The actual fracturing treatment pressure must not exceed the casing test pressure at any time during fracturing operations.

7. Blowout prevention and pressure testing

(1) A holder must install blowout prevention equipment that meets the current API standard 53 for blowout equipment after setting the casing to shut-off a wellhead which must be supported and secured to prevent stresses on all connections.

(2) Blowout prevention equipment installed at a well that may be subject to fracturing must include a remote blowout prevention actuator that-

(e) is powered by a source other than rig hydraulics;
(f) is located as a minimum 20 meters from the well head; and
(g) has an appropriate related pressure equal to or greater than the induced fracture pressure.

(3) Lines, valves and fittings between the blowout preventer and the remote actuator must be flame resistant and must have a working pressure rating higher than the maximum anticipated well heads surface pressure.

(4) Blowout prevention equipment must have 100% availability at all times.

(5) The blowout prevention equipment must be tested to 100% of related working pressure and the annular-type blowout preventer must be tested to 6894.76 kPa (1,000 psi) at the time of installation in accordance with current API standard 53 for blowout equipment.

(6) Blowout prevention equipment that has failed any pressure test must not be used until it is repaired and has passed the pressure test.

8. Mechanical integrity testing and monitoring

(1) The injection lines and manifold, associated valves, fracturing head or tree and any other well head component or connection not previously tested must be tested with water, mud or brine to at least the maximum anticipated treatment pressure for a minimum of 30 minutes with less than a 5% initial pressure loss.

(2) A record of the pressure test must be maintained and included in the well file.

(3) The pressure exerted on treating equipment including valves, lines, manifolds, fracturing head or tree, casing and fracturing string, if used, must not exceed 95% of the working pressure rating of the weakest component.

(4) A function-tested relief valve and diversion line must be installed and used to divert flow from the fracturing string-casing annulus to an overhead tank in case of fracturing string failure.

(5) The relief valve must be set to limit the annular pressure to no more than 95% of the working pressure rating of the casings forming the annulus.

(6) The fracturing treatment pressure must not exceed the test pressure of any given component at any time during the fracturing operations.

(7) During fracturing, annulus pressure, injection pressure and the rate of injection must be continuously monitored and recorded.

(8) Micro-seismicity (in real time<5 minute delay) must be monitored by a long array of accelerometers located in an offset monitoring well, situated 100m or more away from the well at a comparable depth.

(9) Micro seismic sensors must be designed for temperatures between 175-200^{o}C.

(10) Tiltmeter measurements must be taken with an array of tiltmeters either located in shallow offset wells (10m) at the site surface or in a more sensitive deep offset well of comparable depth to fracturing depth and in the fracturing well which provides information on fracture orientation and direction.

(11) Downhole pressure sensors must be used to provide indirect measurements of fracture height, which are to be connected to the production casing as well as outer casings to monitor well integrity.

(12) Performing temperatures and flow logging along the length of the well must correlate with information on fracture growth.

(13) Proppants must be tagged with radioactive isotopes so that proppant can be analysed to locate where different stages of the proppant went and to locate fracture at depth.

(14) Chemical tracers must be added to fracturing fluid to improve the understanding of fracture fluid loss and flowback.

(15) Temperatures in the well must be measured to trace fluids from shale formations that are at a higher temperature than shallow fluids using fibre-optic sensors to measure temperature, pressure and sound that provides real-time information on fracture locations in the well (fibre-optic sensors are especially valuable for use in downhole high pressure high T situations where electronic gauges fail).

9. Suspended well integrity management

(1) A holder must ensure that management standards and procedures are in place for monitoring wells that are in suspension phase following drilling and fracturing operations, prior to development phase including the status of the equipment and any annulus pressure.

(2) Procedures must take account of the specific circumstances of the well and must include the reporting criteria for any anomaly and a risk assessment of the anomaly.

(3) The suspension of a well-

(a) must be effected in such a way that the well can be re-entered safely and secured using pressure control equipment, without compromising the barrier in place; and
(b) may not jeopardise the future final decommissioning of the well.

10. Well decommissioning or closure

(1) A well that is no longer active, or producing, or for which the approved suspension period determined in terms of regulation 21(1)(b) and (c) has passed, must be plugged and decommissioned in line with the guidance contemplated in regulation 21(1)(d) and reported on in accordance with a final rehabilitation, decommissioning and closure plan reviewed and considered for approval by the competent authority, in compliance with the requirements of the Financial Provisioning Regulations.
(2) The holder must undertake seismic monitoring at the site for a period of 3 years after fracking activities have ceased and include the results of the seismic monitoring in the quarterly audit report.

APPENDIX 2

Prohibited substances

The following substances will not be allowed as additives to fracturing fluids

Chemical Components	Classification	CAS Registry
Methanol (Methyl)	HAP[1]	67-56-1
Ethylene glycol (1,2 – Ethanediol)	HAP	107-21-1
Diesel	Carcinogen, SDWA[2], HAP	68476-34-6
Naphthalene	Carcinogen, HAP	91-20-3
Xylene	SDWA, HAP	1330-20-7
Hydrogen chloride	HAP	7647-01-0
Toluene	SDWA, HAP	108-88-3
Ethylbenzene	SDWA, HAP	100-41-4
Diethanolamine (2,2 iminodiethanol)	HAP	111-42-2
Formaldehyde	Carcinogen, HAP	50-00-0
Sulphuric acid	Carcinogen	7664-93-9
Thiourea	Carcinogen	62-56-6
Benzyl chloride	Carcinogen, HAP	100-44-7
Cumene	HAP	98-82-8
Nitrilotriacetric acid	Carcinogen	139-13-9
Dimethyl formamide	HAP	68-12-2
Phenol	HAP	108-95-2
Benzene	Carcinogen, SDWA & HAP	71-43-2
Di (2-Ethylhexyl) Phthalate	Carcinogen, SDWA & HAP	117-81-7
Acrylamide	Carcinogen, SDWA & HAP	79-06-1
Hydrogen fluoride (Hydrofluoric Acid)	HAP	7664-39-3
Phthalic anhydride	HAP	85-44-9
Acetaldehyde	Carcinogen, HAP	75-07-0
Acetophenone	HAP	98-86-2
Copper	SDWA	7440-50-8
Ethylene oxide	Carcinogen, HAP	75-21-8
Lead	Carcinogen, SDWA & HAP	7439-92-1
Propylene oxide	Carcinogen, HAP	75-56-9
p-Xylene	HAP	106-42-3
1-Methylnaphthalene		90-12-0
2-Butanone (MEK)		78-93-3
Aniline	Carcinogen* ^HAP	62-53-3
2-Methylphenol	^HAP	95-48-7
3- Methylphenol	^HAP	108-39-4
Acetonitrile	^HAP	75-05-8
Phenol	$Mutagenic Cat 2, ^HAP	108-95-2
Thiophene		110-02-1

[1] Hazardous Air Pollutant
[2] Safe Drinking Water Act – is the principle federal law in the United States intended to ensure safe drinking water for the public

Pyrrole		109-97-7
2-Methylnaphthalene		91-57-6
Benzidine	Carcinogen*, ^HAP	92-85-5
Isophorone	Carcinogen (Category 2), ^HAP	78-59-1
Chloroethane	Carcinogen, ^HAP	75-00-3
2-pyrrolidone		616-45-5
Vinyl chloride	Carcinogen*,SDWA,^HAP	75-01-4
Bromomethane	$Mutagenic Cat 2,^HAP	74-83-9
4-methylphenol	^HAP	106-44-5
Acetone		67-64-1
2-Hexanone	Reproductive Toxicity Cat 2,	591-78-6

*As per the International Agency for Research on Cancer (IARC)

$GHS only on germ cell mutagenicity (somatics are not) is classified.

^Initial List of Hazardous Air Pollutants with Modifications | US EPA

APPENDIX 3

STANDARD CONDITIONS APPLICABLE TO AN ENVIRONMENTAL AUTHORISATION FOR AN EXPLORATION AND PRODUCTION ACTIVITY

(1) The following conditions are applicable to an environmental authorisation granted for applications contemplated in subregulation 8(1):

(a) The holder must notify the compliance unit of the competent authority, the designated agency, the relevant heritage resource authority and the Minister responsible for water affairs fourteen days before the commencement of the exploration operations to facilitate compliance inspections.

(b) Prior to the commencement of the exploration operations, the holder of the exploration right must appoint:
  (i) an independent environmental control officer who is required to be on site throughout the operational phase of the exploration operations; and
  (ii) a heritage specialist who is required to fulfil certain tasks and be available on site at specific times to assess any excavations or archaeological or palaeontological finds that could be unearthed through the exploration operations in line with the environmental management programme "chance find protocol".

(c) Once appointed, the holder of the exploration right is required to provide in writing, the names, contact details, expertise and experience of the persons identified in paragraph (1)(b) and in the case of the heritage specialist, the intervals and instances when the specialist is required on site, to the competent authority and designated agency.

(d) The independent environmental control officer will have, amongst others and as a minimum, the duty to:
  (i) prepare and maintain a project file which contains the following information as a minimum;
    (aa) copies of all rights, permits, authorisations, licenses, programmes, plans consents and financial guarantees associated with the exploration operation;
    (bb) the approved environmental management programme;
    (cc) a copy of the approved baseline monitoring plan;
    (dd) details including the certification of the accredited laboratories to which samples are to be sent;
    (ee) emergency response plan for health, environment and safety; and
    (ff) any correspondence including reports and audits sent to or received from any decision making authority or the designated agency where relevant;

  (ii) maintain a site diary documenting the activities being undertaken on site daily;
  (iii) maintain an incident register which includes the remedial measures implemented to deal with an incident as well as the preventative measures implemented to avoid the re-occurrence of such an incident;
  (iv) maintain a complaints register which includes the measures implemented to address the complaint;
  (v) ensure, on a daily basis, that the monitoring is being undertaken in relation to the approved baseline monitoring plan as required;
  (vi) inspect the operations, on a daily basis, to ensure compliance with the environmental management programme;
  (vii) maintain a daily photographic record of the activities being undertaken;
  (viii) prepare and submit to the designated agency and the Minister responsible for water affairs a close out report on finalisation of exploration activities;

(ix) prepare a quarterly audit report which must, as a minimum, include the following:
(aa) the period of the audit;
(bb) compliance with the environmental management programme impact management outcomes and actions;
(cc) compliance with undertaking the monitoring requirements of the baseline monitoring plan as relevant;
(dd) document any audit findings issued; and
(ee) corrective measures for audit findings;
(x) submit the audit report to the compliance unit of the competent authority, the designated agency and the Minister responsible for water affairs and upload the report to the website of the holder.

(e) The audit cycle begins on commencement of operations and is required to be undertaken quarterly, with effect from the commencement date. The audit report must be submitted to the compliance unit of the competent authority, the designated agency and the Minister responsible for water affairs within three days of the end date of the audit.
(f) The heritage specialist will have as a minimum, the duty to–
(i) prepare and maintain a project file which contains copies of the baseline monitoring plan as contemplated in regulation 8(2)(b) and the environmental management programme including the "chance finds protocol" contemplated in regulation 8(2)(a);
(ii) confirm that the site map of all identified heritage or cultural resources required to be monitored including the agreed buffers in which no activities should be undertaken, is correct and complete, and update the site map should any deficiencies be identified;
(iii) ensure, on a monthly basis, that the baseline monitoring is being undertaken in compliance with the approved plan;
(iv) inspect, on a monthly basis, the operations to ensure compliance with the environmental management programme and buffers with respect to the protection of archaeological, palaeontological, cultural or heritage resources; and
(v) inspect, when contacted by the holder, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, aged ostrich eggshell fragments, charcoal and ash concentrations which could be associated with historic dwellings etc. and ensure that the procedures of the "chance find protocol" are adhered to in such instances.

(g) On commencement of the exploration operations, the requirements of the following programme and plans must be initiated and implemented by the holder:
(i) the approved environmental management programme which must include a chance find protocol for cultural heritage and palaeontological resources;
(ii) the baseline monitoring plan; and
(iii) the plans, reports and calculations required in terms of the Financial Provisioning Regulations.

(2) The following conditions are applicable to the issuing of an environmental authorisation contemplated in regulation 8(7) and 8(13)(a):
(a) The holder must notify the compliance unit of the competent authority, the designated agency, the relevant heritage resource authority and the Minister responsible for water affairs fourteen days before the commencement of the exploration operations or the continuation of exploration activities into production operations, to facilitate compliance inspections.
(b) Prior to the commencement of the exploration or production operations the holder is required to make the following appointments:

(i) the experts identified in paragraph (1)(b); and
(ii) a well engineer who is required to be on site throughout the operational phase of the exploration or production operations.

(c) Once appointed by the holder of the exploration or production right, the holder is required to provide in writing, the names, contact details, expertise and experience of the persons identified in paragraph 2(b) and in the case of the heritage specialist, the intervals and instances when the specialist is required on site, to the competent authority, the designated agency, the relevant heritage resource authority and the Minister responsible for water affairs.

(d) The independent environmental control officer will have the duties identified in paragraph (1)(d) and the following additional duties as a minimum:
(i) in the project file include as a minimum the following information and any updates to that information;
(aa) copies of all rights, permits, authorisations, licenses, programmes, plans consents and financial guarantees associated with the operation;
(bb) copies of site plans indicating the well pads to be constructed and drilled;
(cc) a copy of the approved environmental management programme;
(dd) a copy of the approved integrated operational monitoring plan;
(ee) a copy of the approved water and waste water management plan;
(ff) a copy of the approved solid waste management plan;
(gg) a copy of the emergency and spill contingency plan;
(hh) details including the certification of the accredited laboratories to which samples are to be sent; and
(ii) details including the certification of the waste treatment and waste disposal facilities to which the waste is to be directed; and
(ii) Inspect the operations daily to ensure compliance with the environmental management programme, integrated operational monitoring plan, water and waste water management plan, solid waste management plan, and the emergency and spill contingency plan;
(iii) Prepare a quarterly audit report which complies with the requirements of paragraph (1)(d)(ix). The reference to the baseline monitoring plan in paragraph (1)(d)(ix)(cc) must be read as a reference to the integrated operational monitoring plan;
(iv) Submit and upload the quarterly audit report as per the requirements and audit cycle contemplated in paragraphs 1(d)(x) and (1)(e);

(e) The well engineer will have the following duties as a minimum:
(i) design all wells;
(ii) maintain a well file as contemplated in regulation 14(3) and submit the file to the designated agency;
(iii) inspect the operations on a daily basis to ensure compliance with the well design requirements, the pressure testing requirements and the emergency and spill contingency plan;
(iv) sign off on all pressure test results;
(v) submit the records for mechanical integrity tests to the designated agency on a quarterly basis;
(vi) be present when blowout prevention equipment is installed and tested;
(vii) prepare a technical report on a weekly basis for inclusion in the audit report prepared by the environmental control officer which technical report must as a minimum include the following:
(aa) the period covered by the technical report;
(bb) compliance with the construction requirements of the environmental management programme impact management outcomes and actions;

(cc) compliance with the monitoring requirements of the integrated operational monitoring plan;
(dd) compliance with the water and waste water management plan;
(ee) compliance with the solid waste management plan;
(ff) compliance with the emergency and spill contingency plan;
(gg) a collation of water quality results represented in a graphical form indicating trends and cumulative impacts;
(hh) fracturing fluids and proppants used on site, including the type of chemicals and proppants, quantity used and location of use including well names and locations;
(ii) material data sheets for all fracturing fluids, proppants and chemicals; and
(jj) report any incidents that have happened relating to the operations, or spikes and anomalies in testing, providing details and remedial measures;

(viii) liaise with the environmental control officer weekly to provide input to the audit reports being prepared for the operation;
(ix) identify and report any risks to the environmental control officer;
(x) keep records of all pressure tests and provide the information for quarterly audits;
(xi) keep records (including the raw data) of cement strength and compression testing and provide the information for the quarterly audit reports;
(xii) request inspections from the designated agency as required; and
(xiii) maintain and archive all design and construction records, including topographical surveys and materials test results on all materials used, for access during the operations and after decommissioning and closure.

(f) The holder must ensure that:
(i) all boreholes are capped to avoid tampering with groundwater quality from surface pollution or human interference to ensure that results provided are a true reflection of the boreholes; and
(ii) that the solid waste management plan is updated within the first year of commencement to reflect the nature of the wastes generated including the water content, classification etc. and resubmitted to the competent authority for approval.

APPENDIX 4

WATER QUALITY LIMITS FOR DISCHARGE INTO A WATER RESOURCE AND/OR IRRIGATION WITH WASTEWATER

- These water quality limits will be tailored to site specific conditions as part of the water use license.
- Water containing nuclides or radioactive material must not be discharged into a water resource or irrigated on land.

Water Quality limits for Discharge of Water Containing Waste in terms of section 21(f) of the National Water Act, 1998 (Act No. 36 of 1998)

Parameter	Limit (mg/l)
Acetone (mg/l)	0
Aluminium (mg/l)	5
Ammonia (mg/l)	0.025
Arsenic (mg/l)	0.01
Barium (mg/l)	0.7
Benzene (mg/l)	0
Beryllium (mg/l) found in coal slag	0.004
Boron (mg/l)	0.5
Bromide (mg/l)	0.5
Calcium (mg/l)	32
Cadmium (mg/l)	0.05
Chemical oxygen demand (mg/l)	not exceed 75 mg/l after applying chloride correction
Chloride (mg/l)	5
Chromium (mg/l)	0.012
Chromium (vi) (mg/l)	0.007
Cobalt (mg/l)	0.5
Copper (mg/l)	0
Cyanide (mg/l)	0.001
Diesel (mg/l)	0
Electrical conductivity (milli siemens per m)	Not to be increased by more than 75
Ethyl benzene (mg/l)	0
Feacal Coliform	0

Formaldehyde (mg/l)	0
Fluoride (mg/l)	1
Iron (mg/l)	0.3
Lead (mg/l)	0
Lithium (mg/l)	0.010
Magnesium (mg/l)	0.1
Manganese (mg/l)	0.18
Mercury (mg/l)	0.02
Methane (mg/l)	10
Methanol(mg/l)	0
Molybdenum (mg/l)	0.01
Naphthalene(mg/l)	0
Nickel (mg/l)	0.5
Nitrate/Nitrites (mg/l)	1.5
Ortho-phosphate (mg/l)	1
pH	6.5-8.4
Phenol (mg/l)	0
Potassium-(mg/l)	50
Polycyclic aromatic hydrocarbons (mg/l)	0
Radionuclides (mg/l): $^{228}Ra/^{226}Ra$	0
$S^{18}O$	0
$S^{2}H$	0
Selenium (mg/l)	0.02
Silica (mg/l)	5
Soap, oil or grease (mg/l)	0
Sodium (mg/l)	50
Strontium (mg/l)	0
sulphide (mg/l)	0.05
Temperature (^{o}C)	17-30^{0}C (depends on the type of fish species that is there)
Tin (mg/l)	0.005
Toluene (mg/l)	0
Total dissolved solids (mg/l) Directly proportional to EC	40

Total petroleum hydrocarbons (mg/l)	1
Uranium (mg/l)	0
Vanadium (mg/l)	0.25
Vinyl chloride (mg/l)	0
Xylene (mg/l)	0
Zinc (mg/l)	0.002