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GEOTHERMAL MANAGEMENT PLANNING

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ABSTRACT

Recently the Government reinforced the role of Regional Water Boards for allocating geothermal resources and preparing management plans for geothermal areas. The majority of geothermal fields of the Taupo Volcanic Zone (North Island, New Zealand) are located within the area administered by the Waikato Catchment Board (WCB).

This paper describes the strategy and the policies developed by the WCB for geothermal management planning. There is need for close interaction and collaboration between approving agencies such as the WCB, geothermal developers, local authorities, scientists, engineers and the public (including the Tangata Whenua) for the efficient preparation of Water and Soil Management Plans and their successful implementation.

INTRODUCTION

New Zealand's geothermal resources are not only important as a source of energy, but also possess significant intrinsic scientific, educational and historical values. As such they play an important role in our tourist industry and are of traditional cultural and spiritual importance to the Maori people.

Following decades of geothermal resource exploitation without a clearly defined policy and management framework, the government recently recognised the need to develop policy and planning recommendations for the effective use of New Zealand's geothermal resources. In 1982 the "Officials Geothermal Co-ordinating Committee (OGCC)" was established, whose final report (Ministry of Energy, 1986) was approved by the government in 1986.

The adopted policy reinforced the role of Regional Water Boards for allocating the geothermal resource and preparing management plans for geothermal areas. The report identified 12 geothermal fields with high management planning priority of which 9 are located within the boundaries of the Waikato Catchment Board (WCB), formerly the Waikato Valley Authority (WVA).See figure 1.

LEGISLATION

THE WATER AND SOIL CONSERVATION ACT 1967

At present there are a series of statutory approvals required prior to commencing a geothermal development. Obligations which have to be met are considered under various Acts, including:

- Geothermal Energy Act 1953 and Geothermal Energy Regulations 1961 (geothermal licence, safety aspects)
- Water and Soil Conservation Act 1967 (water rights)
- Clean Air Act 1972 (clean air licence)
- Town and Country Planning Act 1977 (planning consent)

Other statutory and non-statutory procedures of potential relevance to geothermal developments include:

- Reserves Act 1977 (land set aside as reserves)
- Conservation Act 1987 (historical and/or archaeological sites)
- Environmental Act 1986 (balanced view of environmental systems, including principles of the Treaty of Waitangi)
- Environmental Protection and Enhancement Procedures (preparation of EIR/EIA)

The Geothermal Energy Act (administered by the Ministry of Energy) vests in the Crown the sole right to tap, take, use, and apply geothermal energy or to grant this right to others. Besides issuing licences and the payment of levies the Act is mainly concerned with safety aspects and standards for geothermal installations.

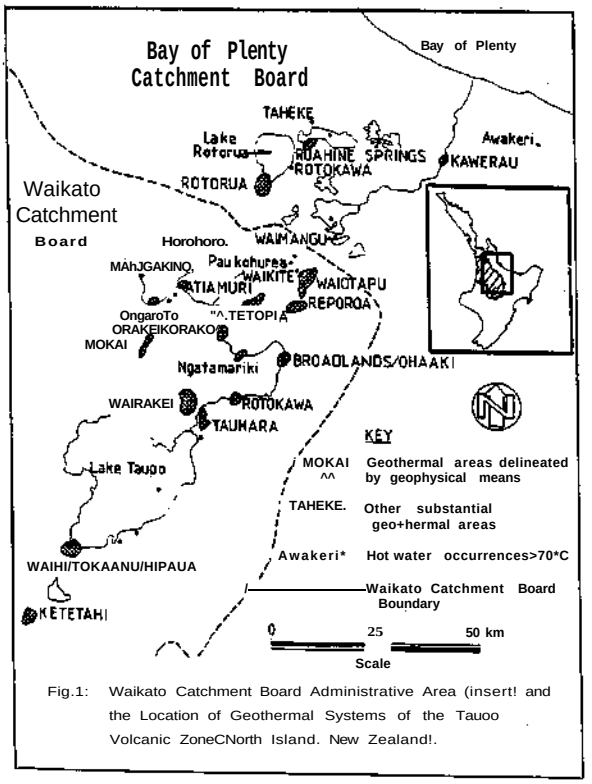

Fig.1: Waikato Catchment Board Administrative Area (insert! and the Location of Geothermal Systems of the Tauoo Volcanic ZoneCNorth Island. New Zealand!.

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In the following the discussion focuses on issues relevant to responsibilities for Regional Water Boards. The Water and Soil Conservation Act addresses aspects of resource management, conservation of natural water and the regulation of use where appropriate. The Act vests ownership of natural water in the Crown, which has delegated the functions of allocation and management to Regional Water Boards (Catchment authorities).

The 1981 Amendment to the Act clearly defines geothermal fluids above 70°C as water resources and consequently puts them under the control of Regional Water Boards.

WATER RIGHTS

Regulatory tools provided under the Act for the management of the water resources include water rights (permits), general authorisations, water classifications and water conservation orders. Water rights confer the right to use water within specified terms and conditions, which are set to protect other values and uses of water.

Geothermal developments usually require several water rights, such as for the taking and discharge of geothermal fluid, the taking of water for drilling, construction and domestic purposes, the discharge of stormwater, cooling water (blowdown), drilling waste, and sewage.

The application for water rights has to be accompanied by appropriate information to enable a balanced decision. The approval procedure provides for formal public participation and a right to appeal against water rights granted.

Figure 2 summarises the procedure involved in a water right application.

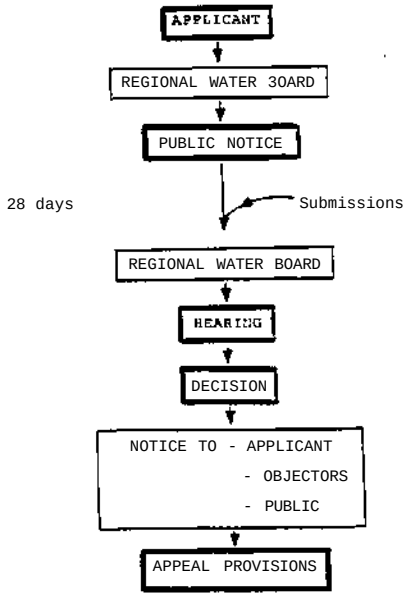

Figure 2 : Water Right Application Procedure

MANAGEMENT OF GEOTHERMAL RESOURCES

THE WCB STRATEGY

The following policies relevant to the preparation of management plans for geothermal fields were adopted by the government (Ministry of Energy, 1986):

- That geothermal water management plans be prepared so that sound management decisions can be made.

- That reserve management plans for geothermal features and geothermal water management plans operate together in managing the resources.

- That priority be given to preparing geothermal water management plans for the following:

  (Names in capital letters represent geothermal fields within the WCB administrative area).

  a Rotorua, Tikitere (Ruahine Springs), WAIOTAPU

  b TE KOPIA, TOKAANU/WAIHI/HIPAUA, REPOROA, WAIKITE/PAUKOHUREA,

  c MOKAI, ROTOKAWA, NGATAMARIKI, Ngawha

- That all bodies and organisations involved in geothermal resource management meet periodically to review the progress and effectiveness of the goals, objectives, policies and management framework, and make any changes considered necessary.

Charged with the responsibility to allocate and manage geothermal resources within its catchment area the Waikato Catchment Board developed a strategy consisting of a two stage programme, with Stage I culminating in an overview document (WCB, 1987), and Stage II incorporating detailed investigations into specified catchment areas containing geothermal resources.

The overview document provides a detailed description of all known fields within the WCB boundary, including geological, geophysical, geochemical, hydrological, environmental, and cultural aspects and outlines existing as well as potential future management problems with the aim of developing a management strategy for geothermal resources and providing the basis for the Board's geothermal policy. Both a detailed strategy and a clear policy are required to indicate to potential developers the approach of the Board to geothermal management and to enable the proper channeling of funds and available human and physical resources in the most efficient way, according to the priorities detailed in the strategy.

The Board's approach to geothermal resources with respect to management planning is to consider the geothermal element as another component of the water and soil resource and to prepare Water and Soil Management Plans on the same basis as existing plans have been produced. This includes the compilation of- a Resource Statement containing all the relevant technical information prior to the preparation of a Management Plan detailing the policies and guidelines developed to manage the resource (Figure 3).

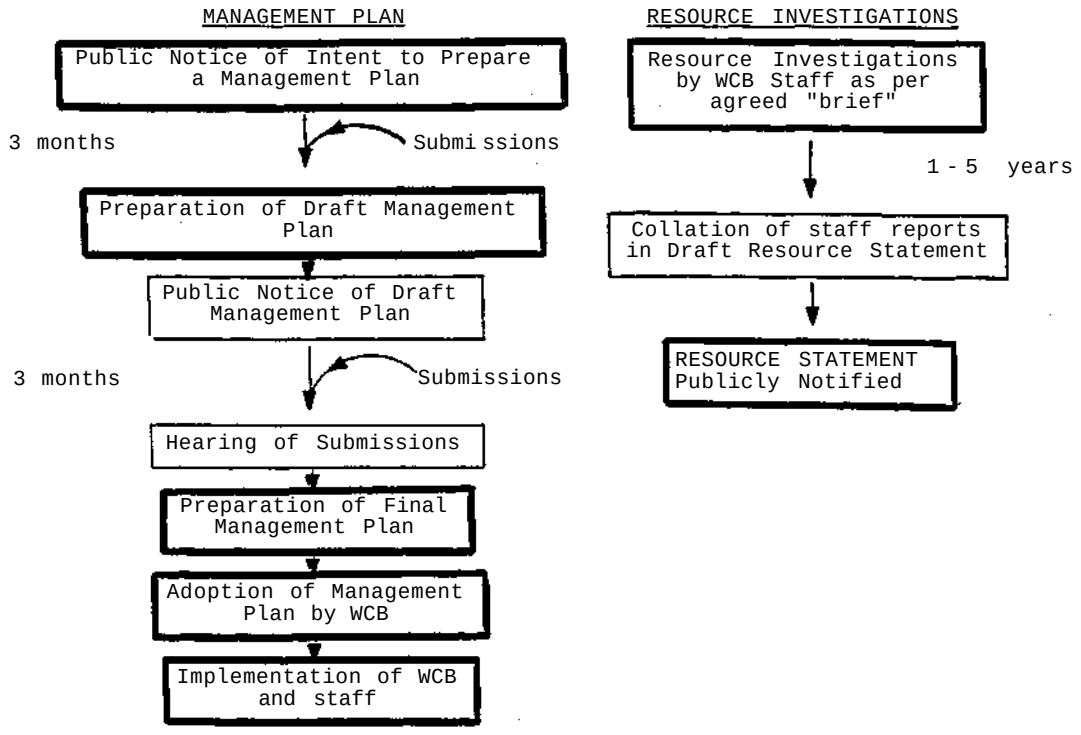

Figure 3 •: Procedures for Preparing a Water and Soil Management Plan

Although geothermal development may be tne largest single impact, other issues within the catchment under consideration, will need to be included in the planning process as well, eg:

- hydrology of water resources (quantity and quality)
- water use
- land use and land use planning
- flooding
- drainage
- soil conservation
- fauna and flora
- Maori values

MANAGEMENT PLAN PRIORITIES

The geothermal fields within the WCB area were grouped into four categories based on Government policy, past tribunal and court decisions, reserve status, energy development, current and proposed usage, existing environmental problems, and catchment wide water and soil issues.

The objectives of this procedure were:

- to specify those geothermal fields with management plan priority;
- to detail the Board's policies with respect to the various categories; and
- to establish guidelines for applicants to develop and use geothermal resources until management plans (containing more specific policies for the allocation and management of the resource) are complete.

In assessing the priority for the preparation of management plans, more weight was given to fields with existing or planned energy developments and less to fields under a current no drilling policy as compared to fields with no such moratorium.

The four categories with their respective fields are illustrated in Table 1 and can be summarised as follows:

Category 1 contains six fields for which the preparation of Water and Soil Management Plans is considered a top priority. A timetable for the production of planning documents (completion within the next five years) has been established and so far detailed investigations have commenced in four fields:

Category 2 includes four geothermal fields with priority for preservation and conservation, where no development should occur. Appropriate protection for these fields could be achieved by including them in the Schedule for Protected Waters.

Table 1 : Grouping of geothermal fields within the WCB administrative area.

Field	Category	Management Plan (completion date)
Tauhara/Taupo	1	1990/91
Mokai	1	1990/91
Rotokawa	1	1991/92
Wairakei	1	1991/92
Broadlands	1	1992/93
Ngatamariki	1	1992/93
Waimangu	2	
Waiotapu	2	
Orakeikorako	2	
Ketetahi	2	
Reporoa	3	
Te Kopia	3	
Waikite/Paukohurea	3	
Tokaanu/Waihi/Hipaua	3	
Mangakino	4	
Atiamuri	4	
Horohoro	4	

Finally categories 3 and 4 include fields with no management plan priority at present. These fields have either some potential for development (Category 3) or existing exploration and investigation plans for energy developments but no proven commercial value, or no development potential (Category 4).

This tentative grouping of the geothermal fields within the WCB area is subject to regular reviews (eg. investigations into category 3 and 4 fields may result in assigning a higher priority to a particular field with a need to prepare a management plan, or category 3 fields could require a management plan under environmental legislation).

THE BOARD'S POLICY

By approving the grouping of geothermal fields within its administrative area - as outlined in Table 1 - the WCB adopted the following policies with regard to geothermal resource management:

1. That priority be given to preparing management plans for the category one fields and that water right applications prior to completion of management plans should be considered according to guidelines (outlined below).

2. That category two fields be "preserved" and developments within such fields be declined.

3. That development in category three fields be considered within the guidelines and only be allowed if the impact on the resource is considered acceptable and no impact occurs to category two fields.

4. That development proposals for category 4 fields be considered according to the guidelines.

GUIDELINES

For the interim management of geothermal resources prior to the completion of management plans, the WCB has produced guidelines for considering water right applications (WCB, 1988). These guidelines will assist potential developers with an indication as to what information may be required to process a water right application. They will also serve both the developer and the WCB staff as a guide to recommended practices and procedures for the investigation, exploration and exploitation of geothermal resources. These guidelines are mainly for major geothermal developments. The topics covered include:

- treatment of drilling waste
- taking of geothermal fluid
- surface discharge of geothermal fluid
- discharge of geothermal fluid onto land/ground
- cooling water waste/blowdown
- accidental spillages
- water abstraction
- stormwater and runoff
- sewage disposal
- Maori aspects
- confidentiality of information
- term of water right
- monitoring requirements

There is a need to provide flexibility to account for new technologies and geothermal practices (eg. novel drilling muds, innovative waste disposal, advanced technology in electricity production) and therefore these guidelines should not be seen as definitive, rigid procedures and practices required by the Board.

TAUPO/TAUHARA AND UPPER WAIKATO RIVER MANAGEMENT PLAN

Stage II of the Board's geothermal strategy involves detailed investigations of specific geothermal fields for the preparation of management plans.

Based on priorities outlined above (Table 1) current activities are concentrating on four fields (Taupo/Tauhara, Mokai, Rotokawa, Wairakei). The Management Plan for the Taupo/Tauhara catchment (completion date 1990/91) will reflect the Board's approach to geothermal management by considering catchment wide water and soil issues together with geothermal resources. For example the upper reach of the Waikato River and the Taupo/Tauhara geothermal field are both incorporated into the same management plan. This stretch of the river experiences a pronounced multi-purpose use, including water supply, waste discharge, recreation, fishery, tourism. These various competing demands create potential conflicts within the Taupo region or may result in spillover effects further downstream (eg. increased nutrient loading resulting in eutrophication in the hydrolakes further downstream). Other non-geothermal issues to be considered include:

- Discrete discharges (sewage, industrial effluents)
- Non-point discharges (runoff from agricultural land, urban runoff)
- Water level fluctuations in Lake Taupo and the Upper Waikato River (due to the artificial regulation of water flows to maximise electricity production)
- Land use planning (soil conservation, erosion)

Aspects relevant to the management of the geothermal resource of the Taupo/Tauhara field include:

- Resource assessment (potential heat output)
- interconnection with Wairakei Geothermal Field
- Thermal surface activity (flow, temperature, area of hot ground, risk of hydrothermal eruptions)
- Domestic and commercial use of shallow hot aquifers
- Potential impacts of development (surface water quality, draw-down effects, subsidence, reinjection strategy, changes in surface activity, relationship between deep and shallow aquifers).

FUNDING

Recent changes by way of an Amendment to the Water and Soil Conservation Act in December 1987 affected the nature of funding for the work of Regional Water Boards. These changes included:

- an end to administration grants;
- greater flexibility in rating powers;

- a review of levels of central government assistance given for water and soil consevation works and water and soil resource management projects; and

- amending legislation providing for recovery of water resource management costs from exclusive water users (i.e. water right holders).

Previously limited cost recovery was possible for water right monitoring only. New legislation with a wider reaching comprehensive, provision for cost recovery for water management purposes means that part of the financial burden is lifted from ratepayers and transferred to exclusive users of the resource.

In February 1988 the WCB adopted by way of Special Order a cost recovery policy fixing the scales of charges recoverable from the holders of water rights. The charges will apply to water rights (and similar authorisations) to take, discharge or dam, and range from $50 for a small water user (e.g. some dairy shed discharges) up to $100,000 for large water users. For every class of right (Taking, Discharging, Damming) a different formula is used to calculate the charges, taking into consideration factors such as the impacts, effects and benefits on other users and on the resource, the priority of the respective catchment areas for resource management planning, and the extent of administration and monitoring required for exercising a particular right.

The revenue from the cost recovery policy will be exclusively used for water and soil management functions (amounting to about 30% of the total expenditure in the budget for the financial year 1988/89). Other revenue is derived from general rates and government grants (approximately one third each of total income), however the latter source of money is gradually being phased out and has to be compensated on a regional base (ratepayers) and by exclusive water right holders.

FUTURE **GOVERNMENT POLICY**

PROPOSED LEGISLATION

Two major review processes of considerable importance for future environmental administration and legislation in New Zealand are presently underway. These are:

- The Local Government Reform; and

- The Resource Management Law Reform.

The joint reform exercise aims at a coherent resource law reform, where the broad objectives and rules are set by the government and admnistration and enforcement should take place appropriate to the level of community affected by the decision. The objective is for the new structures, with their new resource law to be operative in 1989/90.

Most natural resource statutes, including those concerned with mineral and energy resources (Mining Act, Geothermal Energy Act) are included in the review and a discussion paper released in August 1988 outlines various possible models for the law reform. All should have regard to the principles of equity, efficiency, and good environmental management (including the needs of future generations, intrinsic values of ecosystems, and sustainability) and giving practical effects to the principles of the Treaty of Waitangi (Ministry for the Environment, 1988)

The following section discusses some concerns relating to the management of geothermal resources under existing legislation and how they may be resolved under the proposed law reform.

LEGAL STATUS OF MANAGEMENT PLANS

Existing legislation does not provide statutory backing for Water and Soil Management Plans. However a "Draft Water and Soil Conservation Bill 1986" does include specific provisions for management plans such as defining procedures for their preparation, allowing for public participation and rights of appeal. These procedures are adopted by the WCB in the preparation of Water and Soil Management Plans (Figure 3) and a number of (non-geothermal) planning documents have been completed already.

WATER RIGHTS FOR DOMESTIC USE

The current legislation (Water and Soil Conservation Act 1967) requires:

- All abstractors and users of geothermal resources (excluding for domestic use) to hold water rights.

- All geothermal discharges to be controlled by water rights.

Consequently the use of geothermal water for domestic purposes would not require a water right except for discharges which may be brought under a general authorisation (under the Geothermal Energy Act 1953 domestic users of geothermal water above 70°C could be required to obtain a licence). New legislation may require ALL geothermal users to obtain water rights.

PROTECTION AND PRESERVATION

Geothermal resources considered worthy of protection can either be included in the Schedule of Protected Waters or put under a Water Conservation Order.

The difference is that the Schedule of Protected Waters has no statutory backing, whereas there is provision for the latter in the Water and Soil Conservation Act 1967 [Section 20A(i)]. However, under present legislation the use of a Water Conservation Order for geothermal resources is very limited as the Act only refers to 'any specific river, stream, or lake, or any specified part thereof. Under the proposed legislation (Draft Water and Soil Conservation Bill, 1986), these specified waters will be replaced by the term "water body".

Some geothermal features are already included in reserves and as such require the preparation of Management Plans under the Reserves Act 1977 to provide for and ensure the use, enjoyment, maintenance, protection, preservation and development of the reserve.

These plans may have a bearing on protecting the wider geothermal reservoir, and where geothermal features are to be given full protection, provisions also need to be made in Water and Soil management plans (eg. to ensure that the hydrothermal system is preserved intact and not adversely affected by other potential uses within or outside the reserve)

OVERLAPPING LEGISLATION

Both developers and people affected by development often consider the present resource management laws to be too complex, costly, bureaucratic and involving too many overlaps. With respect to geothermal resource management planning some concerns of overlap between the Geothermal Act and the Water and Soil Conservation Act became apparent, partly as the result of the situation in Rotorua.

The Geothermal Energy Act provides no provisions for comprehensive management of geothermal resources, limited guidance by way of criteria for decision-making, and does not involve public procedures. Some criteria are provided, however, to indicate that an authority rather than a licence should be granted if there is a likelihood that a bore will need to be closed at a later date. The criteria provided for determining whether bores should be closed incorporate water and soil resource management issues, for example, whether a bore is detrimentally affecting other bores, energy supplies or tourist attractions, or that closure is in the public interest. Recent claims for compensation by affected bore owners clearly demonstrate a need to integrate the principles contained in water and soil management plans covering geothermal areas with the authorisation and licencing procedures for the use of geothermal energy.

One of the objectives of the reform of existing resource management statutes is a process of consent integration. This could be achieved, for example, by a single Resource Management Act embracing all relevant legislation, and providing for a joint hearing procedure to evaluate and deal with the impacts of any activity which may affect the environment and to consider specific consents together (Ministry for the Environment, 1988)

For major developments with multiple-aspect environmental affects, an environmental impact assessment would be required. This should be prepared according to a standardised procedure to ensure that issues are dealt with consistently and may include social, cultural and economic aspects.

Recent experiences with the Rotorua Geothermal Field has shown that a clearly defined strategy for geothermal resource management in New Zealand is timely. The production of planning documents and their implementation will need a co-ordinated effort and effective communication between Regional Water Boards and the development agencies, local territorial authorities, the Maori people and the scientific community whose expertise in geothermal matters enjoys a worldwide reputation.

SUMMARY

Regional Water Boards are charged with the responsibility of allocating and managing geothermal resources. Based on a review of existing information and an evaluation of present or potential management issues, the Waikato Catchment Board developed a strategy and policies for geothermal resource management. The Board considers the preparation of management plans on a catchment wide basis (including non-geothermal water and soil issues as well) as a powerful and effective tool for the comprehensive management of geothermal areas. Detailed investigations into areas of top priority (Taupo/Tauhara, Mokai, Rotokawa, Wairakei) have commenced and guidelines were prepared to assist in water right applications prior to the completion of the management plans. A close interaction between -scientists, engineers, the public (local people, tangata whenua) and approving agencies is essential for the successful management of geothermal resources.

The current review of natural resource legislation will hopefully provide the basis for an effective management framework resulting in an efficient use of the resources for the benefit of both individuals and the community as a whole, and include the preservation of geothermal areas as an essential part of our national heritage.

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