

**REVIEW OF THE DRAFT EMP IN
SUPPORT OF AN APPLICATION
FOR GAS EXPLORATION IN THE
WESTERN KAROO
(CENTRAL PRECINCT)
BY SHELL EXPLORATION
COMPANY**

Final report

1 April 2011

Fritz Bekker
Clean Stream Environmental Services
P.O. Box 867
Stilbaai
6674



TABLE OF CONTENTS

Contents	Page
1. INTRODUCTION	3
2. EXECUTIVE SUMMARY	3
3. THE APPLICATION	5
3.1 Protection of the rights of stakeholders	5
3.2 Notification and consultation with affected parties	6
3.2.1 Purpose of public participation	6
3.2.2 Objectives of Golder's public participation process	6
3.2.3 Inadequate time allowed for public response	8
3.2.4 Opportunity to review the final EMP	8
3.3 Negotiated extensions or exemptions from the MPRDA	8
3.4. Legal content requirements of an EMP	9
3.5 Baseline information	10
3.6 Impact assessment	11
3.7 Risk management	11
3.8 Description of environmental management measures	13
3.9 Migration of pollutants	16
3.10 Muddled stages of exploration	17
3.11 Monitoring and performance assessment	20
3.12 Closure and environmental objectives	22
3.13 Financial provision	22
4. ENVIRONMENTAL AUTHORIZATION	24
4.1 Applicable listed activities not identified by Golder/Shell	24
4.1.1 Listing Notice 1 (GN R544 of 18 June 2010)	24
4.1.2 Listing Notice 2 (GN R545 of 18 June 2010)	26
4.1.3 Listing Notice 3 for specific geographical areas (GN R546 of 18 June 2010)	28
5. GENERAL COMMENTS	32

List of tables

Table 1: Example of problem formulation as part of a risk assessment	12
Table 2: Example of impacts associated with geophysical data acquisition	15
Table 3: Summary of Golder's significance assessment of pollution migration	16
Table 4: Example of a more sensible impact assessment framework for gas exploration	20
Table 5: Shell's financial provision for decommissioning and rehabilitation	23

1. INTRODUCTION

Clean Stream Environmental Services was contracted by Derek Light Attorneys to perform a review of the draft Environmental Management Plan (Report No. 12800-10364-5) in support of an application by Shell Exploration Company B. V. (Shell) for shale gas exploration in the western Karoo. The draft Environmental Management Plan (EMP) for the central precinct (PASA Reference No. 13/3/220) was reviewed in detail and the majority of findings in this review also apply to the western and eastern precincts.

This EMP review was performed within a limited timeframe and some issues may require further research and verification. This review focuses on the legal content requirements of an EMP as provided for in the Mineral and Petroleum Resources Development Act (2002) and the Mineral and Petroleum Resources Development Regulations (2004). A number of related shortcomings have also been highlighted in this review.

2. EXECUTIVE SUMMARY

The generic and generalized draft EMP as submitted by Golder Associates does not allow a proper peer review of scientifically credible information. No site specific information relating to the envisaged exploration activities were supplied in the draft EMP and little scientific evidence in support of an environmental impact assessment was provided. Golder Associates relied on qualitative level assessments and a number of assumptions to arrive at speculative opinions pertaining to the environmental, social and cultural heritage-related consequences of Shell's proposed exploration activities.

The objectors and stakeholders should not be subjected to speculative opinions in an EMP that supports an application for an exploration right. It should not be necessary for objectors and stakeholders to perform parallel impact assessment procedures in order to evaluate unsubstantiated opinions.

The lack of very important information pertaining to the project's water supply, ground water aquifers, real concerns raised by stakeholders and actual well site localities does not enable objectors to form well-informed decisions pertaining to the application.

The draft EMP does not include a plan to manage and rehabilitate the environmental impacts as a result of exploration as required by the MPRDA and can therefore not be considered to be an EMP as defined by the Act. **It is therefore believed that Shell has failed to submit an EMP relevant to their application within the 120 day period allowed from notification.** The application process as contemplated in Section 79 (4) (a) of the MPRDA does not allow for a phased approach where a mostly irrelevant, generic and generalized EMP can be submitted with the undertaking to supply vital information at a later stage and as part of an EIA process that is not administered by the MPRDA.

Golder/Shell identified two listed activities that require environmental authorization and repeatedly stated in the draft EMP that all shortcomings in this document will be remedied during a later detailed EIA phase. This is simply not true for two reasons.

Firstly, the first activity (transformation of land bigger than 1 000 m²) will trigger a much less detailed and much less intensive route of application, which is the Basic Assessment route. No specialist studies are required for the compilation of a Basic Assessment and it therefore relies heavily on the expertise of the Environmental Assessment Practitioner, i.e. Golder Associates. This activity will also only need authorization if the current land use is zoned as open space or conservation, otherwise no assessment will be necessary. Much land in the central precinct of the Karoo may be zoned as agricultural.

The second listed activity as identified in the draft EMP (construction of gas infrastructure with a capacity of more than 50m³ per day) may only be triggered when Shell has performed hydrological fracturing, found significant gas resources and commences with the extraction, refining or processing. This activity is part of a Production/Development phase and may not take place during exploration, especially when no gas reserves are found.

Secondly, the environmental authorisation processes in terms of NEMA will only focus on that listed activity, i.e. such as the construction of petroleum handling infrastructure where visual impacts of surface tanks must be addressed, for example. Unrelated activities such as drilling site selection, exploratory drilling and hydrological fracturing will therefore not be guided by any EIA process.

It is put forward that Shell may have been advised incorrectly to include invasive drilling and gas stimulation in this first application of a potential 9-year exploration period. It would have been more appropriate to perform the required geophysical examinations and limited drilling under the authority of an approved exploration right that is limited to these activities only. A further application for a renewal of the exploration right to include appraisal drilling could then be made at a later stage and in compliance with the environmental requirements as contemplated in Section 81 (2)(c) of the MPRDA and other relevant legislation.

All risks to the environment and the people of the Karoo must first be investigated by means of detailed site-specific specialist investigations before applications for unfamiliar and invasive exploration technologies should be considered.

The opinion is held that gas stimulation through hydrological fracturing is an unknown procedure in South Africa and also not properly legislated by South African law. This procedure should therefore not be considered as part of an application for an exploration or production right. It is telling that most of the adverse impacts associated with similar gas stimulation procedures as undertaken in North America, were only detected when human health effects occurred.

It is put forward that Shell's self-promoting internal policies and commitments relating to the environment are inferior to applicable South African legislation, best practice and standards. The general perception is put across in the draft EMP that Shell maintains some lofty internationally accepted environmental standard that must surely be good enough for the South African context. The strategy that Shell knowingly followed by submitting this fatally flawed EMP is in fact an attempt to bypass legislation that are in place to protect the people of South Africa as enshrined in Chapter 2 of the Constitution. Section 4 of the Bill of Rights state that everyone in South Africa has the following rights:

1. The right to an environment that is not harmful to their health or well-being.
2. The right to have the environment protected for the benefit of present and future generations through measures that prevents pollution, promotes conservation and secures sustainable development.

Shell's draft EMP does not meet the terms of Section 4 of the Bill of Rights or not one of the legal provisions of the MPRDA or the MPRDA regulations that deals with the content requirements of an EMP in support of an exploration right.

Golder Associates played along with Shell's strategy by conjuring a far-reaching blanket finding that *no adverse impact will occur as a result of Shell's activities on any environmental aspects, socio-economic conditions or cultural heritage resources in the Karoo*. No financial provision has subsequently been made by Shell for the mitigation of environmental degradation, the protection of cultural resources or the compensation of land owners for loss of agricultural land or income. Golder Associates have risked tarnishing their professional integrity by presenting this biased document as an Environmental Management Plan in the absence of site specific supporting scientific evidence.

3. THE APPLICATION

3.1 Protection of the rights of stakeholders

Section 2 (a) of the MPRDA states that it is the objective of the Act to "*recognize the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic*".

The entitlements that transpire from a granted exploration right have the potential to deprive landowners of the full and beneficial ownership of their properties. This ownership-deprivation is done in favour of the holder of such an exploration right, i.e. Shell Exploration Company B.V. in this case.

Upon the granting of an exploration right to Shell in terms of the MPRDA, further consent of the surface owners or occupiers of the land will not be a legal requirement. Shell will therefore secure a number of far-reaching rights such as full access to the land, the right to use water and the right to proceed with all activities associated with exploration, i.e. clearing of vegetation, earthworks, removal of fencing, drilling, etc.

Shell's compliance with and PASA's correct execution of all the MPRDA provisions should ensure that land owners are treated fairly, equitably and reasonably. Section 79 (4)(a) and (b) of the MPRDA therefore requires Shell to do the following:

1. To notify and consult with any affected parties.
2. To submit an environmental management plan (EMP) in terms of Section 39.

These two provisos in the MPRDA are the only balancing mechanisms available to land owners and stakeholders in order to protect their livelihoods against the adverse consequences of exploration activities. It will be shown in this review that the draft EMP does not comply with the above two fundamental legal obligations.

3.2 Notification and consultation with affected parties

3.2.1 Purpose of public participation

The purpose of a successful public participation process as described in NEMA (1998) should be as follows:

- To provide an opportunity for Interested and Affected Parties (I&AP's) to obtain clear, accurate and comprehensible information about the proposed activity, its alternatives and the environmental impacts thereof.
- To provide I&AP's with an opportunity to indicate their viewpoints, issues and concerns regarding the activity, alternatives and / or the decision.
- To provide I&AP's with the opportunity of suggesting ways of avoiding, reducing or mitigating negative impacts of an activity and for enhancing positive impacts.
- To enhance transparency and accountability in decision-making.

The people who will be most affected by Shell's exploration activities are the Karoo land-owners and lawful occupiers close to any proposed well drilling locality, its access roads or any of its associated infrastructure. No specific information pertaining to the placement of well drilling localities or any associated infrastructure was supplied in the draft EMP and it was stated that drilling localities could be placed "*anywhere*" within the 30 000 square kilometre application area of the central precinct. This lack of site-specific information in the draft EMP deprived the Karoo stakeholders, who willingly participated in the public participation process, of a reasonable opportunity to participate meaningfully.

3.2.2 Objectives of Golder's public participation process

Golder included a list of objectives of their public participation process in an attachment to the draft EMP (Technical Report: Public Consultation Process – Central Precinct). These objectives are as follows:

- To raise issues of concern and assist stakeholders with suggestions for enhanced benefits.

- To verify that these issues have been recorded and considered in the EMP.
- To allow role-players the opportunity to contribute relevant local information and traditional knowledge in order to verify existing baseline information.
- To allow stakeholders the opportunity to comment on the findings of the environmental assessments.

Figure 2.1 in Golder's technical assessment report show the public participation process that was followed as part of the application (Figure 40 in the draft EMP). The Figure shows that a Comments and Response report should have been made available before the draft EMP was announced. This report was not provided along with the draft EMP to enable stakeholders to verify that their concerns have been recorded. The unannounced posting of information somewhere on Golder's website cannot be considered to be making information available to the stakeholders.

The 2074 issues that were raised by stakeholders in the central precinct before 18 February 2011 were summarized by Golder into 14 generalized "key" issues from which local content was removed as presented in Part 6.5 of the draft EMP.

The public participation process as followed by Golder clearly does not comply with their own objectives (Part 1.1; Technical Assessment Report No. 12800) for the following reasons:

- The capturing of relevant issues and concerns as raised by role-players during the public participation process could not be verified from the draft EMP. This information was not made available in the document or its appendices.
- Relevant local information and traditional knowledge was not incorporated into the draft EMP.
- The draft EMP does not allow role-players to comment on environmental assessment findings because no environmental impact assessment was undertaken. Golder stated in their draft EMP that "*impact significance will be confirmed as part of the detailed EIA*". Role-players are herewith referred to some future EIA process for an accurate assessment of potential adverse impacts.

The public participation process as followed by Golder does not comply with the requirements as listed by NEMA (1998) as it did not provide stakeholders with the following:

- Sufficient opportunity to obtain relevant information on the development proposal.
- Sufficient time to give feedback regarding their site specific concerns.
- The opportunity to make suggestions on how to avoid, reduce or mitigate impacts.

- A process that enhances transparency and accountability in decision-making.

3.2.3 Inadequate time allowed for public response

Shell had the opportunity to study the application area and thus plan their extensive draft EMP since or even before the approval of a 12 month Technical Cooperation Agreement by PASA. This Technical Cooperation Agreement was valid from December 2009 to December 2010 and allowed Shell to carry out a detailed technical cooperation study of the application area although no actual fieldwork is allowed during this period.

Shell therefore had at least 14 months since December 2009 to conceptualize the draft EMP, which was only made available to the public on 7 March 2011. Role-players or interested and affected parties (I&AP's) are now required to comment on this document by 5 April 2011 and have thus only been given 20 working days to comment on this voluminous draft EMP and its 10 appendices.

Many role-players do not have access to the internet nor the ability to download the large documents as posted on the Golder Associates website. Some role-players may only have been reached at the public meetings that were scheduled for 16, 17 and 23 March 2011 at Beaufort-West, Victoria-West and Graaff-Reinet respectively. Role-players from the Graaff-Reinet area will then for example effectively only have had 7 working days to comment on the 204 page draft EMP and its 10 appendices as presented to them on 23 March.

3.2.4 Opportunity to review the final EMP

It is stated on p.1 of the draft EMP that this document will be made available for comment, presented at a series of meetings in March 2011, and then once finalised, submitted to the Petroleum Agency of South Africa (PASA). This statement implies that stakeholders will not have access to the final version of the EMP before submission to PASA. Shell/Golder therefore has the opportunity to circumvent and downplay important issues in the final EMP without distributing it to the stakeholders, effectively undermining the transparency of the process.

3.3 Negotiated extensions or exemptions from the MPRDA

It is stated in section 1.3 of the draft EMP that applicant/regulator negotiations concluded that PASA will allow Shell to submit an EMP, *“in the absence of specific drilling sites, to as a minimum assess and make recommendations for mitigation in respect of the types of activities to be conducted somewhere within the regional areas”*.

This alleged negotiated deal between the applicant and the regulator (PASA) resulted in a situation where “typical” impacts and activities are assessed on “fictional” drilling sites. These highly subjective inputs were then fed into an impact assessment procedure as Part 8 of the draft EMP, which is called a technical

assessment. Any environmental impact assessment where specific activities are not evaluated in concert with site specific environmental conditions, local issues and real stakeholder concerns, may well be a worthless paper exercise.

PASA does not have the authority to give extensions or exemptions from any of the stipulations of the MPRDA. Shell has been instructed, in accordance with Section 39(2) of the MPRDA, to develop an EMP and submit this to PASA within 120 days, on or before 14 April 2011 (Part 1.3 of the draft EMP).

A generic and generalized EMP cannot suffice as a programme with which real impacts must be managed. 14 April 2011 marks the end of the allowed 120 day EMP development period and not the beginning. Shell therefore failed to submit an EMP within this allocated period.

3.4. Legal content requirements of an EMP

The MPRDA defines an Environmental Management Plan as “*a plan to manage and rehabilitate the environmental impacts as a result of exploration*”. Section 79 (4)(b) of the MPRDA states that an EMP as contemplated in Section 39 must be submitted in support of an exploration right application within a period of 120 days from the date of a notice that an application has been accepted. Section 39 of the MPRDA stipulates that an applicant who prepares an EMP must provide the following information:

1. Baseline information concerning the affected environment must be established. This must be done to determine protection measures, remedial measures and environmental management objectives (Section 39 (3) (a)).
2. An investigation, assessment and evaluation of potential impacts on the environment, socio-economic conditions of the role-players and any natural heritage (Section 39 (3) (b)).
3. Develop an environmental awareness plan to describe how risks to the environment must be managed (Section 39 (3) (c)).
4. Describe how any action, activity or process that may cause pollution or environmental degradation will be modified, remedied and controlled (Section 39 (3) (d)).
5. Describe how the migration of pollutants will be contained or remedied (Section 39 (3) (d)).
6. Make available the prescribed financial provision for the rehabilitation or management of negative environmental impacts (as contemplated in Section 41(1)).

Section 52 of the MPRDA Regulations (2004) also provides a list of information requirements that an Environmental Management Plan must contain. These information requirements are as follows:

1. Description of the environment likely to be affected (Section 52 (2)(a)).
2. An assessment of potential impacts on the environment, socio-economic conditions and cultural heritage (Section 52 (2)(b)).

3. A summary of the assessment of the significance of potential impacts including mitigation and management measures (Section 52 (2)(c)).
4. Financial provision showing details of the method of providing this provision as contemplated in regulation 53 (Section 52 (2)(d)).
5. The planned monitoring and performance assessment of the EMP (Section 52 (2)(e)).
6. Closure and environmental objectives (Section 52 (2)(f)).
7. A record of the public participation undertaken and the results thereof (Section 52 (2)(g)).
8. An undertaking by the applicant regarding the execution of the EMP (Section 52 (2)(h)).

3.5 Baseline information

Baseline information on the affected environment must be gathered to support the development of environmental protection measures as required by Section 39 (3) (a) of the MPRDA. The draft EMP incorporated some regional desktop information on geology, climate, soil, topography, terrestrial ecology, surface water, ground water, air quality, visual aspects, noise, cultural heritage, sensitive landscapes and the economic environment. The opinion is held that this baseline information on the existing environment as presented in Part 4 of the draft EMP is nothing more than regional information that can be found in relevant books or publications on the internet.

The broad desktop studies as performed in support of the draft EMP can therefore not suffice as baseline information for an exploration activity of the magnitude that Shell proposes to execute on a number of very specific Karoo farms.

Golder admitted in Part 8 of the draft EMP that “*the significance of Shell’s proposed activities is dependent on the site characteristics*”. Site characteristics were not available at the time of drafting the EMP because no drilling sites have been identified.

The affected environment pertaining to Shell’s application can surely not cover the entire 30 000 square kilometres (central precinct only) when considering that only 8 one hectare drilling sites may be required per precinct as stated in the draft EMP. Golder/Shell has failed to provide baseline information concerning the environments that may be affected by exploration activities on these 8 farms. This could have easily been done within the allowed 120 days.

No truthful environmental protection, remedial or management measures can be developed without site information on the affected environment and the draft EMP therefore does not comply with Section 39 (3) (a) of the MPRDA (2002) or Section 52 (2)(a) of the MPRDA Regulations (2004).

3.6 Impact assessment

Section 39 (3) (b) of the MPRDA requires Shell to investigate, assess and evaluate potential impacts of their proposed exploration activity. This stipulation that include a requirement for “*the assessment of potential impacts*” as contemplated in the MPRDA Regulations can only be interpreted as a clear obligation that some sort of environmental impact assessment must be performed.

Principle 17 of the Rio Declaration on the Environment and Development as cited by Sadler & McCabe (2002) states that “*environmental impact assessment as a national instrument shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision by a competent national authority*”. This Principle, with South Africa a signatory of the Rio Declaration, could only be attained under the authority of a well-designed process that regulates information requirements and ensures the involvement of all role-players.

The basis of all environmental impact assessments is therefore to provide appropriate information that will enable stakeholders to take the correct decision in a specific situation. Matthews *et al.* (1976:5) as cited by Barrow (2006) noted that a myriad of individual and collective decisions by persons, groups and organisations result in a process that dictate the environmental management of resources. Correct decision-making is therefore of importance for the successful outcome of an impact assessment process and the outcomes should only be based on sound information.

Golder’s assessment of potential impacts relating to the exploration right application was done in the format of a technical assessment where an “*estimated guideline of significance ratings*” was given. The actual impact assessment was referred to a future EIA process that still needs to be performed.

This draft EMP therefore does not accomplish the legal requirement to investigate, assess and evaluate potential impacts on the environment, on the socio-economic conditions of stakeholders or on cultural heritage as required in Section 39 (3) (b) of the MPRDA and Section 52 (2)(b) of the MPRDA Regulations.

3.7 Risk management

Section 39 (3) (c) of the MPRDA requires that an environmental awareness plan must be prepared to describe how risks to the environment can be managed. Risk management include the estimation and evaluation of risks as well as potential responses of receptors to such risks. This requirement of the MPRDA essentially deals with the prediction of problems and hazards before they occur.

The importance of risk assessment hardly needs emphasis in the wake of incidents such as the BP blowout in the Gulf of Mexico and the earthquake/tsunami/radiation leakage in Japan. Risk or hazard assessment does not only include the risk of accidents but also natural disasters, anthropogenic activities and the failure of standard protection measures.

A very contentious activity such as gas stimulation with the use chemicals known for their toxicity should be subjected to a detailed risk assessment. Such a risk assessment should ideally be performed within a framework of problem formulation, analysis and risk characterization. An example of a risk scenario as applicable to the problem formulation phase of risk assessment is shown in Table 1.

Table 1: Example of problem formulation as part of a risk assessment

STRESSOR	SOURCE	RECEPTOR	PATHWAY	TIMEFRAME	ENDPOINTS
Gaseous emissions	Flaring	Residents, employees, visitors, ecosystems	Atmosphere, wind	During operation of flaring activity	Asthma, airway infections, climate change, vegetation uptake, soil chemistry, soil micro-fauna, etc.

Predictive tools such as a risk assessment can be problematic because they are imperfect and have a limited coverage in time and space. It can be seen from the example in Table 1 that detailed and sound site-specific information and local measurements are required to perform a risk assessment.

Even more detailed studies need to be performed for exposure assessments, ecological effects assessments and toxicity assessments. The unexpected must always be expected, even with good background data. One should also rather err on the safe side, which is in line with the precautionary principle. This principle is enshrined in the South African environmental legislation and cannot be ignored. Predictive assessments can only be achieved by making assumptions on the safe side and accepting worst case scenarios, particularly when dealing with incomplete and inadequate information.

The draft EMP by Golder contains a chapter where examples of environmental impacts are assessed with the use of a matrix depicting “before” and “after” mitigation scenarios. The result of this biased assessment where no site specific information was used revealed that only the flaring of gas during hydrological fracturing will require some modification of the project design. The significance of all other impacts was downscaled to low significance on the assumption that Shell’s mitigation will be 100% successful. This approach to risk assessment is not in accordance with industry standard and is a worthless paper exercise.

It must be emphasised that Shell’s financial provision as contemplated in Section 52 (2)(d) of the MPRDA Regulations must be calculated with the use of information as obtained from an accurate assessment of risks. This was not done by Golder Associates. Shell subsequently did not budget for any eventualities pertaining to environmental degradation or the management of negative environmental impacts. R90 Million was budgeted for well site and access road restoration, monitoring, maintenance and management as shown in Part 10.1.1 of the draft EMP. Section 41 (1) of the MPRDA clearly state that financial provision must be made for the management of negative environmental impacts. Shell evidently did not budget for these.

The only reference to an environmental awareness plan in the draft EMP is in Section 3.3.2 of the MPRDA overview (p. 20) where it is listed as one of the legal requirements in terms of Section 39(3) that Shell must comply with. Parts 9.5.2 and 9.7.4.7 of the draft EMP succinctly refer to Shell employees that will be trained to carry out their duties. These few references to training certainly do not comprise an awareness plan as required by the MPRDA.

This draft EMP as prepared by Golder Associates therefore does not contain an awareness plan to describe how risks to the environment can be managed by Shell employees. The draft EMP also does not contain an assessment of potential risks to reduce the potential of pollution and the degradation of the environment. The draft EMP also does not make financial provision for the management of negative environmental impacts.

The opinion is therefore held that the draft EMP does not comply with the requirements of Section 39 (3) (c) of the MPRDA or Section 52 (2)(d) of the MPRDA Regulations or Section 41 (1) of the MPRDA.

3.8 Description of environmental management measures

Section 39 (3) (d) of the MPRDA requires a description of actions, activities or processes that Shell will have in place to modify, remedy or control pollution and environmental degradation that may occur as a result of their exploration activities.

Part 9 of the draft EMP comprises a series of plans that outline the EMP that will be implemented during all phases of the exploration project with mitigating measures included in Part 9.7. The following five phases or primary project activities were listed by Golder for a description of management measures:

1. Geophysical data acquisition.
2. Vertical borehole drilling.
3. Gas stimulation with hydrological fracturing.
4. Horizontal borehole drilling and hydrological fracturing.
5. Decommissioning.

It is not the purpose of this review to compile a parallel EMP with management measures for all potential adverse consequences. It will, however, be attempted to illustrate exactly how inadequately impact description and management measures were addressed in the draft EMP. The geophysical data acquisition phase is used as an example.

Geophysical data acquisition phase as an example

Part 8 of the draft EMP deal with a technical assessment of environmental issues and it was found by Golder that negligible impacts on land use, soil, vegetation and sensitive landscapes are expected during the geophysical data acquisition phase. No mitigation was therefore proposed or budgeted for in the draft EMP. A sketchy explanation of the data acquisition techniques was given, which cannot rationally be seen as a description of actions, activities or processes that Shell will have in place to modify, remedy or control pollution and environmental degradation as required by the MPRDA.

The geophysical data acquisition phase of exploration was judged by Golder to have no adverse environmental consequences whatsoever in Part 9 of the draft EMP. No management, modification or environmental control was therefore proposed in Part 9 (the Environmental Management Plan part) of the draft EMP.

Shell applied for the right to perform intensive geophysical surveys including magneto-tellurics, shallow seismic acquisition and micro seismic acquisition over a 30 000 square kilometre area in the central precinct. The seismic surveys include the use of explosives to transmit a pulse of acoustic energy into the ground. The resultant reflected sound waves are then picked up by buried geophones or seismometers for interpretation in a mobile laboratory where the sound is amplified, filtered, digitized and recorded. Equipment used during this phase may include generators, battery packs, vehicle mounted vibrator plates, weight drop apparatus, receiving sensors, geophones and accelerometers.

It is important that these surveys are performed in quiet areas away from vehicular traffic or other anthropogenic disturbances, especially the MT scans. These surveys can also not be performed accurately on road surfaces. Much 4x4 or/and off-road driving will therefore be required and the Shell employees will probably need to establish encampments in inaccessible areas. It is just not practically feasible to perform these time consuming surveys over 30 000 square kilometres of tough terrain by foot and without setting up base camps.

A number of very significant impacts may be associated with this exploration stage and these impacts have been ignored by Golder Associates in their draft EMP. Potential impacts as well as probable mitigating measures are shown in Table 2 as an example of a more accurate approach.

Table 2: Example of some impacts associated with geophysical data acquisition

Potential impacts	Potential mitigating measures
Land use conflict: Shell would have to enter and overnight on many properties where owners are absent or do not support their application.	Comprehensive consultation with local authorities, stakeholders and individual property owners. Personal communication with each land owner. Compensation agreements in place.
Shell may be refused access or may not be able to locate the property owner.	Comprehensive consultation. Selection of alternative sites.
Shell activities may hamper day-to-day farming activities.	Comprehensive consultation. Negotiated compensation.
Surveys would have to be performed away from existing roads and much off-road driving will be required.	Comprehensive consultation. Selection of alternative sites. Select alternatives to ground transport (helicopter). Perform ecological studies beforehand. Avoid sensitive areas.
Destruction of vegetation.	Use hand cutting techniques for vegetation removal and not mechanical methods. Perform vegetation studies beforehand to determine whether damage to sensitive species may occur.
Soil pollution may occur as a result of leakages and spills from battery packs and generators.	Supply emergency spill clean-up equipment.
Soil compaction and erosion may occur as a result of off-road driving and vibrator plate operation.	Minimize soil compaction and erosion by driving along contours and where possible, on existing roads. Loosen soil after compaction with vibroseis trucks.
Acoustic disturbance to humans, wildlife and livestock as a result of seismic signal charge detonation.	Minimize shot firing close to people and livestock. Consider seasonality of wildlife. Ensure that the charge is small and deep enough into the ground.
Cratering may occur if the explosive charge is put in too shallow.	Ensure that the charge is small and deep enough into ground.
Fire hazard caused by charge detonation.	Clear vegetation around explosive charge before shot firing. Consult with land owner pertaining to local fire management. Provide fire fighting equipment.
Physical danger of explosives to people, wildlife and livestock.	Ensure that each charge is small enough. Disable misfired charges correctly. Block and control access to exploration areas when setting and detonating a charge.
Danger of misfired charges to humans, wildlife and livestock	Keep proper record of the localities of all laid charges and disable misfired charges correctly.
Camp activities may generate solid waste and sewage effluent.	Provide waste bins and chemical toilets.
Camp activities may generate noise and light pollution.	Establish camps away from receptors. Ensure noise attenuation on engines and generators.

Table 2 is just an illustration of real impacts that will most probably materialize during the geophysical acquisition stage, which were **not** considered by Golder Associates in the draft EMP. Much more pronounced impacts that were also not identified, may transpire during the other more invasive stages of exploration.

This draft EMP does therefore clearly not comply with Section 39 (3) (d) of the MPRDA that requires a description of actions, activities or processes that Shell will have in place to modify, remedy or control pollution and environmental degradation.

3.9 Migration of pollutants

Section 39 (3) (d) of the MPRDA requires a description of how the migration of pollutants will be contained or remedied.

The outcome of Golder's assessment of the migration of pollutants from Shell's exploration activities is presented in Parts 8 and 9 of the draft EMP. A summary of their findings for their different phases of the exploration project are shown below in Table 3.

Table 3: Summary of Golder's significance assessment of pollution migration

Aspect	Geophysical data acquisition	Well site preparation	Exploration drilling	Hydrological fracturing
Surface water	Negligible	Very low	Very low	Low
Ground water	Negligible	Low	Negligible	Low
Air quality	Negligible	Low	Low	Low

It is evident from Table 3 as summarised from the draft EMP that Golder expects no migration of any pollutants to occur during any phase of Shell's exploration activities. This assessment by Golder should be viewed with much scepticism in the absence of any scientific proof including sound baseline information, risk assessment or proper impact identification. This unproven and biased opinion by Golder attempts to exempt Shell from describing how the migration of pollutants will be contained or remedied. Standard pollution prevention measures cannot simply be named with the assumption that they will be 100% effective because they hardly ever are.

The aligned stipulations of Section 39 (3) of the MPRDA were designed to act as building blocks for each other. It is for this reason that all aforementioned stipulations of this Section must be adhered to before suitable measures for the mitigation of pollution migration could be developed. These aforementioned stipulations includes baseline environmental information gathering, the completion of impact assessment procedures and the description of risks as contemplated in Sections 39 (3) (a), (b) and (c) of the MPRDA.

The draft EMP clearly does not comply with Section 39 (3) (d) of the MPRDA as it does not provide a description of how the migration of pollutants will be contained or remedied.

3.10 Muddled stages of exploration

The draft EMP does not clearly describe the stages and activities that are associated with the proposal and it will be shown below that no less than 5 different variations of proposed project stages are given in the single document. The description of management measures within the different phases (construction, operation, decommissioning and closure) of each stage has been ignored and these phases have been confused with project activities.

It is not possible to prepare a truthful assessment of environmental impacts within the context of a process that clearly muddle up different stages, activities and the phases within these activities. The rationale behind this finding is explained below by highlighting the inconsistencies in the draft EMP:

Golder’s project stage variation No. 1: Part 1.2 of the draft EMP states that the following “*proposed exploration activities will be undertaken, should the application be approved*”:

1. Gathering of geophysical data.
2. Drilling of up to 8 exploration boreholes.
3. Gas stimulation during vertical and horizontal drilling.

Golder’s project stage variation No. 2: Part 8 of the same draft EMP lists the following exploration activities as part of its technical assessment where the severity of impacts are ranked:

1. Geophysical data acquisition.
2. Well site preparation.
3. Exploration drilling.
4. Hydrological fracturing.
5. Decommissioning.

Golder’s project stage variation No. 3: Part 9.2 of the same draft EMP lists the following distinct project phases as part of the exploration process:

1. Geophysical data acquisition.
2. Drilling of vertical boreholes and the sampling of intact geological cores for gas.
3. Gas stimulation in the vertical borehole with hydrological fracturing.
4. Drilling of a horizontal borehole from the base of a vertical hole “*only if gas can be stimulated to flow within the shale layer*”.
5. Hydrological fracturing and testing of the horizontal boreholes.
6. If the exploration proves unsuccessful, gas exploration wells will need to be decommissioned and made safe.

Golder’s project stage variation No. 4: Section 9.7 of the same draft EMP attempts to outline the EMP’s and mitigating measures that will be implemented during the duration of the project. It categorizes only two “*primary project activities that will require specific mitigation measures*”, which are follows:

1. Drilling and Well Installation.
2. Hydraulic Fracturing.

Part 9.7 then confusingly continues to list individual EMP's as provided in the broad regional specialist studies "*in a more general sense*" and without reference to the management of impacts during the lifetime phases of specified activities. These unstructured listing of EMP's include diverse aspects such as water supply, grievance mechanisms, fish habitat, soil, wildlife management, waste management, fuel handling, safety, etc. This unstructured approach does not facilitate proper planning for the management of impacts during distinct project stages and phases.

Golder's project stage variation No. 5: Part 11.1 of the same draft EMP names the "*number of discrete phases of the exploration programme*" as follows:

1. Geophysical data acquisition.
2. Drilling and casing of deep level boreholes.
3. Testing and sampling of shale rock samples.
4. Possible hydrological fracturing in vertical boreholes.
5. Hydrological fracturing of exploratory horizontal holes after drilling another vertical borehole from a nearby location that will have a horizontal section at its base.

It is clear that the authors of the draft EMP did not synchronize the different sections of the document properly. They were not ready to plainly name each project activity or stage and then address all impacts associated with these activities during the construction, operational, decommissioning and closure phases. The draft EMP therefore has no rational structure within which impacts can be assessed correctly.

The consequences of these inconsistencies in the different parts of the same draft EMP are far-reaching. An EMP as intended by the MPRDA is a process where the same activities should be subjected to different assessment criteria throughout the document up to a stage where a decision pertaining to the project's viability in terms of its environmental consequences can be made. Each stipulation of the Section 39(3) of MPRDA therefore builds on the previous one towards an outcome.

Golder muddles up the project stages and activities with the phases within individual activities in Parts 2 and 3 of the draft EMP. The decommissioning phase has been dealt with as a project stage in Parts 2 and 3. Impacts during the construction, operational, decommissioning and closure phases should be assessed for each individual activity and decommissioning is not a project stage or activity (Table 4).

It is put forward that Golder/Shell provided 5 very different scenarios of project stages during exploration and that all 5 are in actual fact wrong.

A relevant guideline document has jointly been prepared by the Oil Industries International Exploration and Production Forum (E & P Forum) and the United Nations Environmental Programme for Industry and Environment Centre (UNEP IE). This guideline document is called *Environmental Management in Oil and Gas Exploration and Production: An Overview of Issues and Management Approaches*.

This guideline was developed with Shell International Exploration and Production B.V. as leading partners (UNEP, Technical Report No. 37; 1997).

This guideline makes provision for the following distinct exploration project stages:

1. Geophysical data acquisition stage. Decommissioning and closure should be undertaken if this stage provides negative results.

2. Exploratory drilling. The presence or absence of hydrocarbon reserves is determined during this stage. This stage involves vertical drilling only with a range of recordings and analyses that are made. Decommissioning and closure should be undertaken if this stage provides negative results.

3. Appraisal stage. The economical feasibility, size and nature of the gas reserves are determined during this stage with more drilling and analyses. Appraisal drilling may include directional drilling (horizontal drilling) from the same pad or new well pads. Appraisal wells should ideally be drilled from the same pad to reduce the project's footprint. Decommissioning and closure should be undertaken if this stage provides negative results.

4. Development stage (Production). Permanent production-related casing and infrastructure is typically installed at the well sites and on the drill pad to handle gas and fluids during the production stage. The stimulation of gas flow with techniques such as hydrological fracturing or acid treatment is often undertaken during this stage. This production stage only commences when the appraisal stage show positive results. Access to the sites is then improved, long-term land use agreements are signed, gas storage and transport facilities are constructed, flaring of gas is performed, etc.

It makes perfect sense to stop with exploration-related activities after the Appraisal stage when potential free-flowing wells can be blocked with blowout preventers. Further applications should then be made for the more permanent activities that must be undertaken during the Development or Production stage.

For the assessment of environmental impacts, each main project stage should be subdivided into separate activities, which should then be assessed individually with consideration of the phases of development, which always remain the same, i.e. construction, operation, decommissioning and closure. An example of a more sensible methodology for the assessment of impacts during distinct project stages is shown in Table 4:

Table 4: Example of a more sensible impact assessment framework for gas exploration

PROJECT STAGES AND ACTIVITIES	IMPACTS THAT MUST BE IDENTIFIED			
	Construction	Operational	Decommissioning	Closure
1. Geophysical data acquisition 1.1 Magneto-telluric surveys 1.2 Seismic acquisition	?	?	?	?
2. Exploratory drilling 2.1 Access road construction 2.2 Well site preparation 2.3 Well site infrastructure construction 2.4 Drilling and casing of deep level boreholes 2.5 Testing and sampling	?	?	?	?
3. Appraisal stage 3.1 Appraisal well drilling and casing from the same pad 3.2 Road construction between pads 3.3 New Appraisal well site preparation 3.4 Appraisal well drilling and casing from new pads 3.5 Testing and sampling	?	?	?	?

Each environmental aspect such as groundwater, surface water, air quality, soil, etc. should then be assessed within the above-mentioned framework. Specialist scientists should then plan and execute their site-specific investigations accordingly.

The purpose of an EMP is to make answers available where there are question marks in Table 4. These answers have not been provided in the draft EMP.

3.11 Monitoring and performance assessment

Section 52 (2)(e) of the MPRDA Regulations (2004) states that an EMP must contain the “*proposed monitoring and performance assessment*” that will be instated. This is an important requirement by the Act for the prediction of environmental effects before they occur and the investigation of the effectiveness of mitigating measures.

Golder indicated in Part 9.7.5 of the draft EMP that “*detailed monitoring plans will be developed once the ESIA is completed and the project design has been finalized*”. This ESIA acronym is not explained in the relevant section of the draft EMP (Acronyms and Abbreviations on p. iv) and it is assumed that Golder meant EIA.

Applicable monitoring plans for all the environmental aspects cannot be finalized only when an EIA is prepared because Golder intends to prepare this EIA for two listed activities only. These activities are the transformation of land bigger than 1000m² in size (Activity 24 of Notice 1) and the construction of gas processing infrastructure (Activity 4 of Notice 2) as presented in Part 11.2.2 of the draft EMP. The main impacts that may be associated with these two listed activities will be the

destruction of vegetation when clearing the well sites and gaseous emissions from gas processing infrastructure.

Monitoring plans will therefore only focus on impacts relating to these activities, i.e. such as the identification of sensitive vegetation species and air quality monitoring. Monitoring and performance assessment plans for crucial environmental aspects related to exploration, will therefore **not** be developed as part of a future EIA.

Section 52 (2)(e) of the MPRDA Regulations does not make provision for the fulfilment with this stipulation at a later stage than with submission of the EMP. **There is no monitoring or performance assessment strategy in the draft EMP, which is a flagrant disregard of this clear requirement under the MPRDA Regulations.**

Some isolated references to monitoring have been made in the draft EMP with Part 9.5.3 that conveniently states that “*any significant impact must be reported immediately to Shell, and a written report shall be submitted on these incidents, including a root cause analysis*”. It is put forward that significant impacts should be identified by Shell themselves and immediately reported to the relevant authorities. Shell can surely not be trusted to be the regulating authority in this regard.

Measurements on the natural environment are vital throughout all stages and phases of a development and an understanding of the processes involved can only be arrived at if measurements are made (Strangeways, 2003). An example of a monitoring standard applicable to this application is the International Code of Practice (SABS ISO 5667-11:1993) for the sampling of groundwaters. This standard states that the purpose of sampling programmes for groundwaters is to survey the quality of groundwater supplies, to detect and assess groundwater pollution and to assist groundwater resource management. The following more detailed objectives of groundwater monitoring are given:

- To determine the suitability of groundwater as a source of drinking water or industrial/agricultural water and to monitor its quality during supply.
- To identify, at an early stage, the pollution of aquifers caused by potentially hazardous surface or sub-surface activities.
- To monitor and understand the movement of pollutants in order to assess their impact on groundwater quality and to calibrate groundwater models.
- To develop an understanding of groundwater quality variations, including those caused by deliberate actions.
- To collect data for pollution control law enforcement.

Detailed monitoring programs such as for groundwater monitoring as noted above could not have been developed by Shell/Golder in the absence of well site localities and monitoring has therefore been omitted from the draft EMP. **The draft EMP does not comply with Section 52 (2)(e) of the MPRDA Regulations in that proper monitoring and performance assessment has not been provided.**

3.12 Closure and environmental objectives

Section 52 (2)(f) of the MPRDA Regulations (2004) states that “*an EMP must substantially be in the standard format provided by the Department and must contain closure and environmental objectives*”.

Part 6.3 of the draft EMP (technical assessment on p. 101) refers the reader to Part 9 of the document as if closure and environmental objectives will be discussed in this Part. It is not. The only reference to closure in Golder’s draft EMP is in Part 8.5.5 under decommissioning. The closure and decommissioning phases are different phases of the lifetime of a project’s stage or activity and closure should not be dealt with under the decommissioning phase (see Table 4).

A detailed prediction and description of residual environmental impacts are required before decisions can be made pertaining to the impact of a development proposal on the environment, land owners or cultural heritage resources. Residual environmental impacts are defined by the MPRDA Regulations as “*the environmental impact remaining after closure*”. **The Shell/Golder draft EMP ignored Section 52 (2)(f) of the MPRDA Regulations as no closure or environmental objectives were provided.**

3.13 Financial provision

Section 39 (4)(a) of the MPRDA stipulates that the Minister must, within 120 days from the lodgement of an EMP, approve the EMP if the applicant has complied with Section 41(1) that deals with financial provision. Section (41)(1) basically requires that an applicant must make the prescribed financial provision for the rehabilitation or management of negative environmental impacts.

Section 52 (2)(d) of the MPRDA Regulations prescribes that an EMP must contain financial provision which must include:

- The determination of the quantum of the financial provision as contemplated in Section 54 that deals with compensation payable to the owner or lawful occupier of land.
- Details of the method providing for the financial provision as contemplated in Regulation 53. Regulation 53 continues to list 4 options with which financial provision can be made “*for the rehabilitation, management and remediation of negative environmental impacts*”.

Regarding the first point, there are few references to compensation in the draft EMP. Part 5.6 referred to compensation as a concern that was raised by stakeholders and it was stated in Part 8.5.2 that land owners of well sites may receive compensation through lease agreements.

It is furthermore stated in Part 10.2 that “*Shell will provide full compensation to any landowner with evidenced direct negative impact or loss on their land as a result of their activities*”. This commitment by Shell is considered to be worthless and shrewd as it places the proof of evidence on Karoo land owners. This proof may require very costly scientific investigations and protracted legal action that can easily surpass the value of their properties.

The draft EMP does not provide an amount that Shell has budgeted for the compensation of any land owner. The draft EMP also does not provide an amount that Shell has budgeted for the rehabilitation, management and remediation of negative environmental impacts. Part 10.1.1 dealing with financial provision shows an amount of R90 million that are allocated to exploration activities as shown in Table 5.

Table 5: Shell’s financial provision for decommissioning and rehabilitation

Activity	Cost (Rands)
Restoration of site and access roads	80 000 000.00
Monitoring, maintenance and management	2 000 000.00
Contingencies	8 000 000.00
Grand Total	90 000 000.00

The activities that are shown in Table 5 are standard costs that are associated with exploration activities and do not include a budget for the rehabilitation, management and remediation of negative environmental impacts. These impacts may include chemical spillages, leakages, gas blowout, fires, explosions, ground water contamination, reduction in ground water yield, surface water contamination, soil contamination, dust, gaseous emissions, road maintenance, erosion, etc.

Importantly, no budget has been allocated to compensate land owners for loss of agricultural production as a result of exploration activities or the lease of their properties as required by the MPRDA.

The draft EMP therefore does not comply with Section 39 (4)(a) of the MPRDA or Section 52 (2)(d) of the MPRDA Regulations.

4. ENVIRONMENTAL AUTHORIZATION IN TERMS OF NEMA (ACT 107 OF 1998)

The NEMA EIA Regulations and Listing Notices (GNR's 544, 545 and 546 of 18 June 2010) require that environmental authorization must be obtained before the commencement of a number of potentially detrimental activities. Golder/Shell only identified 2 activities that may require environmental authorization in terms of NEMA. These activities involve the transformation of land bigger than 1 000 m² per well site (Table 2 on p.24 of the draft EMP) and the construction of gas handling infrastructure (Table 3 on p.24 of the draft EMP).

The first activity (transformation of land bigger than 1 000 m²) as identified in the draft EMP will trigger a much less detailed and much less intensive route of application, which is the Basic Assessment route. No specialist studies are required for the compilation of a Basic Assessment and it therefore relies heavily on the expertise of the Environmental Assessment Practitioner, i.e. Golder Associates. The main difference between a Basic Assessment and an EIA resolves around the number of interactions with the regulatory authorities as well as the need for specialist inputs. This identified activity will only need authorization if the current land use is zoned as open space or conservation, otherwise no assessment will be necessary. It is assumed that most areas in the central precinct of the Karoo may be zoned as agricultural.

The second identified listed activity as identified in the draft EMP will only be triggered when Shell has performed hydrological fracturing, found significant gas resources and commences with the extraction, refining or processing. This activity may only be triggered during the Production/Development phase.

It is therefore believed that Shell may attempt, upon the granting of an exploration right, to commence with all activities related to exploration without the need for a Basic Assessment, Scoping Study or EIA.

4.1 Applicable listed activities not identified by Golder/Shell

A number of listed activities that may require environmental authorization by Shell, have been identified as part of this EMP review. These activities should be examined in consultation with the relevant authorities and are explained below:

4.1.1 Listing Notice 1 (GN R544 of 18 June 2010)

Activity 9

The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water -

- (i) with an internal diameter of 0,36 metres or more; or
- (ii) with a peak throughput of 120 litres per second or more,

excluding where:

- a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or
- b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.

This listed activity is for the construction of facilities or infrastructure for the bulk transportation of water in a pipe that exceed 1000 metres in length where 1) the peak throughput (maximum capability and not the planned throughput) is 120l/s (432 m³ per hour) or more and 2) the pipe has an internal diameter of 360mm or more.

It is stated in Part 5.4.4.1 of the draft EMP that the exploratory well diameter at surface will be 20 to 30 inches (508 to 762mm) and tapering down to 4 to 8.5 inches (101 to 215mm) at the deepest point, which may be 5000 metres deep. It can be expected with a large degree of certainty that at least 1000m of the exploration well will be cased with a pipe exceeding 360mm in internal diameter.

It is also stated in Part 5.6.1.1 of the draft EMP that the amount of water required for hydrological fracturing could be up to 6 million litres (6 000 m³) per well.

It is therefore put forward that the process of hydrological fracturing will trigger listed activity Number 9 of Listing Notice 1 (GN R544) because the well will be used for the bulk transportation of water into shale gas compartments.

Activity 13

The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.

The construction of facilities and infrastructure for the storage or handling of dangerous goods where the combined capacity exceeds 80 cubic metres gives rise to a listed activity. Again the *combined capacity* should include all Shell's facilities as part of this application. Dangerous goods as defined in SANS Code 10234 include explosives, flammable gases, flammable aerosols, flammable solids, flammable liquids as well as gases under pressure.

It is put forward that apart from surface handling facilities, the exploration well itself will be used for the storage and handling of dangerous goods.

Activity 22

The construction of a road, outside urban areas,
 (i) with a reserve wider than 13,5 meters or,
 (ii) **where no reserve exists where the road is wider than 8 metres**, or
 (iii) 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 Notice 545 of 2010.

New double-lane roads will definitely be required by Shell given the amount of vehicular traffic to and from exploration well sites.

Activity 23

The **transformation of undeveloped, vacant or derelict land** to – residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares.

The combined transformation of vacant land will exceed 20 hectares if all phases of the development are considered together as required by the NEMA regulations.

Activity 24

The **transformation of land bigger than 1000 square metres in size**, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule or thereafter such land was zoned open space, conservation or had an equivalent zoning.

This activity has been identified by Golder but with the proviso that existing land use will still determine whether environmental authorization will be required. It is presumed that most of the land in the central precinct will be zoned as agricultural. This means that Shell does not have to obtain environmental authorization for any activity, according to their draft EMP.

4.1.2 Listing Notice 2 (GN R545 of 18 June 2010)

Activity 3

The construction 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.

The combined holding capacity within one 5000m drilling well with an average pipe diameter of 20 inches may be up to 1 008.5 cubic metres. The well may therefore store dangerous goods with a capacity exceeding 500 cubic metres.

Activity 4

The construction 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.

Activity 5

The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the **generation or release of emissions, pollution or effluent** and which is not identified in Notice No. 544 of 2010 or 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 that Act will apply.

It is stated in the draft EMP that excess gas will need to be flared (burned off) at well localities, depending on local conditions.

Activity 6

The construction of **facilities or infrastructure for the 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 than 700 tons per day;
- (ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity more than 50 cubic metres per day.

Activity 15

Physical **alteration of undeveloped, vacant or derelict land** for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for:

- (i) linear development activities; or
- (ii) agriculture or forestation where activity 16 in this Schedule will apply.

Activity 18

The route determination of **roads** and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before 03 July 2006 and which have not been authorised by a competent authority in terms of the Environmental Impact Assessment Regulations, 2006 or 2009, made under section 24(5) of the Act and published in Government Notice No. R. 385 of 2006, **if**

- (i) it is a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998);
- (ii) it is a road administered by a provincial authority;
- (iii) the road reserve is wider than 30 metres; or
- (iv) **the road will cater for more than one lane of traffic in both directions.**

Activity 21

Any activity which requires an **exploration right** or renewal thereof as contemplated in sections 79 and 81 respectively of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

It is stated in the draft EMP that this activity has not been gazetted. However, the Transitional Arrangements under NEMA states that if a mining company's proposed activities trigger listed activities in terms of the NEMA EIA Regulations and/or the Waste Act and/or the Air Quality Act, the mining company must obtain the necessary approvals in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) and the NEMA and the EIA Regulations and the Waste Act and the Air Quality Act".

Activity 26

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), except where [Activity 28 in Notice No. R. 544 of 2010 applies] such commencement requires basic assessment in terms of Notice of No. R544 of 2010.

It is stated in the draft EMP that excess gas will need to be flared (burned off) at well localities, depending on local conditions.

4.1.3 Listing Notice 3 for specific geographical areas (GN R546 of 18 June 2010)

Activity 2

The construction of **reservoirs for bulk water supply** with a capacity of more than 250 cubic metres.

This activity is applicable in the Eastern Cape and Northern Cape provinces:

In a protected area identified in terms of NEMPAA, excluding conservancies;
Outside urban areas, in:

- (a) National Protected Area Expansion Strategy Focus areas;
- (b) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;
- (c) Sites or areas identified in terms of an International Convention;
- (d) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;
- (e) Core areas in biosphere reserves;
- (f) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.

The construction of **reservoirs for bulk water supply** with a capacity of more than 250 cubic metres.

In the Western Cape:

In a protected area identified in terms of NEMPAA, excluding conservancies;
In all areas outside urban areas.

The draft EMP or the Ecological study does not include an identification of the above-mentioned protected areas in the Western Cape section of the central precinct. Shell/Golder would therefore not have been able to predict the triggering of any listed activity within these specific geographical areas.

Activity 4

The construction of a **road wider than 4 metres** with a reserve less than 13,5 metres. In the Eastern Cape and Northern Cape provinces:

Outside urban areas, in:

- (a) A protected area identified in terms of NEMPAA, excluding conservancies;
- (b) National Protected Area Expansion Strategy Focus areas;
- (c) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;
- (d) Sites or areas identified in terms of an International Convention;
- (e) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;
- (f) Core areas in biosphere reserves;
- (g) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve.

In the Western Cape:

All areas outside urban areas.

Activity 10

The construction 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 metres.

In Eastern Cape and Northern Cape provinces:

Outside urban areas, in:

- (a) A protected area identified in terms of NEMPAA, excluding conservancies;
- (b) National Protected Area Expansion Strategy Focus areas;
- (c) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted
- (d) Sites or areas identified in terms of an International Convention;
- (e) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;
- (f) Core areas in biosphere reserves;
- (g) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;

In the Western Cape:

All areas outside urban areas.

Activity 12

The **clearance of an area of 300 square metres or more of vegetation** where 75% or more of the vegetative cover constitutes indigenous vegetation.

This is applicable throughout South Africa.

Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004.

Within critical biodiversity areas identified in bioregional plans.

Activity 13

The **clearance of an area of 1 hectare or more of vegetation** where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010.

This is applicable for the following areas throughout South Africa:

Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority.

National Protected Area Expansion Strategy Focus areas.

In the Eastern Cape, Northern Cape and Western Cape:

Outside urban areas, the following:

- (a) A protected area identified in terms of NEMPAA, excluding conservancies;
- (b) National Protected Area Expansion Strategy Focus areas;
- (c) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;
- (d) Sites or areas identified in terms of an International Convention;
- (e) Core areas in biosphere reserves;
- (f) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.

Activity 14

The **clearance of an area of 5 hectares or more of vegetation** where 75% or more of the vegetative cover constitutes indigenous vegetation.

In Eastern Cape, Northern Cape and Western Cape:

All areas outside urban areas.

Activity 19

The **widening of a road by more than 4 metres** or the lengthening of a road by more than 1 kilometre.

In Eastern Cape and Northern Cape provinces:

Outside urban areas, in:

- (a) A protected area identified in terms of NEMPAA, excluding conservancies;
- (b) National Protected Area Expansion Strategy Focus areas;
- (c) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted
- (d) Sites or areas identified in terms of an International Convention;
- (e) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;
- (f) Core areas in biosphere reserves;
- (g) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve.

In the Western Cape:

All areas outside urban areas.

Activity 26

Phased activities for all activities listed in Listing Notice 3 and as it applies to a specific geographical area, which commenced on or after the effective date of this Schedule, where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.

This stipulation applies to all the areas as identified for the specific activities listed in this schedule.

5. GENERAL COMMENTS

A number of serious shortcomings were noted in the draft EMP, which is recorded in this section. There may be some repetition with aspects listed in previous sections but these issues were still recorded because of subtle contextual differences.

5.1 Gas stimulation as part of exploration

The MPRDA (2002) defines an exploration operation as “*meaning the re-processing of existing seismic data, acquisition and processing of new seismic data or any other related activity to define a trap to be tested by drilling, logging and testing, including extended well testing with the intention of locating a discovery”.*

It is argued that the proposed geophysical studies as well as exploration drilling with the purpose of 1) identifying the shale layer and 2) for the detection of hydrocarbons - constitute the full process of exploration as intended under the MPRDA. The main aim of an exploration operation under the MPRDA should therefore be to define a trap of earth gas and not to commence with an operation related to the act of mining as defined by the MPRDA as a “*mining operation*”. The process of hydrological fracturing that is essentially a production tool, should therefore be excluded from this application for an exploration right.

It is stated in the draft EMP (p.1) that hydraulic fracturing will not be used if a shale layer cannot be found or if no hydrocarbons are detected. It is furthermore stated (p.2) that initial exploration will be performed in an effort to better understand the geology and demonstrate the existence of shale layers deep under the ground. It is furthermore stated that Shell’s well testing phase will include seismic surveys in the boreholes, data logging of the boreholes and the analysis of removed cores and rock cuttings. These activities without gas stimulation should serve to define a trap and locate a discovery as intended by the Act.

In terms of section 82 (1) of the MPRDA, a holder of an exploration right has the exclusive right to apply for a production right in respect of the petroleum and the exploration area in question. Experimental gas stimulation with an invasive and irreversible procedure such as hydrological fracturing should only be allowed later in the process when all site-specific impacts related to the chosen technologies have been fully investigated.

Shell admitted on p.3 of the draft EMP that even with the use of Soekor’s 1960s results, they may not encounter gas bearing zones with the exploration drilling programme. Meaningful exploration activities at this early stage should therefore focus on the objective of delineating gas bearing zones in the vastly variable geological formations of the Karoo. This means that well testing should only be done with the aim of locating a discovery as intended by the MPRDA.

5.2 Significance of downgraded impacts

Identified impacts of moderate significance as noted in Part 8 of the draft EMP were summarily downgraded by Golder to *low significance* on the basis of a biased assumption that all Shell's mitigating measures will be 100% successful. These far-reaching assumptions should not be made without clear scientific evidence and the precautionary principle that is enshrined in South Africa's environmental legislation should not be ignored.

There would be no environmental management required in the South African mining and petroleum industry if it was common practice to assume that all mitigation will be 100% successful.

5.3 No site-specific baseline information

Section 39 of the MPRDA (2002) stipulates that an environmental management plan (EMP) must be submitted in support of a prospecting right. This EMP must establish baseline information concerning the affected environment and investigate, assess and evaluate the impact of prospecting activities on the environment. There can be no substitute for the actual environment (site locality) where an activity is intended.

5.4 Basis for important financial provision calculations

The Minister may only approve an EMP in support of an application for exploration if it complies with Section 39 of the MPRDA (2002). Baseline environmental information of proposed drilling sites has not been included in the draft EMP. Section 41 (1) of the MPRDA requires that financial provision must be made for the management of negative impacts. Shell/Golder can surely not devise accurate protection, remedial and management measures for drilling sites as contemplated in Section 39 (3) (a) of the MPRDA, without knowing exactly where the impact will occur and which farmers will be affected.

5.5 Inadequate detail in the Figures and Plans

Figure 2 in the draft EMP shows the central precinct application area of 30 000 km² on a map to the scale of 1:1,500,000. The draft EMP states that Shell could choose to focus their initial exploration effort "*anywhere within this area*".

Sections 2 (2) of the MPRDA Regulations (2004) specifies a number of requirements for a plan in support of an exploration right application. This plan must be handed in along with Form M when an application is made for an exploration right. These requirements are as follows:

- A plan of the land to which the area relates must be signed by the applicant and dated (Section 2 (1)).
- The coordinates and spheroid of the land must be shown on the plan (Section 2 (2)(a)).

- The location and where applicable, the name and number of the land to which the application relates must be shown (Section 2 (2) (d)).
- Surface structures and registered servitudes, where applicable, must be shown (Section 2 (2)(g)).

Section 28 (2) of the MPRDA Regulations (2004) specifies that an application for an exploration right (Form M) must also be accompanied by a plan showing:

- A registered description of the area to which the application relates (Section 28 (2)(d)).
- Certified copies of the title deeds, where applicable, in respect of the area to which the application relates.

It is argued that this application for exploration drilling by Shell will have highly site specific consequences. The use of contentious gas stimulation technologies on specific farms will result in site specific impacts, which are important to role-players that may be affected in those areas.

I&AP's should have the opportunity to study plans with appropriate information as part of the public participation process. The EMP should therefore be accompanied by plans of an appropriate scale showing farm boundaries, roads, servitudes, coordinates, surface structures, farm names and farm numbers where Shell intends to access land.

This information has not been made available in the Golder/Shell draft EMP and it is not known if it has been supplied to PASA along with Shell's application form.

5.6 Massive size of application area

An approved exploration right is valid for a period of 3 years and can be renewed for three periods of two years each. i.e. 9 years in total. An exploration right holder then has the exclusive right to continuously conduct exploration activities and then lodge further applications for commercial exploitation of the resource after this period.

The relatively short 120 day period allowed for the completion of site specific environmental baseline studies should be viewed as a warning that it is not the intention of the MPRDA to cater for exploration right applications of the magnitude that Shell intended with their three applications in the Karoo. It is believed that the allotted 120 day period is adequate for a first application involving only the proposed geophysical surveys or/and limited vertical drilling.

5.7 Proposed EIA process not adequate to address all issues

On granting of an exploration right by PASA, based on the draft EMP under review, Shell may simply have to follow a generalised basic assessment, scoping or EIA process for two secondary issues that may include the transformation of land bigger than 1000m² to industrial land and the construction of gas infrastructure with a capacity of more than 50 m³ per day. Shell can easily circumvent the requirement of

environmental authorization for these listed activities by reducing the size or capacity requirements as published in the three Listing Notices under the NEMA Regulations (GN R544, GN R545, GN R546).

The drilling site selection phase, exploratory drilling or hydrological fracturing will then not be guided by any EIA process.

5.8 Stakeholder issues not addressed in the generic draft EMP

It is alleged in the draft EMP that *“the EMP process has seen widespread consultation with interested and affected parties through a multistage consultation process affording stakeholders the opportunity to engage with proponent and consultant teams early on in the process, and again during the period of stakeholder review of the draft documents”*.

Stakeholder involvement should focus on site-specific issues of importance and these issues should be communicated to all I&AP's in the EMP. A list of identified landowners as distributed as Appendix A along with the draft EMP does not suffice in this regard.

The I&AP issues should be evaluated concurrently with the various activities that may be undertaken during exploration. The concerned people of the Karoo took part in the consultation process with the hope to find out how the exploration activities may affect their site-specific livelihoods before an exploration right is issued to Shell.

If the generic EMP is approved by PASA in its current form, site-specific comments that these people willingly supplied as part of the process, will not have been considered in the EMP. I&AP's have the right to influence decisions that may affect their livelihoods.

5.9 Legally binding commitments in the EMP

Part 9 of the Golder/Shell EMP contains the Environmental Management Plan which will become legally binding on the applicant should the exploration right be granted. If legitimate site-specific I&AP concerns are not recognized in this section, they will not be addressed by Shell. The concerns were not adequately recognized in this section.

The closure phase that deals with all residual impacts after closure was completely ignored in Part 9 of the EMP with the result that Shell cannot be held accountable for any long-term damage to the environment, should this EMP be approved.

5.10 Conflicting statements in the draft EMP

It is stated in Section 3.2 - last paragraph that “Although the granting of an Exploration Right permits Shell to commence with exploration activities, certain activities associated with exploration will require Shell to first obtain other regulatory approvals from the relevant authorities prior to commencing with these activities”.

It is also stated in a contradictory statement in the overview of the legal context on p.17 that “this EMP only supports an Exploration Right application. Approval of the EMP does not permit Shell to undertake exploration borehole drillings, nor does it allow Shell to make a subsequent application for Production Rights. All these activities are subject to an independent regulator processes and approvals”.

The Golder/Shell draft EMP clearly attempts to downplay the importance of the granting of an exploration right. The holder of an exploration right has the following rights in terms of Section 5 and Section 82 (1) of the MPRDA:

- It grants the holder a limited real right in respect of the petroleum and the land to which such right relates.
- It grants the holder and their employees full access to the land to which such right relates and the holder may construct any infrastructure and bring any equipment required for exploration.
- It grants the holder a right to use water from any surface or ground water source on the land subject to requirements of the National Water Act (1998).
- The holder may carry out any activity incidental to exploration, which may include a vast number of secondary activities, i.e. use of access roads, removal of fencing, etc.
- The holder has an exclusive right to be granted a production right and its renewals.
- The holder has an exclusive right to remove and dispose of petroleum samples found.

It is important to note that the above rights will be awarded to Shell should their current application for an exploration right as supported by the draft EMP, be approved. The Golder/Shell draft EMP cunningly downplays the importance of this application.

5.11 Application for 4 minerals

Shell’s application for an exploration right includes an application for 4 “*minerals*”, which are gas and condensate, oil, natural gas and petroleum. The definition of a mineral in the MPRDA specifically excludes petroleum and the draft EMP therefore sometimes erroneously refers to an application for minerals.

5.12 Natural condition of petroleum

The definition of petroleum in the MPRDA refers to “*any liquid, solid, hydrocarbon or combustible gas existing in a natural condition in the earth’s crust*”. It is argued that the definition of petroleum as contained in the Act does not include unconventional shale gas that has to be subjected to an artificial hydrological fracturing process before becoming a liquid, solid, hydrocarbon or combustible gas.

5.13 Full EIA to be prepared

A statement in Part 4.1 of the draft EMP is confusing where reference is made to a full EIA that will still be prepared. It is mentioned in Part 4.1 that thorough baseline studies will still be undertaken during a full EIA phase and that only desktop studies were used for the preparation of the draft EMP. It is stated in other sections of the draft EMP that a basic assessment, scoping study or EIA will be prepared for 2 listed activities associated with hydrological fracturing.

Golder attempts to transfer the applicant’s obligation to address pertinent issues related to drilling and hydrological fracturing to some future process. It must be noted that the Basic Assessment, Scoping Study or EIA processes for environmental authorisation in terms of NEMA (1998) in respect to certain listed activities, will only focus on that listed activity, i.e. such as the construction of petroleum handling infrastructure. A Basic Assessment or Scoping Report refers to an abridged process where environmental authorization for certain activities can be obtained without much difficulty.

5.14 Downplaying of new road requirements

It is assumed by Golder throughout the draft EMP that no new roads will be constructed before the intended drilling operation is undertaken as stated in Table 2 and Table 3 of the draft EMP. It was also assumed that no road will be widened by more than 6m or extended by more than 1000m. The construction, widening and extension of access roads require prior environmental authorization under the NEMA Regulations.

The selection and full operation of 1 hectare drilling pads (as a minimum) on existing farm roads that average about 3m in width is not realistic. Existing roads are all there for a reason and it will be highly disruptive to road users if these access routes are congested by Shell’s traffic and well pad infrastructure. It can therefore not be assumed that “*no new roads*” will be constructed before Shell completes their investigations into potential drilling sites and before all I&AP concerns pertaining to roads are evaluated.

The construction of roads may in turn trigger other listed activities such as the clearance of indigenous vegetation, water crossings, re-alignment of power lines, etc.

5.15 Weather data of Beaufort West used

It is noted that no temperature, humidity, wind speed or wind direction related data were obtained for the central precinct. Golder undertook to perform a broad, regional investigation of baseline information in the study area. However, something specific such as weather data to be used in actual designs must not be geographically removed from the study area.

Beaufort West's weather data was used although this town is situated to the south-west and completely outside of the application area. There is a major mountain range that divides Beaufort West and the central precinct, which result in varying weather conditions between these two areas. This mountain range is shown on Figure 18 of the draft EMP. The eastern part of the central precinct is more than 300km from Beaufort West and this data could surely not be used for any calculations in the development of an EMP.

This omission may result in unreliable assessments of air quality and noise related impacts. The design of surface water infrastructure should also not be based on distant background data of precipitation, evaporation and adverse environmental conditions.

5.16 Confusion between precincts

It is stated in Part 4.4.1 of the central precinct draft EMP that the characteristics of Lithosols will be similar to the Lithosols of the central precinct (Golder 2011). This sentence is nonsensical and shows that some parts of the document have been copied between the different precincts. The broad background information as obtained per precinct is therefore broader than originally believed.

Figure 31 in the central precinct EMP incorrectly illustrates the possible areas within which suitable well sites may be located in the Western Precinct. This Figure should therefore be in another EMP.

5.17 Misleading soil study

It is stated in Part 4.4 of the draft EMP that four of the five soil types as identified in the central precinct are not favourable for agricultural utilisation. No comment pertaining to the agricultural potential of alluvial soils was made. This viewpoint can be perceived as a deliberate attempt by Golder to demonstrate to the regulators that the study area has no agricultural potential. Their assumption is based on information as interpreted from a soil classification map with a scale of 1:1,900,000 as presented in Figure 18. Much more reliable information pertaining to actual agricultural practices and areas under irrigation must be available for the study area.

The registered annual water use of 15.785Mm³ for the central precinct is almost entirely for agricultural use according to Part 4.7.1 of the draft EMP. There are 465 registered stock and irrigation water users as shown in Table 12.

5.18 Distinction between application areas

It is not always clear from the preliminary desktop studies whether a distinction is made between the 3 precincts. It is not clear whether statements such as “*information on the electrical conductivity of water from 2356 boreholes is available*” in Part 4.7.4 of the draft EMP refers to all three precincts or only the central precinct.

5.19 Historic buildings

Part 4.11.1 refers to possible historic buildings belonging to the early Trekboer period. All buildings older than 60 years are considered to be historic buildings that are protected. The Trekboer period was definitely more than 60 years ago with the result that all buildings for that period have historical significance.

5.20 License application area

Parts 5.3, 5.4.2 and 5.4.4 of the draft EMP refers to a license application area where the reference should have been made to an exploration right area for the South African context. This lapse may be indicative of the copying and pasting of information between similar American applications for gas exploration and this South African application.

5.21 Size of well sites understated

Infrastructure as proposed in the draft EMP for the one hectare (10 000m²) exploration well sites may include the following:

Storage bunkers for explosives (in compliance with the prescribed safety distances), fuel storage facilities with its bunding, lined storage space for at least 1 008.5 cubic metres of well cuttings and extracted drilling mud, drilling fluid storage, intercepted borehole water storage facility, fresh water storage for at least 6 000 cubic metres of water used during fracking, site offices, store, assembled drilling rig and its equipment, accommodation, domestic waste disposal facilities, restaurant, parking, storage for hazardous chemicals, silo's for Barite storage (clayey drilling chemical), steel pipe storage (5 000m x 20” average thickness pipe), power supply (generators), firebreaks, fencing, storm water infrastructure, internal roads, facilities for the handling of emergencies, gas burners for flaring of unwanted gas (including safety distances), storage for removed topsoil.

It is put forward that one hectare well site areas may be insufficient and that Golder/Shell understated this requirement in an effort to prevent triggering listed activities (amount of natural vegetation to be disturbed) in this regard.

5.22 Volume of drilling mud that will be generated

It was calculated that for each metre of a 5000m deep exploration well with an average diameter of 20" (508mm), 201.7 litres of drilling mud will be generated. Even without undertaking hydrological fracturing, a total of 1 008 500 litres of potentially flammable drilling mud will need to be stored on site. A minimum estimate of 1 008.5 cubic metres of storage space/disposal space will therefore be required. This figure does not include the amount of water that will be intercepted during drilling or the water used during drilling that may add to this total. Impacts associated with this volume of drilling mud have not been addressed.

5.23 Storage of dangerous goods in the wells

A completed exploration well may comply with the definition of a storage facility for dangerous goods and a bulk water supply pipeline during the hydrological fracturing process. The borehole will need to be constructed in such a way that pressurized gas can be kept safely enclosed in it without escaping. Such an exploration well may therefore comply with the description of "*a facility for the storage and handling of dangerous goods*" as described in the NEMA Regulations. Each borehole may therefore trigger a listed activity pertaining to the storage of dangerous goods.

5.24 Impacts related to a proposed central supply base

It was noted that a central supply base would have to be established, which will not be at the well localities. Potential impacts relating to this facility has not been addressed anywhere in draft EMP.

5.25 Cumulative impacts and total size of disturbed areas for well drilling pads

Golder/Shell craftily attempts to circumvent the triggering of area-related listed activities under NEMA by dealing with each drilling site in isolation. Their assessment of potential listed activities in Part 3.4.1 of the draft EMP therefore represents individual well pads.

Listed activities that deal with the clearance of natural vegetation are ignored in the draft EMP on the basis that each drill site (in isolation) will be below the area requirements as stipulated in NEMA. The combined size of disturbed land should be used cumulatively during all phases of the development.

5.26 Uncertain amount of exploration wells

It is stated in the draft EMP that 8 wells may be drilled per precinct area but no commitment pertaining to this number is given anywhere in the document. It is suspected that this figure may be nothing more than a deception that refer only to the very first vertical exploration wells and that the maximum required amount of exploration and appraisal wells will be drilled per precinct area.

5.27 Transitional arrangements in NEMA relating to exploration

Transitional arrangements by the Department of Environmental Affairs and Development Planning as published in the Guideline on Transitional Arrangements, EIA Guideline and Information Document Series (August 2010) reads as follows:

“With the empowering provisions in NEMA in terms of the provisions relating to prospecting, mining, exploration and production and related activities not yet having come into effect, the provisions of the amended NEMA EIA Regulations and Listing Notices and the activities in the Listing Notices relating to prospecting, mining exploration and production and related activities will only come into operation 18 months after the date of commencement of the Mineral and Petroleum Resources Development Amendment Act, 2008 (Act No. 49 of 2008)49”.

It is further stated that: *“Until such time as these provisions come into effect, prospecting and mining activities per se are for all intents and purposes not (yet) listed. However, any operation related to prospecting and mining that constitutes listed activities in terms of the EIA Listing Notices (Listing Notice 1, 2, and 3) and/or a waste management activity and/or an atmospheric emission licence activity will require environmental authorisation in terms of NEMA and the EIA Regulations and/or the Waste Act and/or the Air Quality Act”.*

“Therefore, if a mining company’s proposed activities trigger listed activities in terms of the NEMA EIA Regulations and/or the Waste Act and/or the Air Quality Act, the mining company must obtain the necessary approvals in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) and the NEMA and the EIA Regulations and the Waste Act and the Air Quality Act”.

Compliance with the transitional arrangements was not shown in the draft EMP.

5.28 The use of sea water, saline ground water or acid mine drainage

Reports that Shell is investigating the use of sea water, saline ground water or acid mine drainage as potential sources of water supply during drilling and hydrological fracturing refers.

Saline water will cause rapid corrosion and decay in steel and concrete with a significantly raised risk of well and gas holding infrastructure failure. It is also not a good idea to import highly polluted water for use close to unspoiled surface water and ground water resources.

5.29 Similar applications by Falcon Oil & Gas and Bundu Gas

It cannot be a coincidence that a number of applications for exploration rights are being prepared in the Karoo region at one time. The list of applicants includes Shell Exploration Company, Falcon Oil & Gas as well as Bundu Gas.

All the EMP's in support of these applications are now being prepared in isolation and the combined impact on the Karoo and its people is not being considered by anyone.

5.30 Golder Associates as an independent environmental practitioner

Golder Associates was the appointed consultant for a recent application by Advasol in the Southern Cape. Golder released a statement in the Burger newspaper (p.8; Friday 16 July 2010) that drilling during the exploration phase including hydrological fracturing will have little or no impact on the environment.

This statement was repeated in the EMP which was prepared by Golder and submitted to PASA in support of Advasol's application. In this Golder document it was also incorrectly alleged that the dewatering of groundwater aquifers in the Stilbaai region will have no impact on ground water yield. No independent specialist studies were performed in support of these public statements by Golder. The following questions are therefore raised:

- Is it ethical for an environmental practitioner, who should be unbiased by law (NEMA; 1998), to blatantly promote their client's cause without the back-up of scientifically credible evidence?
- Can Golder Associates be trusted to be making an unbiased assessment of environmental consequences pertaining to the Shell application?

5.31 Inadequate consultation

The draft EMP is not clear, accurate or detailed enough to highlight potential impacts on the role-players in the Karoo. Role-players would still be misinformed pertaining to real issues, even if they were given adequate time to peruse the documentation. A broad, generalized EMP will generate broad, generalized comments, which will be of little use when the activity commences.

5.32 Carbon emissions from shale gas

Coal, oil and gas as used for electricity generation have very large carbon footprints as compared with any other energy source because they are fossil fuels that are being burned. Studies in the UK indicated that carbon emissions from oil and gas is approximately half of that of coal but this cannot be extrapolated to South African conditions where coal quality may be superior or where gas quality may be inferior and cause high methane emissions to the atmosphere.

Total carbon emissions should be calculated for the entire lifecycle of a project and emission calculations cannot be generalized throughout the industry.

The carbon footprint of a power plant that is fed by a nearby coal mine may therefore be lower than that of a gas powered power plant where energy inputs may be high during exploration, extraction, transport, processing, maintenance, plant operation and distribution.

The impacts of coal as a fossil fuel throughout the lifecycle of coal fired power stations are well known in South Africa with many mitigating technologies that have been developed successfully for local conditions. A life-cycle assessment should be performed on a new energy source such as the shale gas in the Karoo before misleading statements can be made that it is a clean source of energy (Part 2.1.3).

5.33 South African legislation and gas stimulation

It is believed that new legislation is required to regulate gas stimulation technologies in South Africa before it can be allowed to commence. Hydrological fracturing and its potential consequences on the environment and human health are currently not properly regulated by SA legislation. Guidelines by the USEPA are mostly irrelevant for South Africa's unique conditions and local expertise must still be developed to identify, analyze, record, monitor and interpret risks and adverse consequences before they occur.

It is indicative of a flawed process and unsound reasoning that Golder Associates supports hydrological fracturing during the gas exploration stage and then recommends in the same paragraph that USEPA findings should be awaited before commencing with the production stage (Part 11.2 of the draft EMP).

Sent electronically

.....
Fritz Bekker
Clean Stream Environmental Services

1 April 2011