

Requirements in an Application & Assessment of Environmental Effects (AEE) for an applied Resource Consent for Hydraulic Fracturing- January 2013

Assessment of Environmental Effects Requirements

The following information is drawn from a draft Council report: *Guide to regulating oil and gas exploration and development activities under the Resource Management Act (November 2011)* and may be subject of change.

An application to discharge hydraulic fracture fluids to land at depth under the Resource Management Act 1991 (RMA) must be accompanied by an Assessment of Environmental Effects (AEE) report. Section 5.1 of the report sets out the RMA requirements for a discharge in more detail. The purpose of the AEE is to determine the likely adverse effects that the activity will have on the environment and how these effects can be avoided, remedied or mitigated. The AEE should present such detail as corresponds with the scale and significance of the effects the activity may have on the environment (RMA section 88 (2)). Section 88 and the Fourth Schedule of the RMA sets out what should be included in an AEE. The following is a possible outline of a comprehensive AEE in the Taranaki region recognising under section 88 (2) the AEE could be less comprehensive and may not contain all the information outlined below:

1. Introduction
 - 1.1 Background
 - Brief description of drilling history of site and any abandoned wells
 - Brief description of previous and current consents applied for by applicant.
 - 1.2 Site Location Information
 - Well site location address, map reference and grid reference
 - Catchment area.
2. Resource Consents Sought
 - Description of proposed activity(s)
 - Which rules in the Regional Freshwater Plan apply to the activity .
3. Related Consents
 - More detailed description of related resource consents sought which are relevant to the proposed programme (e.g., air discharge, stormwater, etc.).
4. Existing Environment
 - 4.1 General Location and Topography
 - Map showing location of well site(s)
 - Description of the topography of the land.
 - 4.2 Land Use

- Brief description of surrounding land use activities.
- 4.3 Vegetation and Wildlife
- Description of any significant native vegetation in the immediate area
 - Details of any scenic or recreation reserves, Regional or National parks in the immediate vicinity of the site.
- 4.4 Adjacent Water Ways
- Location of adjacent waterways in relation to the well site (shown on a map).
- 4.5 Geohydrology and Ground Water Resources
- Description and location of aquifers/water abstractions within the area of interest
 - Details of the freshwater/saltwater interface (FW/SW I)
 - Resistivity logs, if available, and other data that support the depth determination for the SW/FW I.
 - Petrophysical evaluation
 - Geology, lithology and overpressure contaminant (provide a schematic showing geologic formations identifying impermeable and laterally persistent units, any faults or shear zones, and the FW/SW interphase)
 - Description of the geologic formations and dominant lithology within the area
 - Description of formation properties including permeability and pressures
 - Geologic logs (including SP, resistivity, sonic)
 - Gamma ray logs.
- 4.6 Faulting
- Analysis of known faults within the area .
5. Description of Proposed Activity
- As required by section 1(a) of Schedule 4 of the RMA.
- 5.1 Overview of proposed HF stimulation programme
- Description of the HF process
 - Indicative HF stimulation programme – details to include planned execution timeframe, number of HF treatments/well , target interval depth range (including the location of casing perforations in 3 dimensions in terms of NZMG co-ordinates and true vertical depth in metres below ground)
 - Modelling and use of ‘mini-frac’ results to calibrate the model, conceptual design (e.g., fracture pressure)

- Fracturing fluid fate modelling techniques used (e.g., proppant concentration diagrams and interpretation of models and diagnostics)
- Assessment of modelling or tracer techniques used or reasons for not using tracers
- Well integrity pressure testing (when it happened, what the results were)
- Operational procedures
- Results of previous of HF operations in similar formations and data in graphical form of: tubing pressure (psi), slurry rate(bpm), bottom hole proppant concentration (bpm), grid oriented hydraulic fracture extension replicator surface predicted pressure(psi), grid oriented hydraulic fracture extension replicator predicted bottom hole proppant concentration (lb/gal), borehole gauge pressure (psi), surface proppant concentration (lb/gal), grid oriented hydraulic fracture extension replicator predicted bottom hole pressure(psi), grid oriented hydraulic fracture extension replicator predicted slurry rate (bpm), grid oriented hydraulic fracture extension replicator predicted surface proppant concentration (lb/gal); prior to, during and after each hydraulic fracture treatment
- Detail the procedures to be carried out during the HF stimulation programme and the sequence of operations.

5.2 Well Construction and Design (well integrity)- noting many of these details are the responsibility of MOBI (formerly Department of Labour) under the Petroleum Regulations and would only be included for interest and completeness reasons

- Provide details of well construction, materials used and relevant standards
- Details of cementing practices, including cement bond logs and interpretation
- Outline of pressure test results and interpretation
- Well construction diagram
- Details of ongoing life cycle well monitoring
- Well maintenance programmes and procedures
- For old wells that are subject to HF treatments the assessment needs to focus on the condition of the well casing and cement as this can slowly deteriorate over time
- Consideration of any abandoned wells in the vicinity and their condition.

5.3 Details of HF Stimulation Fluids

- Provide details of the composition of the fluids to be used in the stimulation

- Briefly describe the function of each fluid component
 - Provide MSDS sheets for all products/chemicals used
 - Provide an estimate of fluid volumes to be used, expected return flow period and volumes.
- 5.4 Subsurface Monitoring
- Provide details on the proposed diagnostic tools to be used
 - Monitoring and modelling of fracture extent (half-length)
 - Monitoring and modelling of fracture extent
 - Assessment of modelling and tracer techniques used or reasons for not using specific techniques
 - Any other analytical tools or process monitoring data that will demonstrate the fate of injected fluids, proppant and the fracture growth (e.g., well annulus pressure).
- 5.5 Waste Management
- Detail how return fluids will be managed on-site. Include details on the storage, transport and disposal of waste fluids. Relevant construction standards for storage vessels and testing carried out should be included. Noting these matters are the responsibility of other regulatory agencies and could be included for interest and completeness reasons.
6. Assessment of Environmental Effects and Mitigation Measures
- As required by Sections 1 of Schedule 4 of the RMA. To assess the actual or potential effect on the environment and to outline mitigation measures, which will help prevent or reduce the actual or potential effects on the environment.
- 6.1 Potential Adverse Environmental Effects
- Detail the potential environmental effects relating to the proposed activity. To include, but not be limited to, the issues identified in 6.2 below.
- 6.2 Potential Contamination of Freshwater Aquifers
- Leakage due to defective well installation/operation
 - Leakage through geologic media
 - Leakage or improper handling of chemical or wastewater
 - Risk of well blowouts
 - Detail both the physical and process/procedural mitigation measures that will be implemented for each of the above to ensure actual or potential contamination will be avoided. May include details of the integrity of overlying geologic seals, results of testing undertaken on formations and the wellbore, standard operating procedures, planning and design, construction standards, quality control and assurance, on going process

monitoring, alarms and response procedures. This may also include an assessment of the condition of nearby abandoned wells as a possible pathway for HF fluids and gas leakage to the surface.

6.3 Chemical Handling and Waste Management

- Detail procedures for chemical handling, including the delivery, transport and storage of chemicals. Include standard operating procedures, construction details and relevant standards for storage vessels, bunding, and approved handler certification. Recognising these matters are the responsibility of other regulatory agencies and could be included for interest and completeness reasons.
- Provide details of plans and procedures to be carried out in the event of a spill
- Provide details of any attempts made to minimise the volume and toxicity of chemicals being used in stimulation fluids
- Outline the wastes to be produced on-site and expected volumes
- Detail procedures for the handling, storage, transport and disposal of waste materials.

6.4 Use of Water

- Provide an estimate of potential water use volume
- Provide details of where water will be sourced
- Detail any measures implemented to reduce water usage on-site.

6.5 Potential Seismic Effects

- Assess the risk of the proposed activity inducing seismic activity
- Detail any seismic or vibration monitoring to be carried out.

6.6 Positive Environmental Effects

- Detail the positive impacts of the proposed HF stimulation activities.

6.7 Assessment of Alternatives

- Provide a brief assessment of any potential alternative location for the activity or HF stimulation methods.

6.8 Consultation and Affected Parties

- Provide details of any parties deemed to be affected by the proposed activities and any consultation undertaken.

7. Regulatory Context

7.1 Regulatory Background

- Brief description of section 104 of the RMA and description of additional documents which must be considered in assessing the application (Part II of the RMA, NPS, RPS etc).

7.2 Part II of the Resource Management Act

- Assessment of how the proposed activities are in accordance with Part II (Sections 5, 6, 7 and 8) of the RMA.
- 7.3 National Policy Statement - Freshwater Management
- Assessment of how the proposed activities are in compliance with the relevant objectives outlined in the NPS for Freshwater Management. In particular objectives A1 and A2.
- 7.4 Regional Policy Statement for Taranaki
- Assessment of how the proposed activities are in compliance with the relevant policies outlined in the RPS for Taranaki .
- 7.5 Regional Freshwater Plan for Taranaki
- Assessment of the activities against the relevant polices and rules in the Regional Freshwater Plan and justification as to why the activities comply with the policies
 - In particular the following policies should be looked at: 4.1.1 to 4.1.6, 5.1.1, 5A.1.1, 5A.2.1, 6.2.1 to 6.2.7, and 6.5.1 to 6.5.5.
8. Conclusion

An Assessment of Environmental Effects (AEE) in support of hydraulic fracturing discharge applications for four well sites in the Kapuni Field, prepared by Shell Todd Oil Services Ltd, is provided on the Council's website (www.trc.govt.nz) as an example of a comprehensive AEE.