

1. Introduction

- 1.1. My name is Mark William Brockelsby. I hold a Bachelor of Science (Earth Sciences) degree from Waikato University and a Post Graduate Diploma of Science (Geology) from Otago University. I am employed by the Waikato Regional Council (“the Council”) and have worked for the Council or its predecessor organisations (Waikato Catchment Board and Waikato Valley Authority) for over 25 years. Over most of that time I have worked in the regulatory arm of the Council (the “Resource Use Group”) and have held various positions of responsibility within that Group including the position of Programme Manager, Energy. In that role, I was responsible for managing the Council’s regulatory functions in relation to the energy-related operations, including geothermal operations, in the Waikato Region. One of my present roles in the Group is Programme Manager, Consents in which I have overall responsibility for consent processes at the Council. In addition, I have also held positions of responsibility in the Council’s Policy Group. This included, during 1996-97, the position of Manager, Regional Plan Development. My role in that position was to manage the development of the Council’s first comprehensive regional plan under the Resource Management Act.
- 1.2. My work experience and background have involved a high level of involvement in resource management issues associated with geothermal resources. Specifically, these include direct involvement in consent investigations and reporting relating to the development of the Wairakei–Tauhara, Mokai, and Rotokawa Geothermal Systems and drilling and investigations in the Wairakei-Tauhara, Ngatamariki, Mangakino, Reporoa and Horohoro Systems. I was the reporting officer for ECNZ’s (Contact Energy’s predecessor) consent applications relating to development of the Te Mihi part of the Wairakei-Tauhara System in 1994 and for the applications and subsequent appeals by Contact Energy in relation to the Tauhara Geothermal Field, applications which were finally granted by the Environment Court in late 2000.
- 1.3. I was the Council’s reporting officer to the Council, and to the Environment Court on appeal, in relation to the applications by Contact Energy Ltd for the re consenting of their operations in the Wairakei-Tauhara Geothermal System. The Council hearing considered 24 consent applications and was conducted over a total hearing time of approximately 42 days during 2004. Six of these consents were appealed and heard by the Environment Court in 2006/07.

- 1.4. I have been provided with a copy of the Code of Conduct for Expert Witnesses in the Environment Court Consolidated Practice Note 2006 and have read and agree to comply with that Code. Except where I state that I am relying upon the specified evidence of another person, my evidence in this statement is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions which I express.

2. Scope of evidence

- 2.1. My evidence addresses the following matters:
- A general description of the applications;
 - A summary of Waikato Regional Council's submission to the applications;
 - Comments on the applications in the context of the relevant policy and regulatory framework;
 - Comments on effects;
 - Comments on proposed consent conditions.
- 2.2. My evidence relies on policy and technical evidence provided by the following:
- Dr Arnold Watson (geo-scientific matters)
 - Dr Bruce Graham (air quality matters).

3. The applications

- 3.1. The applications sought are:
- 3.1.1. to discharge, by reinjection, up to 95,000 tonnes per day ("tpd") of geothermal water and other waste fluids into the Wairakei-Tauhara Geothermal System;
 - 3.1.2. to discharge by irrigation up to 6,500 tpd of cooling water blowdown and condensate onto land in a defined area of land in the northern part of the application area;
 - 3.1.3. to discharge up to 20 cubic metres per day of sewage effluent into the ground from on-site sewage treatment and disposal systems at the proposed power station site;
 - 3.1.4. to discharge contaminants to air from the proposed station;
 - 3.1.5. to discharge contaminants to air from the Poihipi Rd Station; and
 - 3.1.6. to discharge contaminants to air from the Wairakei Steamfield.

3.2. Terms of 35 years are sought for all consents.

4. Waikato Regional Council's submission

4.1. Waikato Regional Council lodged a neutral submission to these applications. The submission notes that the proposal is within a geothermal system categorised as a "Development Geothermal System" and that the Environment Court has recently granted suites of consents to Contact Energy and Geotherm Group Ltd for ongoing and proposed operations in the system which establish a framework for future management and development of the system. It notes that the purpose of lodging the submission is to promote consistency with Council's policies and the existing regulatory regime established by the Court. This evidence is in support of that submission.

5. Comments on the applications in the context of the relevant policy and regulatory framework

5.1. The applications before the Board require to be considered in the context of the existing policy and regulatory framework.

5.2. Council's geothermal policy has only recently been finalised having been the subject of intense debate and refinement by the Council and Environment Court over the past 3-4 years, through the First Schedule process. This has involved input from many stakeholders including Taupo DC, Geotherm Group, other geothermal developers and Iwi and stakeholder groups. In my opinion, the resulting policy provides a clear and robust basis for the future management of geothermal resources in the Region.

5.3. In 2001, Contact Energy applied for resource consents to authorise most of its ongoing operations in the Wairakei-Tauhara Geothermal System, namely the Wairakei and Poihipi Power Stations and associated steamfields. These applications were publicly notified, received some 200 submissions and were heard by the Council during 2004. The consent hearing, which stretched over some 9 months, ran in parallel with the early stages of the First Schedule process for the Council's geothermal policy. The decision on the consent applications in late 2004 granted all but one of the consents sought, subject to a comprehensive range of consent conditions.

- 5.4. The Council's decision was subsequently appealed by several parties to the Environment Court. The following fundamental policy and "effects" issues were addressed at great length in evidence during the appeal hearing:
- whether the proposed volume of fluid to be extracted was consistent with sustainability of the geothermal resource;
 - what the driving force behind subsidence was;
 - what further land subsidence was likely to occur, where it might occur and what effects the predicted subsidence would have;
 - what operational strategy should be employed to address subsidence and how this strategy should be reflected in consent conditions;
 - what other consent conditions should be imposed to remedy or mitigate subsidence;
 - whether full injection or reinjection of used geothermal fluid should be required;
 - whether any outfield injection of fluid should be permitted;
 - what effects monitoring should be required.
- 5.5. As set out in Mr Bromley's evidence at paragraph 4.2, a key requirement that emerged from the Environment Court's decision was the requirement to maintain a minimum pressure of 56 bars as measured in the Waiora Formation in wells TH1 and TH3. (Note that there is no maximum pressure, or allowable rate of pressure increase specified, a matter I will refer to later). This reflected the Court's conclusions that avoidance of the adverse effects of subsidence should be the primary objective for future management of the various discharges in the System and that pressure change in the reservoir was a fundamental driving force behind subsidence.
- 5.6. The priority given to avoiding subsidence is reflected in condition 3.6 of the General Conditions (GCs) imposed by the Court. This requirement is the cornerstone of the Discharge Strategy required by GCs 3.1 and 3.2 and is critical to the future management of the system overriding other considerations such as facilitating the extraction of energy and avoiding adverse effects on geothermal features.
- 5.7. In addition to the above requirement, the Court imposed conditions which:
- require the establishment of a technical Peer Review Panel to assist Waikato Regional Council in its regulatory role;
 - set out requirements in relation to the kaitiaki role of local hapu;

- establish a damage remediation process (including for subsidence related effects);
- specify management planning, modelling and reporting requirements;
- identify monitoring requirements;
- require the establishment of a \$5m bond (primarily as a back-up to the damage remediation conditions);
- which require inter-operator consultation and documentation of procedures to manage issues of mutual concern (conditions which are triggered in the event of multiple operators in the System);
- enable the periodic review of conditions in response to changing circumstances over time;
- require certain conditions to remain in place until 20 years after the consent expiry date (ie 2046).

5.8. Viewed together, in my opinion, the conditions constitute a robust, comprehensive and enforceable framework for the ongoing regulatory management of the Wairakei-Tauhara Geothermal System. The conditions were formulated with a “whole System” approach in mind and therefore provide a basis within which other developments in the System, can be accommodated. This is exemplified by the consents granted by the Court to Geotherm Group which are aligned and integrated with the Contact consents and many of the conditions are common to both operations.

5.9. In my opinion, a similar approach is applicable here. The applications now before the Board can be viewed, to a large extent, as an “overlay” of further activities within an existing regulatory framework in which most of the appropriate priorities, limits, requirements, and safeguards have already been established.

5.10. I therefore support the general approach as set out in Mr Daysh’s evidence to the development of consent conditions for this project i.e. based on, and closely integrated with the existing Contact consents as the starting point, and complemented as required with further conditions to address further or different effects that may arise. In that way, for example, further reinjection as now proposed should be subject to the requirements under GC 3 of the existing consents which provides for all discharges to be brought within a Council-approved Discharge Strategy which, as noted above, has as its primary objective the need to address the adverse effects of subsidence.

- 5.11. In my view, there are few questions of fundamental resource management policy raised by these applications. In this regard, the geothermal policy context and the relevant considerations therein have been addressed in detail in the evidence of Mr Chrisp for the applicant and I concur with his evidence. In particular, I concur with his opinion, and his supporting reasons, that the proposal is consistent with the relevant objectives and policies of both the Waikato Regional Policy Statement and the Waikato Regional Plan.
- 5.12. Finally, there are, in my opinion, two very significant resource management benefits which flow from the grant of these consents and which very much align with the Council's wider resource management objectives.
- 5.13. The first of these benefits is the earlier and/or greater removal of contaminants from the Waikato River than would otherwise occur under the relevant existing resource consents. In this regard, the sole reason for the reinjection consent sought is to enable the disposal of separated geothermal water (up to 60,000 tpd) and condensate (up to 35,000 tpd) both of which are currently authorised to be discharged to the river until 2026. The removal of these waste waters will result in a significant improvement in the quality of the Waikato River. These improvements are referred to in Mr Chrisp's evidence at paragraphs 42-45 and I concur with his summary of the facts.
- 5.14. The second significant benefit is greater productive efficiency, compared to that achieved by the existing Wairakei Power Station, from the use of the same amount of geothermal resource – quantified in Mr Pummer's evidence (paragraph 7) as an additional 60 MW (net).

6. Comments on Effects

- 6.1. There are, of course, the specific effects of several new or changed activities to be considered and in this regard I have sought the advice of Dr Arnold Watson on geothermal resource management matters and Dr Bruce Graham on air quality matters. My conclusion, based on their evidence, is that there are no adverse effects likely to arise from these applications which cannot be managed through conditions, either new specific conditions or through the general conditions that apply to Contact's existing consents and with which it is proposed that the Te Mihi consents be integrated .

6.2. With regard to potential effects of the proposed reinjection of 95,000 tpd into the System, Dr Watson's evidence is that:

6.2.1. Professor O'Sullivan's modelling does not adequately alleviate concerns about potential effects on Geotherm's proposed development because it does not model the possible influence of faults in the area. Dr Watson goes on to suggest that one approach the Board may wish to consider is the establishment of a buffer zone to restrict reinjection close to Geotherm's property. I comment further on that possibility below;

6.2.2. he has a general concern that rapid pressure increase in the area beneath Taupo may potentially give rise to undesirable subsidence effects and that there may be benefit in restricting the rate of reinjection, or the allowable rate of pressure increase in this area, at least until more is known, via the research currently underway, about the specific cause(s) of subsidence. As noted earlier, there is no explicit restriction on pressure increase in GC 3.6. I comment on Dr Watson's suggestion below;

6.2.3. the proposed reinjection does not cause a change in the life of the field over that which would otherwise occur, to an extent that raises any concern from a resource sustainability perspective. I agree with Dr Watson's assessment on that matter particularly when any such change is weighed against the increased productive efficiency of the use of the resource.

6.3. With regard to potential effects on air quality, Dr Graham's evidence is that the effects of contaminant discharge to air, of which the principal contaminant of concern is H₂S, will be minor and in fact less than the effects from the existing Wairakei Station which Te Mihi will progressively replace.

6.4. Neither the condensate irrigation nor the sewage disposal proposed are, in my view, likely to result in any more than minor effects provided the conditions suggested in Mr Daysh's evidence are complied with.

7. Comments on proposed consent conditions

7.1. I have had discussions with Contact on the proposed conditions as set out in Mr Daysh's evidence and aside from several issues which I address below I am

supportive of those conditions being imposed should the Board decide to grant these consents.

7.2. Avoidance of effects on Geotherm's development

7.2.1. In its submission, Geotherm Group Ltd has raised the possibility of reinjection by Contact, either directly as a result of the Te Mihi consents or by the Te Mihi consents in combination with the existing reinjection consents held by Contact, adversely affecting the exercise of Geotherm's consents.

7.2.2. As noted above, Dr Watson has considered Contact's evidence concerning the possibility of adverse effects on Geotherm and has commented that Professor O'Sullivan's modelling does not adequately alleviate concerns about this potential effect because it does not model the possible influence of faults in the area. He has gone on to suggest a buffer zone as a possible means to provide separation between Contact's reinjection and Geotherm's production.

7.2.3. I am aware that there may be legal reasons why the Board is unable to consider this adverse effect. I am also aware that there may be practical reasons why a "buffer zone" requirement in the conditions may be ineffective – in particular, because the existing suite of consents already allows reinjection right up to the boundary. And, of course, the Board may decide that the evidence regarding the scale and likelihood of adverse effects does not warrant any response to this potential effect.

7.2.4. Those are matters for the Board to consider and obviously the suggested approach below is contingent on its determinations about those matters. Suffice to say, from a regulator's perspective, it would be advantageous if any such potential interference effects were avoided or minimised where practicable. Subject to the Board's determinations as noted above, I am therefore supportive of a buffer zone condition for reinjection in the vicinity of the Geotherm property.

7.2.5. Such a condition could be devised such that any restriction would apply only for a period of time that would reasonably enable the Geotherm project to get underway. If it was not underway by that date, the

restriction on Contact's reinjection could cease. I note that the main take and discharge consents held by Geotherm Group (104980 and 104981/82) both lapse 6 years after their commencement if they are not exercised ie 27/3/2013. Whatever duration may be deemed to be suitable for the project to get underway, the lapse date would appear to be an appropriate upper time limit. Definition of a minimum scale of operation may also be appropriate so as to avoid a small-scale operation unnecessarily constraining Contact's reinjection options.

7.2.6. In the event that Geotherm's proposed development does get underway, Dr Watson has suggested tracer testing by Contact to test the possibility of fault connection from Contact's reinjection back to Geotherm's production area.

7.2.7. The need for, and design of, that testing would presumably depend upon a number of factors that are currently unknown such as the location and extent of Contact's reinjection and the relative configurations of the production and reinjection wells. As such, the details of tracer testing may be a matter best left to be addressed at the appropriate time. In that regard, I note that under the GCs all new reinjection wells are required to have tracer tests undertaken within the first year of operation (refer Schedule Two, G). That, in combination with GC 6.7 requiring investigations and surveys to be undertaken by the consent holder as required by Waikato Regional Council, would appear to provide the necessary authority for the Council to require the testing as suggested by Dr Watson to be carried out. If that testing demonstrated potential adverse effects of concern, action (eg. restricting reinjection rates and/or locations) could then be taken by way of a s128 review of conditions.

7.3. Restriction on pressure increase beneath Taupo

7.3.1. In response to Dr Watson's concerns regarding the potential for increased subsidence as a result of increased reservoir pressure, the Board may wish to consider some form of explicit restriction on the allowable rate of pressure increase in the Taupo area. As noted by Dr Watson, this may have the effect of further constraining Contact's options for disposal of reinjectate, so obviously a workable balance has

to be found. It is assumed Contact will address this matter in rebuttal evidence.

7.3.2. If the Board considers this a significant concern, it may also choose to allow the Council to address the matter, via the Peer Review Panel, in line with the existing regulatory framework as, in my opinion, the existing General Conditions already enable pressure restrictions to be applied. While GC 3.6 does not explicitly provide for a limit on the rate of pressure increase over time, under GC 1.6(f)(viii) the Peer Review Panel has a function to make recommendations to Council as to changes needed to the target pressure regime having regard to the primary objective of the Discharge Strategy (ie. the need to address the adverse effects of subsidence). GC 3.9 requires Contact to report pressure trends and progress towards achieving the target pressure regime on a 3 monthly basis. GC 3.10 then enables the Council, at any time, to require or allow changes to the Discharge Strategy and explicitly includes possible changes to the target pressure regime (GC 3.10(a)). That would appear to enable the Council, on the recommendation of the Peer Review Panel, to impose a limit on the allowable rate of pressure increase (thereby potentially limiting reinjection) in the Taupo area.

7.4. Air quality monitoring condition

7.4.1. Proposed condition 3 of consent 116789 (Te Mihi Power Station discharges to air) sets out ambient air quality monitoring proposals for H₂S. It specifies that the monitoring

“...shall be carried out for at least six months prior to the commissioning of the new power station and continue for a period of at least three years after commissioning of each stage of the power station.”

7.4.2. I consider that the condition should be reworded to require the monitoring to be undertaken for the duration of the consent. Air quality, and in particular the potential nuisance effects of H₂S, is a stated concern of a number of submitters. With the commissioning of Rotokawa II, Te Mihi and possibly a new station at Tauhara in the next few years, ambient H₂S levels in the general locality will increase. In

the event that H₂S becomes a local nuisance issue, ongoing monitoring at the proposed stations will be extremely useful from a regulatory perspective in identifying actual H₂S levels that are occurring in the locality, and potentially, in determining the likely origin of those effects.

- 7.4.3. It is nevertheless acknowledged that to date, the Council is unaware of any complaints concerning H₂S levels in the area and that, even with the commissioning of future power stations, H₂S is only ever likely to result in nuisance (rather than health) impacts. Accordingly, it is suggested that the condition should also provide for the ambient monitoring to be scaled down or suspended, at the approval of the Council (ie. without necessitating a s127 change application).

7.5. Review condition

- 7.5.1. In my opinion there is a need for a further specific s128 review provision. The consent conditions proposed in Mr Daysh's evidence links the Te Mihi consents to the General Conditions in the existing Wairakei consents (refer conditions 1 and 2 of consents 116786 and 116787 respectively). However, Contact seeks terms of 35 years for their Te Mihi consents whereas the consents to which the General Conditions referenced attach, expire on 30/6/2026. There is therefore a need to ensure that there is provision for reviewing the Te Mihi consents, prior to the expiry of the existing Wairakei consents, to ensure continuity of the relevant requirements under the General Conditions. Accordingly I propose that the following further condition be imposed on consents 116786 and 116787:

In addition to the two yearly reviews provided for by condition x hereof, the Waikato Regional Council may within the six months prior to 31 March 2026, following service of notice on the consent holder, commence a review under section 128(1) of the Resource Management Act 1991 of the conditions of this resource consent for the purpose of anticipating the expiry of Waikato Regional Council consent 104718 and if appropriate imposing additional conditions in lieu of the General Conditions applying to resource consent 104718.

7.5.2. I also note a difference between condition 2 of 116786 and condition 1 of 116787, namely the omission in the former of a sentence addressing possible inconsistency between the conditions of the new reinjection consent and the General Conditions. For clarity and consistency, that sentence should be added to condition 2 of 116786.

A handwritten signature in black ink, appearing to read "M. B. Weledly". The signature is written in a cursive style with a large initial "M" and a long, sweeping tail on the "y".