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Our Ref: 7.00261



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Dear Sir/Madam

Proposed National Policy Statement for Renewable Electricity Generation – Geothermal Policy Questions

Thank you for your questions relating to Environment Bay of Plenty's Energy Policy planning; in particular the geothermal provisions. The questions you have asked are:

- 1 Can you confirm that Environment Bay of Plenty will take the same planning approach as Waikato Regional Council in relation to its geothermal policy
- 2 Will Environment Bay of Plenty be undertaking the same level of work as Environment Waikato did in finalising the plan provisions? Can you provide a list of studies performed?

Taking these questions in turn:

- 1 **Will Environment Bay of Plenty use the same planning approach as Environment Waikato?**

Environment Bay of Plenty is taking the same planning approach as Environment Waikato for the Regional Policy Statement and the Regional Plan provisions, insofar as the resource issues are the same in both regions.

The only area of difference is where we find that the resource and management circumstances vary from those faced by Environment Waikato and thus no relevant policy exists in their framework. Management of the Rotorua geothermal field is such an example, where what would normally be regarded as a protection field has been subject to development, thus policy for Rotorua must reflect the need to manage limited production in a field with a strong requirement to manage the intrinsic value of the surface features.

2 Will Environment Bay of Plenty undertake the same level of work as Environment Waikato to finalise the plan provisions?

The resource that both regional councils manage shares a common geological basis – the Taupo Volcanic Zone, both are managing in the Resource Management Act context, thus the planning and management principles for that resource are substantially the same.

Environment Bay of Plenty does not intend to replicate the background work Environment Waikato used for justification of its planning regime and the resultant planning provisions it uses. This has been robustly tested through the environment court quite recently (August 2007).

To finalise the planning provisions, the changes that Environment Bay of Plenty proposes to make to the Regional Policy Statement and the regional plan provisions must be done through a Resource Management Act Schedule 1 process. We cannot predict entirely what concerns will be flushed out in the submission process, but those canvassed by the existing energy generators using geothermal heat sources are unlikely to differ from what was expressed in the Environment Waikato process. Environment Waikato is seeking comment on the draft provisions for next generation Regional Policy Statement, and feedback from their discussion draft (August 2009) is that all those with a significant interest in the geothermal provisions would like them to remain the same.

Environment Bay of Plenty has sourced and undertaken studies to identify and classify the resource and its surface expressions within the Bay of Plenty. A considerable number of studies have been carried out the Rotorua resource to characterise what resource is available for use after the near collapse of the field in the 1980's.

3 Can you provide a list of studies performed?

Apart from policy development for the Rotorua field, Environment Bay of Plenty will be relying on the Environment Waikato planning, policy and legal opinions for background on policy development. An electronic copy of their section 32 record has been sent to Nicholas Vincent at Ministry for the Environment.

In terms of classifying fields in the Bay of Plenty for the level of use, this exercise was done for the development of the geothermal chapter of the Regional Water and Land Plan.


In terms of determining the level of use that will result in the maintenance of surface features in the Rotorua field, this has been done via extensive field modelling in association with field monitoring. The consultation process and titles of the reports used in developing the plan are attached as annex 1. The most recent document used to inform the plan for field management is "Rotorua Geothermal Field Management Monitoring Update: 2005" D A Gordon, B J Scott and E K Mroczek. This is enclosed.

Finally, you requested a copy of the Bay of Plenty Regional Policy Statement. This was made operative in 1999 and is now being reviewed.

- A copy of the geothermal section of the operative RPS is attached as Annex 2. The entire RPS can be found at <http://www.envbop.govt.nz/Knowledge-Centre/Operative-Regional-Policy-Statement.aspx>

- Also attached as Annex 3 are draft provisions for the geothermal chapter of the 2nd generation RPS, due to be released for comment as a draft later this year. You will note that although the format varies from that of Environment Waikato, the objectives policies and methods are very similar.

Yours faithfully



Mary-Anne Macleod
Group Manager Strategic Development

Attachments:

- 1 Consultation record and report titles used in developing the Rotorua Geothermal Plan
- 2 Geothermal chapter of Bay of Plenty Operative Regional Policy Statement.
- 3 Draft Geothermal provisions for Bay of Plenty 2nd generation Regional Policy Statement.

Annex 1

Rotorua Geothermal Regional Plan - Operative 1999

Consultation record and report and references used

3.4.2 Consultation

- 3.4.2(a) Project Initiation: Early 1991;
- 3.4.2(b) Technical Report Released: October 1992;
- 3.4.2(c) Public Meeting: 17 February 1993
- 3.4.2(d) Inhouse "Think-Tank" Workshop: 18 February 1993
- 3.4.2(e) Registration of Unregistered Geothermal Users: 27 March 1993
- 3.4.2(f) First Interest Group Workshop: 29 June 1993
- 3.4.2(g) Geothermal Meeting with Te Arawa Representatives: 15 July 1993
- 3.4.2(h) Peer Review Workshop: 30 September 1993
- 3.4.2(i) Second Interest Group Workshop: 20 October 1993
- 3.4.2(j) Environment B·O·P Workshop: Morning 16 November 1993
- 3.4.2(k) Adoption by Resource Planning Committee: Afternoon 16 November 1993
- 3.4.2(l) Further consideration of amendments by Resource Planning Committee: 14 December 1993
- 3.4.2(m) Adoption by Environment B·O·P 16 December 1993

3.4.3 Reports and References

In compiling this regional plan, the following documents were referenced:

- 3.4.3(a) The Resource Management Act 1991.
- 3.4.3(b) The Proposed Environment B·O·P Regional Policy Statement.
- 3.4.3(c) Rotorua Geothermal Field: Response of field since closure (1987 - 1992), Environment B·O·P Technical Publication No. 7, October 1992.
- 3.4.3(d) Preliminary Report on the Te Arawa Representative Geothermal Resource Claims (WAI 153), Waitangi Tribunal Report: 7WTR
- 3.4.3(e) Treaty of Waitangi Claims and the Geothermal Resources of the Bay of Plenty; Report to the Bay of Plenty Regional Council, Raukura Consultants, June 1993.

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- 3.4.3(f) Geothermal Overview Report 1991; Environment B·O·P Technical Publication No. 4, August 1991.
- 3.4.3(g) Geothermics Special Issue 1992; Rotorua Geothermal Field, Edited by Rick Allis and Tom Lumb, Pergamon Press.
- 3.4.3(h) Inventory of New Zealand Geothermal Fields and Features; Houghton BF, Lloyd EF, Keam RF and Johnston DM, 2nd Ed. 1989, GSNZ Misc. Publication No. 44.
- 3.4.3(i) Inventory of Important Geological Sites and Landforms in the Bay of Plenty Region; Kenny JA and Hayward BW, 1st Ed. 1993, GSNZ Misc. Publication No. 70.
- 3.4.3(j) Taking the Waters, Early Spas in New Zealand; Rockel I, GPO 1986.
- 3.4.3(k) Tourism Sector in the Rotorua District Economy, Prepared for RDC by APR Consultants, December 1991.
- 3.4.3(l) Rotorua District Economic and Business Development Plan, August 1992.
- 3.4.3(m) Geothermal Resources, a policy and management framework, Ministry of Energy, 1986.

Annex 2

Geothermal chapter of Bay of Plenty Operative Regional Policy Statement

10 Geothermal Resources

10.1 Background

The geothermal assets of the region are unique and valuable. They include the energy potential of geothermal fields and the intrinsic, taonga and tourism values of surface activity and features. Considerable damage has already occurred to a number of geothermal surface features and ecosystems. For example, only one of the five geyser fields present in the Taupo Volcanic Zone in 1840 remains today (Whakarewarewa). Geothermal features and ecosystems in the Bay of Plenty are undervalued by the local community in that the international significance of the features and ecosystems is not appreciated. However, it is of major importance to the region and New Zealand that councils, other management agencies, tangata whenua, all users and the wider regional community, manage and protect these regional treasures and sustain their unique and valuable qualities.

The landforms produced by volcanic activity are among the youngest in New Zealand, the most recent ash fall deposits coming from the Tarawera eruption in 1886. Geologically, the whole volcanic area has been altering and reforming as the result of magma flows and ash ejection over the last 260,000 years, with much of the activity having taken place within the last 50,000 years, relatively recent in geological time. Volcanism is caused when hot magma bodies move upward through the earth's crust and lie close to the surface. Depending on the chemical composition of the magma, together with its viscosity and gas content, the magma will either flow out over the surface as lava flows or eject violently to form ash, pumice deposits and ignimbrite. It is the collapse of the ground surface subsequent to high volume ejections that have caused the caldera formations now occupied by many of the Rotorua lakes, in particular, Lakes Rotorua and Tarawera.

The magma bodies, or parts of them, can persist for many thousands of years beneath and at the edges of caldera and other volcanic formations, usually at about 5 km depth. Thermal energy from these bodies spreads into surrounding rock where it can heat deep groundwater. Over time, heated groundwater and gases move upwards towards the surface in up-flow zones. At locations such as Whakarewarewa and Waimangu, hot geothermal fluid and gases are discharged through surface features such as hot springs, geysers and fumaroles.

The geothermal resources of the region comprise geothermal energy derived or derivable from and produced within the earth by natural heat phenomena, all geothermal water, and associated geothermal surface features. The whole system of heat source, up-flow of heated groundwater (geothermal fluid), surface features and fluid, steam and gas emissions is called a "geothermal

field" when well-defined by scientific investigations. When natural features or cursory scientific studies indicate the possibility of a geothermal resource at depth, such a system is known as a "geothermal prospect". A "geothermal area" is an intermediate category supported by extensive though incomplete scientific studies but not subject to deep drilling and testing. The approximate locations of the region's geothermal resources are shown on Map 10.

Sustainable management of geothermal resources means managing these resources in such a way that the potentials, qualities and attributes are retained and protected.

This approach to sustainable management will mean that some geothermal fields are likely to be protected from extractive use. Other fields will be available for use and development within the constraints of providing for the protection of significant features and values, and avoiding, remedying or mitigating any adverse effects. This requires a knowledge of each field's geology, hydrology and other climatic factors, and its thermal dynamics including possible connections with other fields, and a sound understanding of the consequences of not achieving a defined sustainable equilibrium between the natural renewal of the resource and its natural outflows and use.

Geothermal activity and features such as geysers, fumaroles, mud pools and hot springs can only continue to play if the field pressure is maintained at a level that enables a healthy natural outflow. In the Rotorua area, geothermal activity and features are taonga of immense value to iwi of Te Arawa and to the regional tourism industry. The protection of outstanding geothermal features such as these from inappropriate use and development is a matter of national importance (refer section 6(b) of the Act).

Apart from volcanic events, people's interaction with geothermal fields has been the main source of destructive effects. From a human perspective, the utility value of geothermal energy is attractive and commercially desirable. However, there are other values that must be considered in the overall context of geothermal resources.

Firstly, there is the intrinsic value of the geothermal features and the specialised ecosystems that have developed around them. Secondly, there are the amenity, recreation and tourism values that have evolved as a result of the geothermal features, landforms and ecosystems. The economic value of the resources is also significant; industries utilising the energy potential of geothermal resources have made a significant contribution to the economic and social development of the region. With prudent management, the renewable nature of geothermal resources will enable current and future generations to obtain beneficial use of the resources.

If the region is to develop its considerable geothermal energy resource, it is vital that the identification of features requiring protection be undertaken and completed as quickly as practicable. Where geothermal features and taonga are identified as requiring protection, the field may be made unavailable for large scale energy production. However, where there are no directly linked

surface features, the field would likely be available for energy extraction subject to the assessment of other possible effects.

The significance of the region's geothermal resource to Maori must be recognised, respected and provided for in relevant plans developed under the Act. Maori have advised Environment B.O.P that only those iwi that have mana whenua over land that has geothermal features can name and identify the taonga status of those features and the associated mauri of the field they come from.



The strategic management of the effects of the use, development and protection of geothermal resources will be a primary function of regional plans, the preparation of which will be guided by this Statement. This will require an integrated co-operative effort, consultation and understandings between Environment B·O·P, district councils, tangata whenua, users and the wider regional community.

Management policy will need to cover the effects of fluid and energy extraction on geothermal fields and features, the effects of geothermal development and hazards, any effects on the environment caused through the discharge of geothermal fluid, and socio-economic consequences on people and communities.

As could be expected for a resource for which there are many competing demands, interested parties are determined that the process for managing the use, development and protection of geothermal resources should be open and fair.

10.2 Geothermal Issues

The issues are:

- 1 If natural geothermal features are not identified, described and registered, they may be lost.
- 2 Geothermal activity, features and values can be degraded through decreases in geothermal field pressure and physical destruction, by inappropriate development, commercial exploitation, misuse, and the lack of appropriate management.
- 3 There is an ongoing need to identify, explore, quantify and understand the geothermal resources of the region.
- 4 Geothermal fields can be adversely affected when the net outflow of energy (natural and extracted) exceeds the net energy input (natural and reinjected).
- 5 Extraction of geothermal energy or fluid can destroy geothermal features and taonga.
- 6 The relationship between geothermal resources available for allocation and the protection of surface activity and features is not always understood.
- 7 Until the values associated with geothermal resources of the region are defined, opportunities for beneficial use may be overlooked.
- 8 Allocation and distribution regimes which are not demonstrably fair and consistent may affect user expectations of certainty with respect to the long-term allocation and availability of the resource.
- 9 Geothermal resources can be used inefficiently and wasted.
- 10 The lack of an established basis for allocating geothermal resources can contribute to inefficient or unsustainable use.

- 11 The lack of understanding of linkages and interconnections between geothermal fields within the region and across regional boundaries could result in the misallocation and degradation of the resource.
- 12 Inadequate information about the dangers of geothermal features and bores can endanger people and developments.
- 13 The discharge of waste geothermal fluids and gases can adversely affect the environment.
- 14 Failure to reinject extracted fluid, gases and condensate can deplete some fields' potential.
- 15 Increasing demand for extraction of geothermal energy threatens the existence of geothermal surface features and ecosystems.

10.3 Objectives, Policies and Methods

10.3.1 Geothermal Features

10.3.1(a) Objective

Geothermal features and qualities including a diversity of geothermal ecosystems, flora and fauna, and land forms and surface features contributing to the natural character of geothermal systems, are protected from inappropriate use and development.

10.3.1(b) Policies

- 10.3.1(b)(i) To sustain and protect from inappropriate use and development geothermal ecosystems, their taonga, heritage, amenity, intrinsic and natural values and associated unique species and ecosystems.

10.3.1(c) Methods of Implementation

Environment B·O·P will:

- 10.3.1(c)(i) Work with other relevant agencies to establish and maintain a comprehensive register identifying and describing each geothermal field within the region.
- 10.3.1(c)(ii) Research and describe, in a regional context, geothermal fields containing geothermal features and associated ecologies.
- 10.3.1(c)(iii) Classify, in conjunction with other relevant agencies, the sites of geothermal features and adapted ecologies, with particular regard to scenic, cultural, spiritual, scientific, intrinsic and ecological values.
- 10.3.1(c)(iv) Require that no part of the region's geothermal resources may be used or developed unless such use or development is authorised by the provisions of a regional plan or by a resource consent. To guide resource users and to assist in the preparation of regional plans and the assessment of resource consent applications, protection levels apply to each geothermal field, area or prospect in the region as follows:

Geothermal Protection Level I:

Complete preservation of the natural, intrinsic, scenic, cultural, heritage and ecological values of the following geothermal resources:

- (a) Waimangu/Rotomahana/Tarawera;
- (b) Whakaari/White Island; and
- (c) Moutohora Island (Whale Island).

Geothermal Protection Level II:

Protection and rehabilitation of the natural, intrinsic, scenic, cultural and heritage values by increasing the geothermal field pressures and the appropriate conservation management of surface features:

- (a) Rotorua

Geothermal Protection Level III:

The use (including abstraction) of geothermal resources, including the known geothermal resources listed hereunder and excluding those in Geothermal Protection Levels I and II, shall not be authorised unless the adverse effects of the activity can be avoided, remedied or mitigated to comply with the principles of sustainable management as determined by a regional plan, or a resource consent application process, and there are no adverse effects on Geothermal Protection Levels I and II geothermal resources:

- (a) Kawerau;
- (b) Lake Rotoiti;
- (c) Rotokawa/Mokoia Island;
- (d) Tikitere/Ruahine;
- (e) Taheke;
- (f) Rotoma/Tikorangi;
- (g) Rotoma/Puhi Puhi;
- (h) Mayor Island;
- (i) Tauranga/Mount Maunganui;
- (j) Papamoa/Maketu;
- (k) Matata;
- (l) Awakeri;
- (m) Pukehinau; and
- (n) Manaohau.

10.3.1(c)(v) Review the preservation and protection levels established in the preparation of a regional water plan.

10.3.1(d) **Explanation/Principal Reasons**

Although geological inventories of the region's geothermal assets have been compiled, there is no comprehensive mechanism for identifying geothermal features that have significance in other value systems. To establish any realistic management strategy for the protection of geothermal features of the region, Environment B·O·P requires a current register and description locating each geothermal site with geothermal surface features. Without a current register, development impacts and effects can not be accurately assessed or predicted.

With guidance from the purpose and principles and heritage provisions of the Act, a classification of geothermal sites and features should be established and qualifying sites protected. A description and analysis of each site containing geothermal features is required to provide for categorising of sites and perhaps ranking of or otherwise prioritising site qualities and values. The description should include both active and

inactive features and geothermal ecologies. Unique and significant features are especially important and the description should give an indication where possible of how sensitive each feature would be to fluctuations in field pressures, both natural and through draw off.

Policy has been established to protect existing surface features and to give management direction to developers. The associated method establishes three protection level categories for known geothermal fields, areas and prospects. The categories are revised versions of those set by the former Bay of Plenty Regional Planning Scheme.

10.3.2 Use and Allocation

10.3.2(a) Objective

The sustainable management of the use, development and protection of the region's geothermal resources.

10.3.2(b) Policies

10.3.2(b)(i) To allow for the use and development of a geothermal field provided that the field's potential, qualities, attributes and values are sustained having regard to –

- (a) The net effects on the field;
- (b) The protection of outstanding natural features, landscapes, significant indigenous vegetation and significant habitats of indigenous fauna;
- (c) Iwi kaitiaki principles and taonga of the field; and
- (d) The reasonably foreseeable needs of future generations – subject to the protection levels established in method 10.3.1(c)(iv).

10.3.2(b)(ii) To ensure effective liaison and co-ordination between resource management bodies responsible for cross-boundary geothermal field management including affected territorial authorities.

10.3.2(b)(iii) To encourage efficiencies in the use of geothermal resources and discourage wastage.

10.3.2(b)(iv) To allocate regional geothermal resources on the basis that allocation does not exceed the amount reasonably required.

10.3.2(b)(v) To promote multiple use of extracted resource in order to maximise the benefits derived from the resource provided that reinjection requirements are not compromised.

10.3.2(c) Methods of Implementation

Environment B•O•P will:

10.3.2(c)(i) Determine which geothermal resources are available for use and development, and those requiring protection.

10.3.2(c)(ii) Acquire, establish and maintain, where practicable and as resources permit, contemporary modelling data covering each known geothermal field in the region.

- 10.3.2(c)(iii) Identify, and as practicable, quantify the amount of geothermal resource available for allocation from each field. Environment B·O·P may from time to time in accordance with statutory procedures vary the amount available at any location.
- 10.3.2(c)(iv) Require applications lodged for an activity using geothermal resources to be accompanied, as appropriate, with modelling and research data relating to field potentials, attributes and qualities, in such detail as corresponds with the scale and significance of the actual or potential effects, including subsidence, that the activity may have on the field and the environment. This may require staged exploration and testing prior to any development.
- 10.3.2(c)(v) Establish and, as appropriate, review sustainable use and development levels for each geothermal field in the region for which an authorisation to carry out an activity exists or is being sought.
- 10.3.2(c)(vi) Identify and establish the nature of linkages and interconnections between geothermal fields, including developing a modelling framework, as practicable, and assessing the consequences of inter-field relationships on surface features and ecologies.
- 10.3.2(c)(vii) Liaise with councils to ensure co-ordinated, integrated and sustainable management is achieved between interconnected geothermal fields.
- 10.3.2(c)(viii) Use education and the transfer of information to encourage the efficient use of geothermal resources.
- 10.3.2(c)(ix) Consider encouraging integrated field management by regional plan provisions including allowing, where appropriate, consortia or a single body to be permitted to take geothermal resources from any one field.
- 10.3.2(c)(x) Consider requiring, as appropriate, geothermal field development to be staged in order to establish field characteristics prior to full development.
- 10.3.2(c)(xi) Consider establishing, and as appropriate activate, geothermal resource buffers to compensate for natural, seasonal or other variation in field water levels and pressure.
- 10.3.2(c)(xii) Research and assess the practicalities, management effects, benefits and costs of providing for tradeable permits.
- 10.3.2(c)(xiii) Facilitate liaison and co-ordination between councils, appropriate Government agencies, the tangata whenua, users, and community interest groups on geothermal management issues and acquire contemporary local knowledge about geothermal resources through consultation.

District Councils should:

- 10.3.2(c)(xiv) Manage geothermal features and ecosystems on land administered by them in a way that protects their natural values.
- 10.3.2(c)(xv) Promote the protection of geothermal surface features and ecosystems through appropriate district and annual plan provisions.
- 10.3.2(d) **Explanation/Principal Reasons**

Given the sensitivity and value of geothermal fields, Environment B-O-P needs to have access to quality information in order to make informed decisions on the protection and sustainable management of geothermal resources and features, and the allocation of geothermal resource available for utility activities.

The public should have access to accurate good quality information about the region's geothermal resources in order to evolve commercial concepts relating to the resource, evaluate any environmental impacts and effects of geothermal resource development, and to generally participate in geothermal planning and management processes in an informed manner.

Without adequate knowledge of resource linkage and management of effects, there is the potential that protection of field features would be compromised. Without cross boundary co-ordination of planning effort, the management of linked resources would not be effective.

Geothermal resources are dynamic, renewable – but limited – resources. They also have a finite life which depends upon the rate that thermal energy is withdrawn from them. They can be used in a sustainable manner over a long period, or they can be destroyed by over-exploitation. To conserve field potentials it is essential that the delicate balance between natural inflow, rates of extraction and natural outflow is achieved. If surface activities and features are present, then sustaining these requires a rigorous management strategy that protects field pressure at a level that sustains the potential for surface activity.

Without careful, equitable and informed management of the region's geothermal resources, the sustainability principle cannot be achieved, the value of the resource and its features will be compromised and the resource made vulnerable to over exploitation and waste. With sound analysis and community participation through planning processes, the resource will remain a valuable asset into the future.

10.3.3 **Hazard Risk and Discharge Effects**

10.3.3(a) **Objective**

Risks associated with geothermal natural hazards are avoided or mitigated and the adverse effects on the environment of unnatural discharges of geothermal energy, fluid, condensates and gases are avoided or remedied.

10.3.3(b) **Policies**

10.3.3(b)(i) To ensure that effective measures are undertaken to avoid, remedy or mitigate any adverse effects resulting from development sites known to have high actual or potential geothermal hazard risk.

10.3.3(b)(ii) To encourage all resource users to use safe practices when using geothermal resources.

10.3.3(b)(iii) To ensure that the public, particularly tourists and developers, are made aware of the hazards associated with geothermal sites and the use of geothermal resources.

10.3.3(b)(iv) To ensure that any adverse effects of unnatural discharges of geothermal fluid, condensates and gases are avoided or remedied.

10.3.3(b)(v) To actively encourage geothermal fluid diversion or reinjection that returns fluid into its source reservoir, subject to an assessment of effects.

10.3.3(c) **Methods of Implementation**

Environment B·O·P and District Councils will:

10.3.3(c)(i) Require, with applications for resource consents, an assessment of geothermal hazard risk for any activity or development of land over or adjacent to geothermal resources, sites or features.

10.3.3(c)(ii) Ensure that managers of geothermal sites and facilities provide adequate warning to visitors (particularly tourists) who have access to those sites or facilities, about geothermal hazard risks.

Environment B·O·P will:

10.3.3(c)(iii) Investigate the feasibility of establishing a geothermal hazard register or map for each geothermal field used by or accessible to the public.

10.3.3(c)(iv) Actively encourage authorised bore owners to implement reinjection or downhole heat-exchange systems.

10.3.3(d) **Explanation/Principal Reasons**

Councils have a duty of care to protect the public from hazards. Tourists and others unfamiliar with the dangers of geothermal sites are particularly vulnerable. Developers should also be aware of geothermal risks associated with site development including buildings, particularly subsidence, hydrothermal incidence, corrosion and gas emissions. Without overstating the case, developers have a right to be made aware of any such geothermal hazards and effects that they may need to avoid, remedy or mitigate.

Apart from natural surface discharges, geothermal fluid can have severe effects on a receiving environment. Net withdrawal of fluid from geothermal aquifers also compromises field pressure and thereby the principle of sustainable management. With current technology, discharge to surface environments is generally an unnecessary and unjustified detrimental effect.

10.4 **Anticipated Environmental Results**

The anticipated environmental results are:

1. Better understanding of the location, extent and qualities of the region's geothermal resources.
2. Protection of the qualities, potentials and attributes of geothermal fields and maintenance of future options.
3. More precise and active identification, protection and maintenance of geothermal taonga, surface features and ecologies.
4. More certainty about which geothermal activities, features and ecologies will be protected, and why.

5. Best practicable distribution of geothermal resources available for allocation.
6. Recognition of and provision for the geothermal requirements of tangata whenua.
7. Efficient geothermal resource use.
8. Adverse effects on geothermal fields and the environment will be effectively avoided, remedied or mitigated.
9. More certainty about the availability of the large geothermal resources of the region.
10. Provision for the long term strategic management of the region's geothermal assets.

Annex 3

Draft Geothermal provisions for Bay of Plenty 2nd generation Regional Policy Statement

Geothermal

Objective	Policies	#	Methods	Pg
<p>Sustainable management of the Regional Geothermal Resource promoted by:</p> <ul style="list-style-type: none"> - Ensuring effective integrated management of geothermal systems; - Providing for the allocation of some of the geothermal resource for take, use and discharge, in a way that enables current energy needs and the reasonably foreseeable energy needs of future generations to be met, while avoiding, remedying or mitigating significant adverse effects on ; and - Protecting some characteristics of the Regional Geothermal Resource from significant adverse effects. 	<p>Understand geothermal resources and effects of their use by requiring high quality data, research and monitoring of the resource and effects of its use.</p>	1	<p>BOPRC facilitate investigation, research and monitoring of characteristics of geothermal systems, particularly significant features, and collate such resulting information by establishing and maintaining a comprehensive database identifying and describing each geothermal system with details on geothermal surface features and associated ecologies.</p>	1
			<p>BOPRC monitor state and trends for characteristics (particularly surface features and ecologies) of all geothermal systems that are not subject to large takes. Consent holders to monitor states and trends of systems subject to large takes.</p>	2
			<p>BOPRC Acquire monitoring and modelling information to develop holistic knowledge of geothermal systems, including identifying and establishing the nature of linkages and interconnections between geothermal systems and assessing the consequences of inter-system relationships on surface features and ecologies.</p>	3
			<p>BOPRC Acquire or establish contemporary models for each geothermal system in the region to identify and quantify the amount of geothermal resource available for allocation from each system.</p>	4
	<p>Recognise some geothermal features as Significant geothermal features, using the Heritage criteria, and annex X of significant features.</p>	2	<p>Define significant geothermal feature types in annex X of this policy statement.</p>	5
			<p>BOPRC Classify the sites of significant geothermal features and adapted ecologies using RPS heritage criteria [and annex X of significant features]. List and map significant geothermal features in regional plan [and district plans?] Characterise features as internationally, nationally, regionally and locally significant.</p>	6
			<p>Develop and implement monitoring programmes for surface features, including ecology.</p>	7
	<p>Information required when seeking consent to take, use or discharge to be commensurate with the scale of the activity and independently peer reviewed.</p> <p>Information developed for systems not subject to large takes commensurate with the threats to features from consumptive or non-consumptive use.</p>	3	<p>Through regional plan and resource consents require that relevant information regarding use and development of geothermal resources and of effects of such use and development are lodged with BOPRC. Commercially sensitive information to be identified so it can be filed appropriately.</p>	8
			<p>Through regional plan and resource consents for large takes require system management plans and regular monitoring and reporting of the effects of exercising consents, including the effects on significant features.</p>	9
			<p>Through resource consents require comprehensive monitoring programme to detect effects.</p>	10

Objective	Policies	#	Methods	Pg
<p>While providing for development and use [take, use, discharge] of geothermal fluid, heat and energy:</p> <ul style="list-style-type: none"> - Require that any use is sustainable and efficient. - Actively protect and maintain geothermal system values; their taonga, heritage, amenity, surface features, ecosystems, intrinsic and natural values. 	<p>Allow for the sustainable use of geothermal resources, by requiring that a geothermal system may only be used or developed if:</p> <ul style="list-style-type: none"> • such use or development is authorised by a regional plan or resource consent • such use is consistent with the protection levels defined in BOPRC geothermal system classification • operating under a steamfield management plan that is common to that entire geothermal system • system characteristics are established prior to anticipated full development (i.e. development may need to be staged) • allocation does not exceed the amount reasonably required • efficiency of use can be demonstrated. 	4	Through regional plans and resource consents require that the BOPRC geothermal system classification (Appendix X) be used to determine the management of each system.	11
			Through environmental education programmes increase public understanding and awareness of geothermal resource characteristics and their vulnerabilities.	12
			Through environmental education programmes increase public understanding of the hazards associated with geothermal sites.	13
			Encourage and assist landowners, occupiers, and community groups in areas with significant geothermal features and ecosystems to maintain and protect their natural characteristics and remedy and mitigate adverse effects.	14
			Through regional plan, district plans and in resource consents regulate new large takes and discharges and: <ul style="list-style-type: none"> • allow take and discharges provided there are no significant adverse effects • allow takes for scientific investigation or to remedy or mitigate existing adverse effects • ensure provision is made on the expiry and non renewal of consents for site remediation, abandonment of wells, removal of buildings and structures, including pipe work, associated with the development activity. • require the use of geothermal resources to be efficient in conserving geothermal energy and fluid. Prefer the use of energy-efficient and fluid efficient technologies over ad-hoc extraction for individual use.	15
	<p>Require integrated system management through use of a system management plan which must contain:</p> <ul style="list-style-type: none"> • System management objective • Operational flexibility and adaptive management • Reservoir and subsidence modelling • Discharge strategy • Mechanisms to ensure cooperation between all consent holders for large takes within the same geothermal system • Research, monitoring and reporting • Non-statutory review for minor amendments 	5	Through regional plans and resource consents require one system management plan per geothermal system. Ensure appropriate measures are included to remedy or mitigate significant adverse effects on significant features.	16
			For systems subject to [any] extractive use require applications lodged for an activity using geothermal resources to be accompanied by modelling and research data relating to system potentials, attributes and qualities, in detail corresponding to the scale and significance of effects that the activity may have. This may require staged exploration and testing prior to any development.	17
			For each system subject to [large scale] extractive use, BOPRC appoint a peer review panel of independent experts whose purpose is to: <ul style="list-style-type: none"> • assess the effects of the exercise of resource consents, compared to the system 	18

Objective	Policies	#	Methods	Pg
	<ul style="list-style-type: none"> • Peer review panel to assist consent authority • System liaison group (where necessary) 		<p>management plan objectives</p> <ul style="list-style-type: none"> • Recommend updates and review of the system management plan and resource consents that are operative within that system • report to BOPRC with findings. 	
			Through consideration, administration and review of resource consents, set up system liaison groups [where appropriate] to facilitate discussion with and feedback from stakeholders.	19
			Require geothermal resource buffers to compensate for natural, seasonal or other variation in system fluid levels and pressure].	20
	<p>Require injection/reinjection in accordance with a discharge strategy that considers the following matters:</p> <ul style="list-style-type: none"> • Dispose of waste fluid • Return waste fluid to the system • Facilitate further extraction of energy from system • Avoid/mitigate differential subsidence • Reduce risk of hydrothermal eruptions esp. in built environment • Remedy/mitigate significant adverse effects on significant features • Avoid/remedy/mitigate contamination of surface or ground water. 	6	<p>Through the regional plan require resource consent applicants to give effect to the policy by:</p> <ul style="list-style-type: none"> • preparing a discharge strategy • Requiring investigation, research, monitoring and reporting on implementation of the Discharge Strategy. 	21
	<p>Such Discharge Strategy shall also have regard to:</p> <ul style="list-style-type: none"> • The likely benefits to or significant adverse effects on the system or its productive capacity • The need for adaptive management and flexibility over time • The benefits, costs and significant adverse effects of the Discharge Strategy • The need to avoid or mitigate potential differential subsidence and remedy or mitigate the adverse effects of subsidence, particularly in the built environment , and • The need to reduce the risk of hydrothermal eruptions particularly in the 		Through regional plan and consent conditions provide for and actively encourage geothermal fluid diversion or reinjection [that returns fluid into its source reservoir] to minimise effects on freshwater and to limit subsidence and instability.	22

Objective	Policies	#	Methods	Pg
	built environment .			
	Recognise controlled depletion in large takes.	7	Through rules in the regional plan and resource consents for large takes manage controlled depletion through methods including but not limited to modelling assessments to determine appropriately stepped production.	23
	Restrict the take, use and discharge of energy and geothermal fluid to avoid significant adverse effects on significant features.	8	Through regional plan, district plans and in resource consents require system management plans to identify [potential?] significant adverse effects on significant features and remedy or mitigation to be undertaken.	24
	Promote efficient use of geothermal resources and discourage wastage, without compromising reinjection requirements.	9	Through environmental education programmes encourage the efficient use of geothermal resources.	25
	Prefer energy and geothermal fluid efficient technologies.	10		
	Provide for small takes, discharges, and non extractive uses which are not inconsistent with any approved System Management Plan.	11	Through the regional plan, district plans: <ul style="list-style-type: none"> • provide for small takes, discharges, and non extractive uses • allow the continuation of existing consents, provided the exercise of such consents not inconsistent with the relevant system management plan. 	26
	In Protected systems defined by the BOPRC geothermal system classification protect significant features by maintaining stocks and flows.	12	For protection Level I systems, through regional plan, district plan and resource consents: <ul style="list-style-type: none"> • protect natural flows of geothermal fluid from deep within the system to the surface • protect significant features and maintain life-supporting capacity/biodiversity of protected systems • allow continuation of legally established takes, provided there are no significant adverse effects • prevent new takes/discharges unless they are for scientific investigation or to remedy or mitigate existing adverse effects • seek remediation for past effects 	27
Development and use of land and non-geothermal water is compatible with use, development and protection of geothermal systems, so that significant features are	Ensure that development and use of land within geothermal systems is compatible with the purpose for which each system is classified, [using the BOPRC geothermal system classification (Appendix X)]	13	Require regional resource consent applications for use of geothermal resource and non-geothermal water use, and district resource consents for land use adjacent to features to address potential effects on these in the application.	28

Objective	Policies	#	Methods	Pg
protected from adverse effects of land use and use of non-geothermal water.			Promote preparation of growth management/other strategies, including provisions in district plans, to ensure that any new land uses and land use practices are compatible with geothermal systems.	29
			Through regional and district plans develop methods and in resource consents apply conditions that protect significant features from adverse effects of use of surrounding land and non-geothermal water.	30
			Require an assessment of geothermal hazard risk for all applications for resource consents involving activities over or adjacent to geothermal resources, sites or features.	31
			DC Manage geothermal features and ecosystems on land administered by them to protect their natural values.	32
			DC Promote the protection of geothermal surface features and ecosystems through appropriate district and annual plan provisions.	33