

# Minerals in the Bay of Plenty Region

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## Executive Summary

The Bay of Plenty Regional Policy Statement and the SmartGrowth Strategy for the western Bay of Plenty have provisions concerned with identifying and locating known or potential mineral resources and protecting access to these resources. An information scoping and review exercise was conducted as a first step towards implementing these provisions. The results of this exercise are presented in this report.

Production figures indicate that industrial minerals (particularly rock, sand and gravel for roading and building) make a significant contribution to the Bay of Plenty economy. The Bay of Plenty is also the leading pumice producing region in New Zealand.

There is ongoing prospecting and exploration interest in the Bay of Plenty for high value metallic minerals e.g. gold and silver. Areas of potential interest for gold and silver include those where historical gold production has occurred, as well as areas in the Taupo Volcanic Zone displaying high prospectivity for epithermal gold mineralisation.

The Bay of Plenty has multiple known occurrences of several minerals associated with volcanic activity. An example of current extraction is amorphous silica at Tikitere. Detailed groundwork would be required to identify and refine other areas for potential future extraction of these minerals.

In regional terms, the locations of quarries for the extraction of aggregate, pumice and sand can be grouped spatially into four areas of activity:

- (a) Te Puke/Paengaroa/Pongakawa extending west to the southern limits of Tauranga.
- (b) An area around Whakatane.
- (c) An area around Murupara.
- (d) Sites adjacent to Rotorua (to a more limited extent).

Previous mineral resource assessments have noted that there are limited sources of good quality roading and building aggregate close to Rotorua and Tauranga. Areas of andesite of the southern Coromandel Volcanic zone represent potential future extraction sites of high quality aggregate in the western Bay of Plenty.

Greywacke ranges constitute a key source of aggregate in the eastern Bay of Plenty. This resource is extracted from quarries and directly from rivers in the east of the region.

Information on potential areas of future extraction for key industrial mineral resources, particularly the hard rock resource in the western Bay of Plenty, should be factored into resource management decisions as a means of protecting access to these resources.



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## Chapter 1: Introduction

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The Regional Policy Statement Known Minerals project was initiated as a means of implementing the mineral-related provisions in the Bay of Plenty Regional Policy Statement (Appendix A). These provisions include policies and methods to promote the protection of access to known mineral resources of the region and to discourage uses of land that would compromise this access. The Regional Policy Statement encourages the regional council, as well as city and district councils, to implement these provisions.

The SmartGrowth Strategy also contains actions with implications for the Known Minerals project. These actions include: to investigate mineral demand and resource potential, to prepare maps showing the location of known or potential resources in the [sub] region, and to develop management strategies that take into account the findings of this investigation. Environment Bay of Plenty has been nominated as the lead agency for undertaking these actions.

An information scoping and review exercise was conducted as a first step in implementing Regional Policy Statement and SmartGrowth provisions. This exercise was conducted with the intention of:

- (a) Identifying information sources;
- (b) Reviewing publicly available information produced by agencies and relevant to the project;
- (c) Identifying any areas of potential future extraction.

This report presents the results of this exercise, and makes recommendations for the ongoing implementation of mineral-related provisions in the Regional Policy Statement.



## Chapter 2: Information Scoping and Review

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To develop a picture of known mineral resources in the region it was necessary to determine what information was currently publicly available. The focus of the scoping and review exercise was on mineral resource information that had already been interpreted rather than geological information or raw data requiring further analysis. The following sections describe the key information sources identified during the scoping process.

### 2.1 Environment Bay of Plenty

Environment Bay of Plenty holds a number published reports and maps on both the mineral resources and the underlying geology of the Bay of Plenty region, as well as reports produced mainly by central government agencies on mineral resources in New Zealand.

Produced in the early 1990s, *Sheet QM302 Whakatane, Geological Resource Map of New Zealand 1:250 000, Institute of Geological & Nuclear Sciences Science Report 92/17* proved to be a key information source. This map covers most of the region and is a compilation of historical data on mineral deposit occurrences, including aggregate quarries. The accompanying report provides a detailed assessment of mineral resources for the area covered by the map. Environment Bay of Plenty also has a data set from the same source (the IGNS GERM database) on its GIS system, that covers the entire region.

Environment Bay of Plenty also holds a substantial amount of quarrying, mining and gravel extraction information in resource consent files, monitoring and compliance reports and spreadsheets. While much of this information has not been systematically collated, it has proved a useful source in compiling this report.

### 2.2 External Sources of Information

The agencies and organisations identified as the main potential sources of mineral resource related information were:

- The Institute of Geological and Nuclear Sciences
- Crown Minerals, Ministry of Economic Development
- District and city councils in the Bay of Plenty region
- The New Zealand Minerals Industry Association.

These agencies and organisations were contacted as part of the information scoping exercise, and provided information to varying degrees. In response to a request, Crown Minerals provided information of relevance to the study area, including recent figures for the total mineral production in the Bay of Plenty and information on recent quarrying activity held by the Inspector of Quarries.

Crown Minerals also undertook some analysis to identify areas in the Bay of Plenty with potential for the future extraction of gold, aggregates, and other non-metallic rocks and minerals. This has been used to supplement information from other sources in the main body of the report.

## Chapter 3: Regional Overview

### 3.1 Current Production

Industrial minerals<sup>1</sup> make an important contribution to the functioning of the Bay of Plenty economy in terms of both direct earnings and the supply of raw materials for the development and maintenance of infrastructure, particularly roading and building. Production figures for the past five years show a direct sales value averaging about \$21 million per annum (Figure 1).

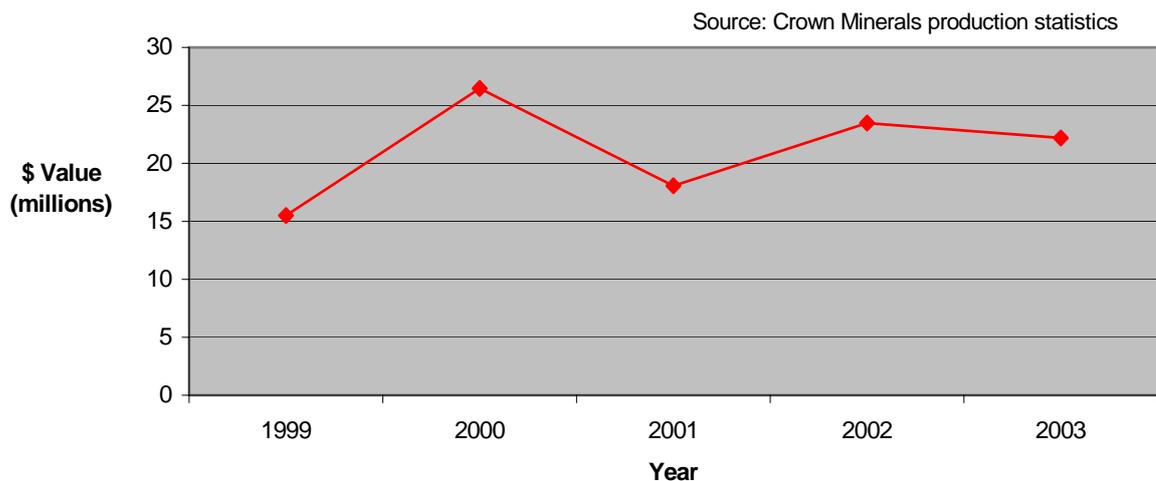


Figure 1 Sales Value of Bay of Plenty Industrial Minerals (1999-2003)

In the national context, the 2003 sales figure places the Bay of Plenty 7<sup>th</sup> of 15 regions (Figure 2), with a sales value comparable to the Wellington region, but significantly lower than the leading producing regions. The Waikato and Northland figures can to some extent be attributed to their proximity to metropolitan Auckland and the demand generated by infrastructural growth in this city.

<sup>1</sup> Non-metallic minerals. The Bay of Plenty currently produces no metallic minerals (e.g. gold, silver, ironsand), although there has been historical gold production and there are areas of exploration interest.

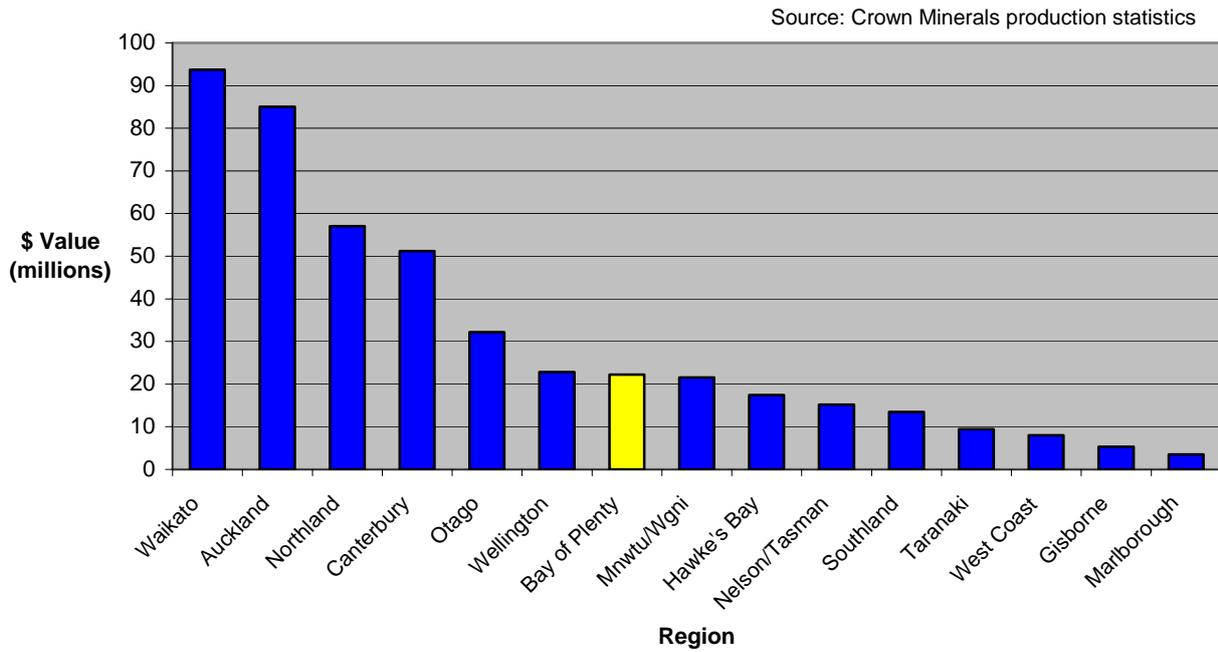


Figure 2 Industrial Mineral Sales Value by Region (2003)

In quantitative production terms, industrial minerals can be divided into two broad categories: minerals of low value per unit that are used in large quantities for basic infrastructure purposes; and minerals of higher value per unit that are generally extracted in lower quantities for more specialised purposes. Figure 3 graphs the quantities of 'high volume' industrial minerals extracted in the Bay of Plenty 1999-2003. The graph shows that the production of rock, sand and gravel for roading and building purposes are the dominant categories. There is also a steady production of pumice, which is primarily used as fill in road construction and for building purposes, with smaller quantities used in horticultural soil mixes and in textile production processes (Christie *et al*, 2000). The Bay of Plenty is the leading pumice producing region in New Zealand.

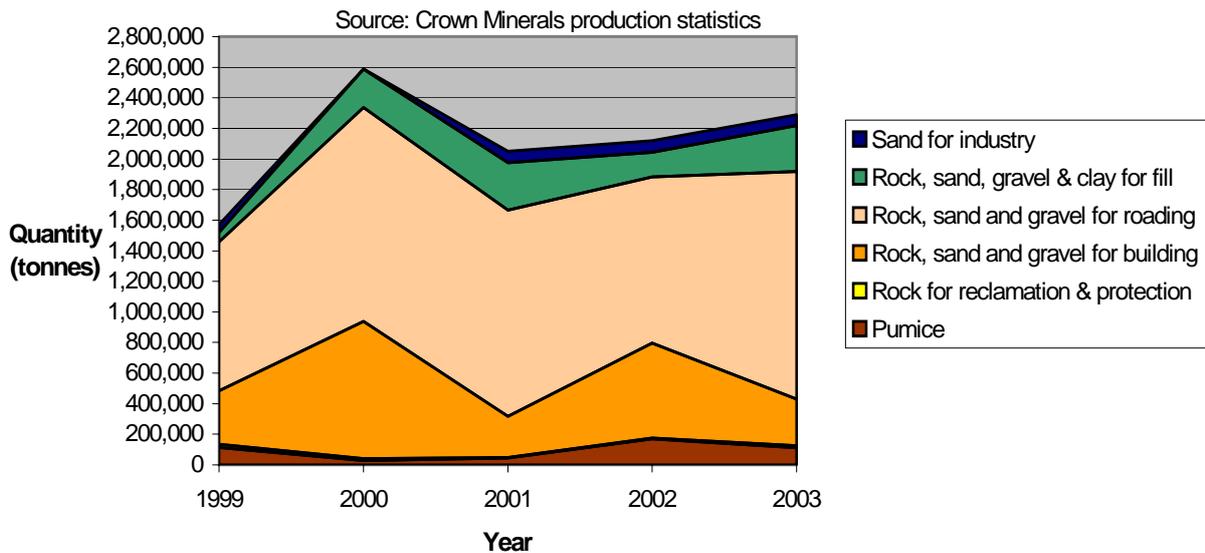


Figure 3 Bay of Plenty Industrial Mineral Production (High Volume) 1999-2003

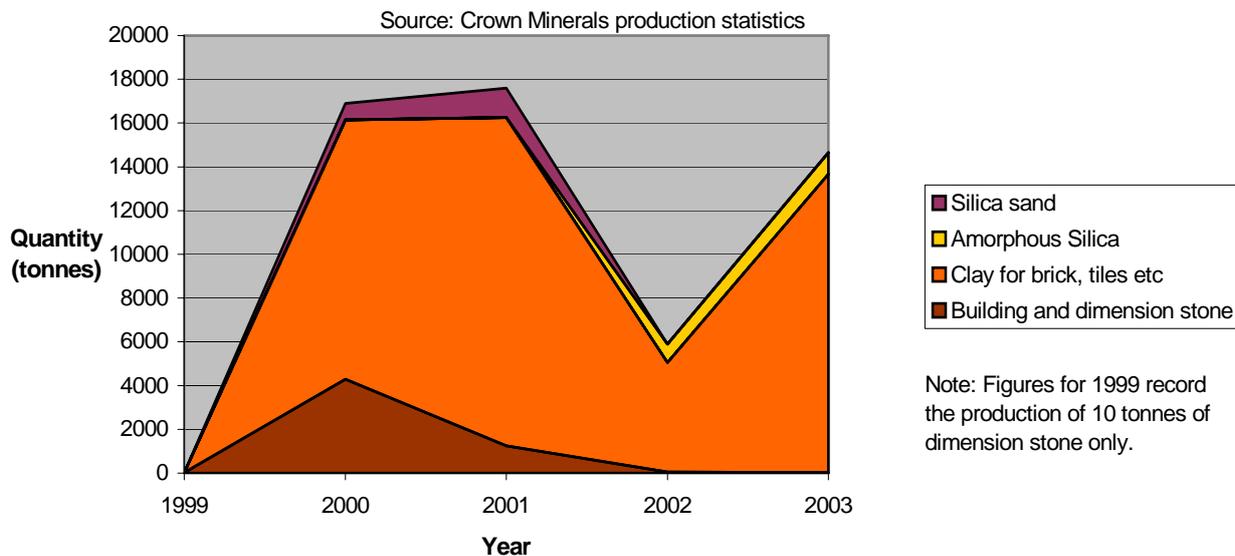


Figure 4 Bay of Plenty Industrial Mineral Production (Specialised Purpose) 1999-2003

Figure 4 maps a five year sequence for the production of industrial minerals extracted for more specialised purposes. Clay for use in bricks and tiles makes the most significant contribution in quantitative terms, although the quantities produced fluctuated significantly over the five year period. The Bay of Plenty is also the only region in New Zealand currently producing amorphous silica, which is added to cement to improve its strength and durability, as well as in tunnel linings, mortars and grouts (Ministry of Economic Development, 2001).

The information available on the sales value of each commodity is more limited, partly due to commercial considerations. However, a breakdown of Bay of Plenty figures for the 2002 production year indicates that rock and sand for roading (\$9.7 million) and rock and sand for building (\$8.1 million) dominate sales earnings. Pumice (\$2.3 million) was also a significant earner.

### 3.2 Prospecting and Exploration

The Crown Minerals Act 1991 governs the prospecting, exploration and mining of Crown owned minerals in New Zealand. Crown owned minerals include all naturally occurring gold, silver and uranium, as well as all other mineral and aggregate resources on Crown owned land or, as a general rule, all land disposed of by the Crown by way of freehold title since 1948.

Three types of permits are issued under the Crown Minerals Act 1991: prospecting, exploration and mining. Prospecting permits are issued for both Crown and privately owned minerals for activities aimed at identifying land likely to contain exploitable deposits. Prospecting permits cover very low impact activities such as geological mapping, general surveys and hand sampling. Exploration and mining permits are granted only for Crown minerals. Exploration permits cover activities designed to identify mineral deposits and evaluate the feasibility of mining, which may include

drilling and bulk sampling. Mining permits (and licences) are for mineral extraction activities.

There are currently 16 permits, licences or applications for permits in the Bay of Plenty region. Of these, 3 are prospecting permits, 2 are exploration permits and 3 are applications for prospecting or exploration (Table 1). The remaining 8 mining permits or licences are for aggregate, pumice or sand extraction and are considered separately in the section on these resources.

*Table 1 Bay of Plenty Mineral Prospecting and Exploration Permits (April, 2005)*

| Permit              | Holder             | Mineral                                | Area                   | Date of Grant or Application | Expiry Date |
|---------------------|--------------------|--|------------------------|------------------------------|-------------|
| <b>Prospecting</b>  |                    |  |                        |                              |             |
| 39 289              | Mercator Gold (UK) | All metallic minerals                  | 1167 km <sup>2</sup>   | 17/1/2005                    | 16/1/2007   |
| 39 241              | Glass Earth Ltd    | All metallic and non-metallic minerals | 8989.5 km <sup>2</sup> | 21/10/2003                   | 20/10/2005  |
| 39 195              | Neptune Resources  | All metallic and non-metallic minerals | 7790 km <sup>2</sup>   | 15/10/2002                   | 14/10/2006  |
| <b>Exploration</b>  |                    |  |                        |                              |             |
| 40 667              | HPD New Zealand    | All metallic minerals                  | 595 ha                 | 4/10/2004                    | 5/10/2009   |
| 40 365              | Waihi Earthmovers  | Aggregates                             | 55 ha                  | 15/5/1997                    | 14/5/2007   |
| <b>Applications</b> |                    |  |                        |                              |             |
| 40 737              | Glass Earth        |  | 4055 ha                | 25/1/2005                    |             |
| 40 736              | Heritage Gold NZ   |  | 5000 ha                | 18/1/2005                    |             |
| 39 298              | Waihi Gold Company |  | 1045 km <sup>2</sup>   | 4/3/2005                     |             |

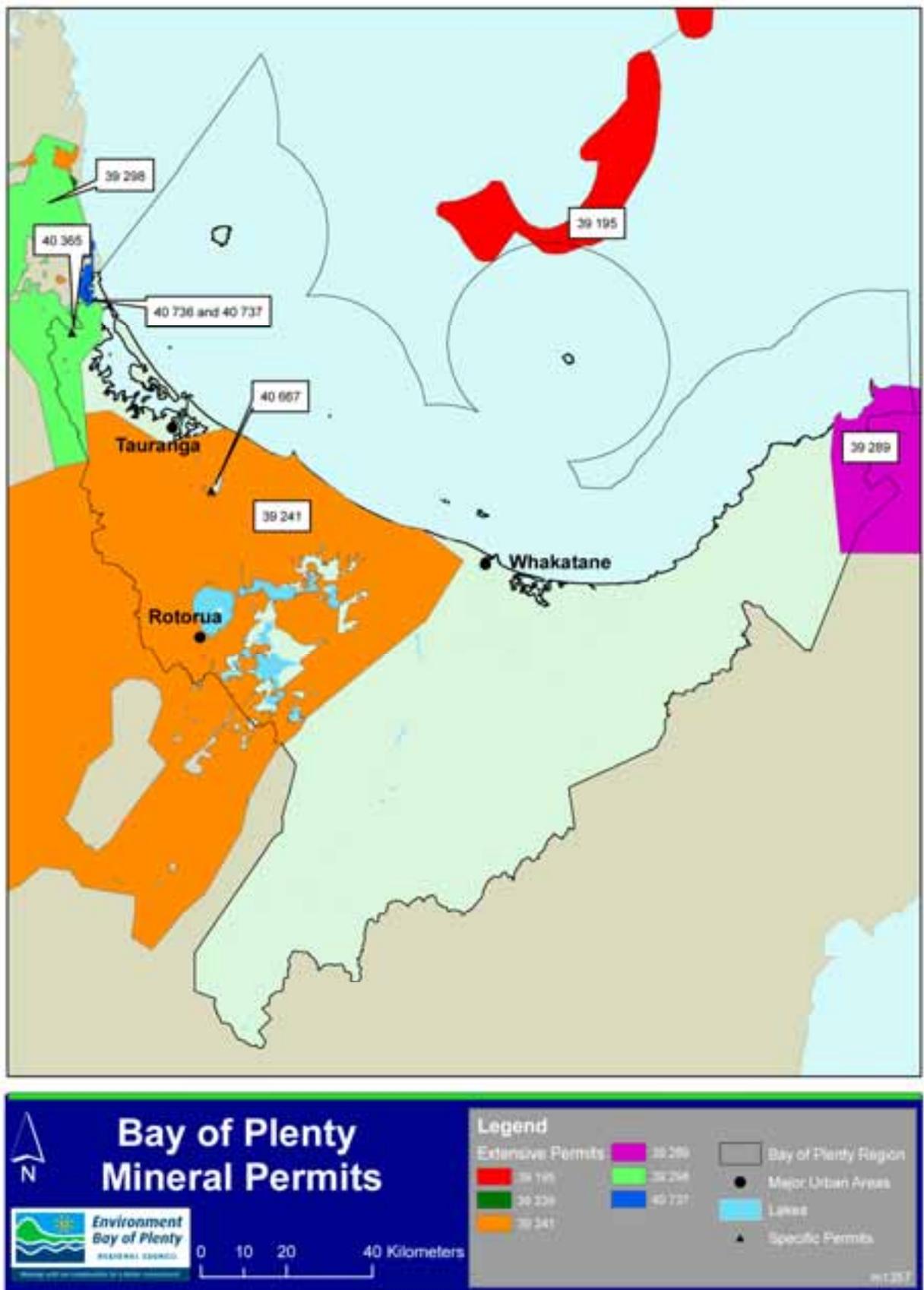
Figure 5 maps the spatial extent of the permits referred to in Table 1. The permit information indicates there is considerable prospecting and exploration interest in potential high value metallic mineral deposits in the region.

Prospecting permit 39 241 held by Glass Earth Ltd is the most extensive, corresponding with large areas of the Taupo Volcanic Zone (TVZ). Glass Earth Ltd is particularly interested in potential epithermal gold deposits in the TVZ, and has developed a comprehensive database to identify target areas for further exploration.

Figure 5 also shows there are prospecting and exploration permits that 'spill' into the northwest corner of the Bay of Plenty from the actively mined Waihi area. Also of note is permit 40 667, centred on Muirs Reefs, an area of historical gold production near Te Puke. Offshore, Neptune Resources (39 195) holds a prospecting permit for potential mineral deposits associated with volcanoes and seamounts of the southern Kermadec Arc and Havre Trough.

A prospecting permit has recently been issued to Mercator Gold (39 289) for an area encompassing the eastern edge of the Bay of Plenty and adjacent parts of the Gisborne District. Mercator Gold is interested in potential epithermal gold mineralisation in the area, which was also explored by another company in the late 1990s.

Figure 5 Bay of Plenty Mineral Permits



Source: Kenex Knowledge Systems Ltd (2005).

### 3.3 Gold and Silver

The prospecting and exploration permits discussed in the previous section indicate that these activities are primarily focused on potential gold deposits in the Bay of Plenty. While there is no current gold production in the region, existing information and the location of the nearby Martha Hill mine at Waihi suggest that this cannot be discounted in the future. Figure 6 maps some areas of potential interest for gold and silver deposits, identified using publicly available information. The map locates these areas in the Western Bay of Plenty and Rotorua districts.

Areas of interest in the Western Bay of Plenty centre on known mineralised areas with historical gold production. Information from Crown Minerals (2004) focuses on two locations in particular and provides the following commentary:

- (i) **Muir's Reefs** in the Te Puke area. Two subparallel, north northeast striking auriferous quartz reefs. Worked intermittently from 1897 to 1928 from several adits and shafts with a production in excess of 1685 kg (54 172 oz) of bullion from 64 482 tonnes of quartz. These reefs and their possible extensions and repetitions have been explored under various mineral licences and permits in more recent times. The area has good prospectivity and is potentially a future extraction site.
- (ii) **The Eliza Mine** on the Waitekohe Stream in the ranges southwest of Katikati yielded only 150g bullion from 12 tonnes quartz earlier last century but remains a potential future extraction site. The known mineralisation is >400m long, several metres wide, and strikes 15° dipping steeply west.

While these remain potential areas of interest, other interpretations should also be taken into account. For example, Houghton and Cuthbertson (1989, p.31) acknowledge the Eliza Mine deposit, but conclude that the history of prospecting and mining in this part of the Kaimai Range has been 'singularly unsuccessful'.

The areas of interest located in the Rotorua District are associated with epithermal gold mineralisation in the TVZ. The TVZ contains volcanic rocks (mainly ignimbrites and rhyolites), hosting a number of active high temperature geothermal fields, each about 10-20km<sup>2</sup> in area. These fields are mainly confined to the active eastern side of the TVZ, and commonly contain ore-grade gold-silver mineralisation (Figure 7).

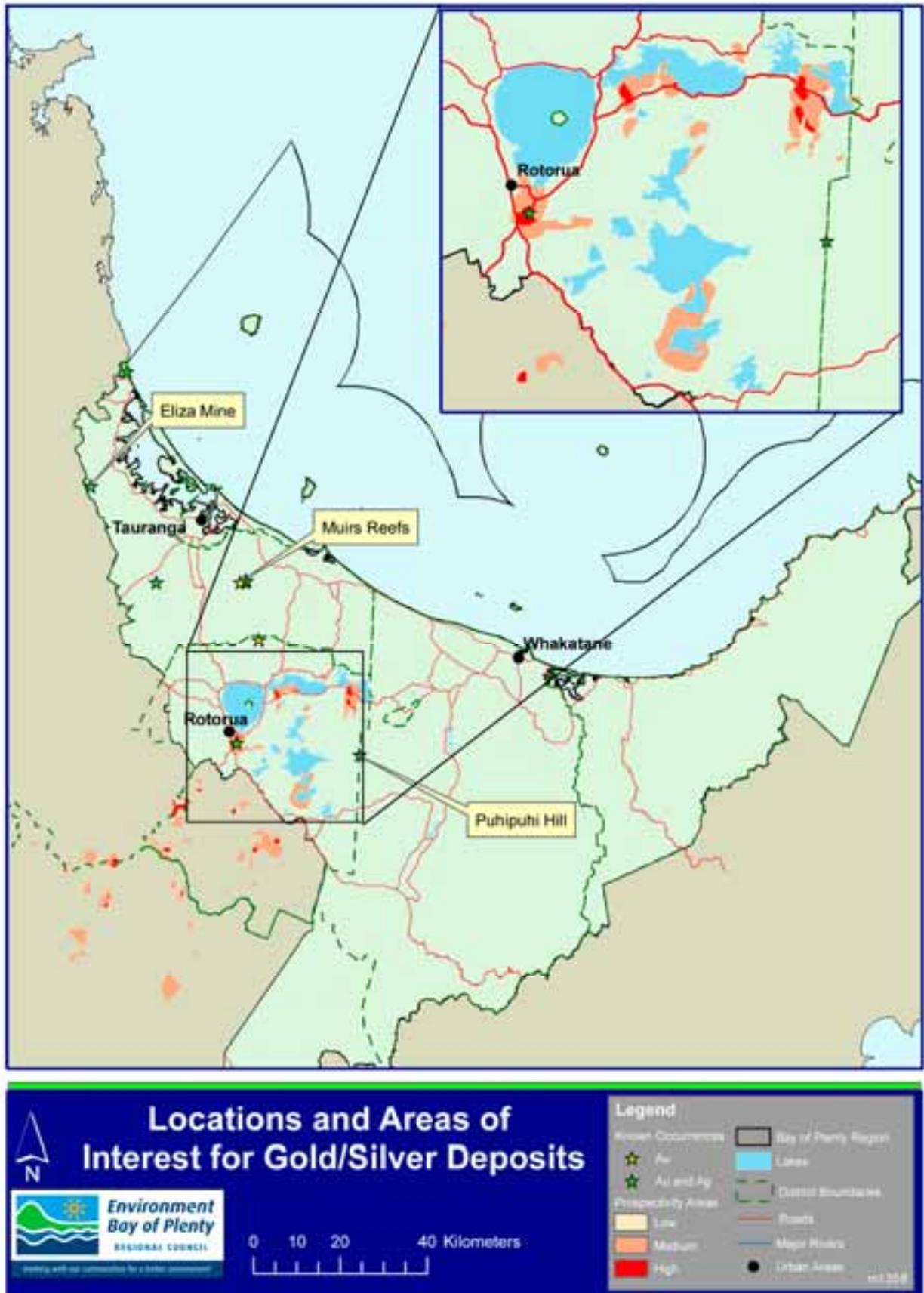


The mineralisation is found in surface siliceous sinters, subsurface quartz veinlets, quartz infilling cavities and silicified hydrothermal breccias, and disseminated in wallrock (Christie and Brathwaite, 2003).

**Figure 7** Deep geothermal fluid emerges from Champagne Pool, Waiotapu to deposit a sinter terrace containing up to 80g/t gold and 175g/t silver.

Source: Christie and Brathwaite (2003) p.25.

Figure 6 Locations and Areas of Interest for Gold/Silver Deposits



Sources: Cody and Christie (1992), Crown Minerals and the Institute of Geological and Nuclear Sciences (2003), Crown Minerals (2004).

The areas of interest in the Rotorua District have no record of significant gold production, but as Figure 6 shows, they do display high prospectivity in places. This prospectivity rating was modelled using spatial recognition techniques in a Geographical Information System. However, the limitations of the model, particularly in terms of data availability, mean that the prospectivity areas identified on the map should be treated as broadly indicative only (Rattenbury and Partington, 2003). In fact, the model is limited by the currency of factors that, if revised in the future, may point to additional zones of gold-silver prospectivity in the Bay of Plenty region (Crown Minerals, 2004).

Crown Minerals (2004) provided the following analysis on prospectivity in the Rotorua district:

The Tikitere and Whakarewarewa areas stand out as prospective (amorphous silica is currently mined at Tikitere). However, because these localities have obvious cultural significance and other intrinsic values, there is little suggestion that they could be areas for potential future extraction. The same would be said for the prospectivity area generally centred on Waimangu. Gold prospectivity is also indicated generally west and south of Lake Rotoma where there is an increased likelihood of an extractable resource, but again contingent on cultural and environmental factors.

In addition to these areas, gold-silver mineralisation was recorded early last century at Puhipuhi Hill (also known as Goldmine Hill), 14km southwest of Kawerau, but more recent reconnaissance exploration in the 1980s and 1990s located only an area of anomalous stream sediment geochemistry.

### 3.4 Other Minerals

The Bay of Plenty region has deposits of many other minerals, particularly those associated with volcanic activity. Figure 8 maps known occurrences and recent extraction sites of these minerals. The map indicates multiple deposits of sulphur, clays, limestone, obsidian, titanium, diatomite and perlite in the region.

Sulphur deposits occur in the volcanic zone stretching from Rotorua to Whakaari/White Island and have been mined at several sites over the years. Sulphur has been mined historically on Whakaari/White Island. However, a volcanic eruption and subsequent lahar in 1914 killed many workers, and highlighted the hazardous nature of extracting minerals in a volcanically active zone.

Clay is present in a number of locations and has been extracted from a site near Whakatane. Obsidian is found at Mayor Island (Tuhua), while there are known occurrences of titanium on Matakana Island and near Waihi Beach. Limestone has in the past been quarried near Ruatoki south of Whakatane, and can also be found southeast of Murupara. In recent times, substantial amounts of amorphous silica have been extracted from a deposit at Tikitere. Limited quantities of dimension stone for building have also been extracted recently.

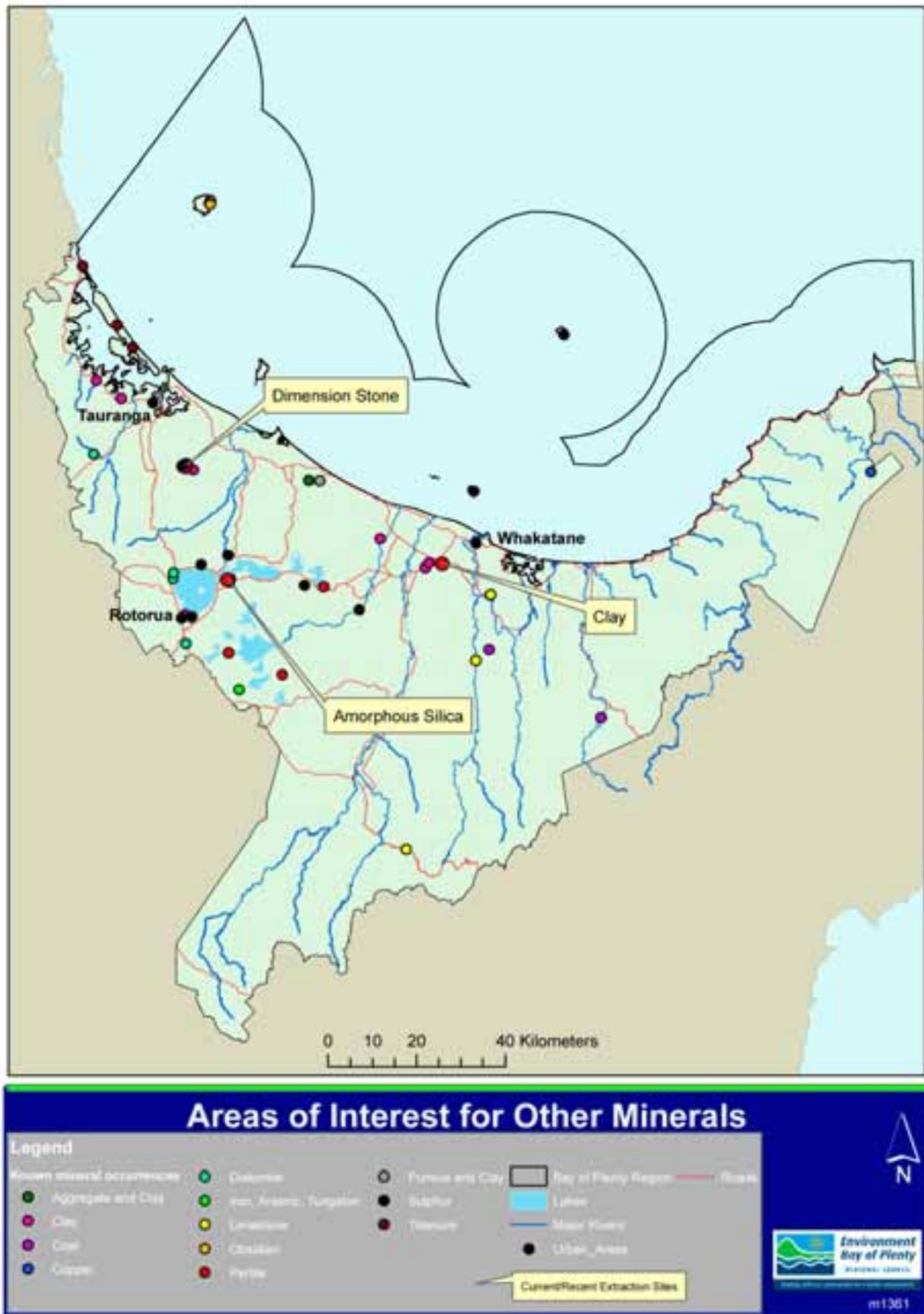
Deposits of perlite and diatomite have been recorded at several sites in the vicinity of Rotorua, and near McLaren Falls to the south of Tauranga. There has also been historical extraction from these deposits in the Bay of Plenty. Substantial quantities of perlite are currently extracted just outside the region at a quarry near Atiamuri to the south of Rotorua. Perlite is used domestically as an inert insulator and filler, and for horticultural/pot plant mixes, while diatomite is quarried for use as a mild abrasive, insulation, filtration and pozzolan material (Ministry for Economic

Development, 2001). The Bay of Plenty would appear to display some potential for the future extraction of both perlite and diatomite.

A report by Cody and Christie (1992) provides more detailed locational information and a historical record of prospecting and extraction activities for the mineral resources referred to above.

It should be noted here that although these recorded occurrences provide some interesting insights into the mineralogy of the Bay of Plenty, detailed ground work would be required to identify and refine areas for potential future extraction of these minerals.

Figure 8 Areas of Interest for Other Minerals



Sources: Cody and Christie (1992), Crown Minerals (2005).

### 3.5 Aggregates, Pumice and Sand

Figure 9 locates current or recent quarry-based extraction sites for aggregate, pumice and sand in the Bay of Plenty using quarry resource consent and mining permit information (additional site-specific information is contained in Table 2). Figure 9 also maps known occurrences of aggregate, pumice, clay and sand. The map indicates a spatial clustering into some general areas of interest:

- (i) There is a zone of activity in the vicinity of the Te Puke, Paengaroa and Pongakawa areas, extending west to the southern limits of Tauranga. Many of these sites are adjacent to the network of major roads and feed the demand generated by Tauranga and its surrounds. Within this zone, there is a general resource-based division, with rock predominantly extracted in the western half, and pumice and sand in the eastern half (Kensington Consulting Group Ltd, 2000).
- (ii) There is a second area of interest surrounding Whakatane, centred in particular on the southeastern part of the Rangitaiki Plain. Again, many of these sites are adjacent to major roads. There are also clusters of known occurrences of aggregate extending inland from the mouths of rivers to the east of Whakatane.
- (iii) A third area of interest is in the Murupara area. Production information suggests the main purpose of many of these quarries is to provide material for forestry roading. Consequently, extraction tends to be undertaken intermittently as required.
- (iv) Finally, there is a limited number of extraction sites adjacent to Rotorua.

Pumice and high quality sand are predominantly extracted from sites near Te Puke and Whakatane. Historically, beach extraction has provided an additional source of high quality sand. For example, the largest sand mining operation in the region extracted approximately 26 000 m<sup>3</sup> from the beach at Otamarakau in 1997 (Lawrie, 1997). However, this operation sparked a debate about the effects of such activities on coastal processes, prompting a report by the Parliamentary Commissioner for the Environment (1998). Beach mining operations have since ceased in the Bay of Plenty, and commercial sand mining from the 'active beach system on the open coast' will soon become a prohibited activity under the Regional Coastal Environment Plan.

In terms of aggregates, the spatial information mapped in Figure 9 tends to support analysis provided by Crown Minerals (2004), which states:

Although there are abundant reserves of low-grade aggregate material (rhyolite) throughout most of the Bay of Plenty region, there are inadequate resources of high-grade material close to Tauranga and Rotorua. High grade andesite is therefore brought in from quarries near Katikati and Te Puke.

Cody and Christie (1992, p.70) agree, noting that good quality roading and concrete aggregate are particularly lacking in abundance, and that 'the eastern greywacke ranges offer good quality aggregate resources but they are far removed from the urban centres of greatest need'.

The Crown Minerals report (2004) adds that:

Andesite is and has been quarried at many localities in the region and so those areas where there is 'fresh' andesite of the southern Coromandel Volcanic Zone (CVZ) will themselves contain areas of potential future aggregate extraction.

This analysis affirms the conclusions of Houghton and Cuthbertson (1989, p.32), who, when referring to the andesite of the Uretara Formation (Kaimai Range), state that 'the material is of excellent quality where not hydrothermally altered, and only thickness of overburden constrains the viability of quarrying'.

Figure 10 maps andesites, basalts and dacites in the western Bay of Plenty. The map also shows the locations of existing extraction sites. Figure 10 indicates that there are a number of sites centred on the hard rock resource to the west of Te Puke. There are also hard rock quarries located on the fringes of the Kaimai Range near Waihi Beach and Katikati. While detailed assessments would be required to determine the viability of quarrying at any particular site, at a more general level this spatial pattern would suggest that future extraction sites are likely to be located within or on the edges of these mapped areas.

Crown Minerals (2004) identified additional areas of Tertiary/Quaternary andesites, dacites and basalts, which may also prove to be suitable sites of high quality material for aggregate. These areas are not marked on Figure 10, but are centred on Putauaki to the immediate south east of Kawerau; and to the north of this area in the vicinity of the mining permit 41 606 (see Figure 9).

The Greywacke ranges in the eastern Bay of Plenty are another key source of aggregate in the region. Greywacke is extracted from quarries near Whakatane (see Figure 9), while river gravels also provide a natural concentration of washed, durable materials for roading and construction purposes.

Figure 11 maps the broad gravel lithologies of the region and locates recent river gravel extraction resource consents. The map shows that river gravel extraction sites are confined to the rivers draining out of the eastern greywacke ranges. This is largely due to the structural characteristics of greywacke, which leads to rivers with rock or shingle beds and carrying significant bedloads of shingle, sand and silt (Environment Bay of Plenty, 2003).

River gravel extraction rates are managed under the Regional River Gravel Management Plan for flood and resource management purposes, and to meet demand for aggregate. The extraction of small volumes is generally a permitted activity, while a resource consent is required for the extraction of large volumes (e.g. for commercial purposes). Figures show that a total of 255 587 m<sup>3</sup> was extracted from consented sites in the 2001-2004 period. Approximately 75% of this total was extracted from the Waimana (58 883 m<sup>3</sup>), Waioeka (55 622 m<sup>3</sup>), Whakatane (49 570 m<sup>3</sup>) and Horomanga (34 833 m<sup>3</sup>) rivers.

Figures also show a downward trend in annual extraction rates over the past ten years. The average for the 1993-1997 period was 200 000 m<sup>3</sup> per year, for the 1997-2001 period it was 98 000 m<sup>3</sup> per year and between 2001-2004 the average was approximately 75 000 m<sup>3</sup> per year (Mooney and Pickles, 2005). While there is a ready supply of river gravel, demand would appear to be governed by factors such as the availability of low cost alternatives and specific requirements for certain uses e.g. roading.

There are also some access issues associated with the extraction of river gravels. These issues tend to be about securing access (e.g. across private property) to

sections of rivers where gravel needs to be extracted for river management purposes rather than placing limitations on the overall supply of the river gravel resource. However, the expectation is that greywacke in its various forms will continue to be a principal source of aggregate in the east of the region in the future.

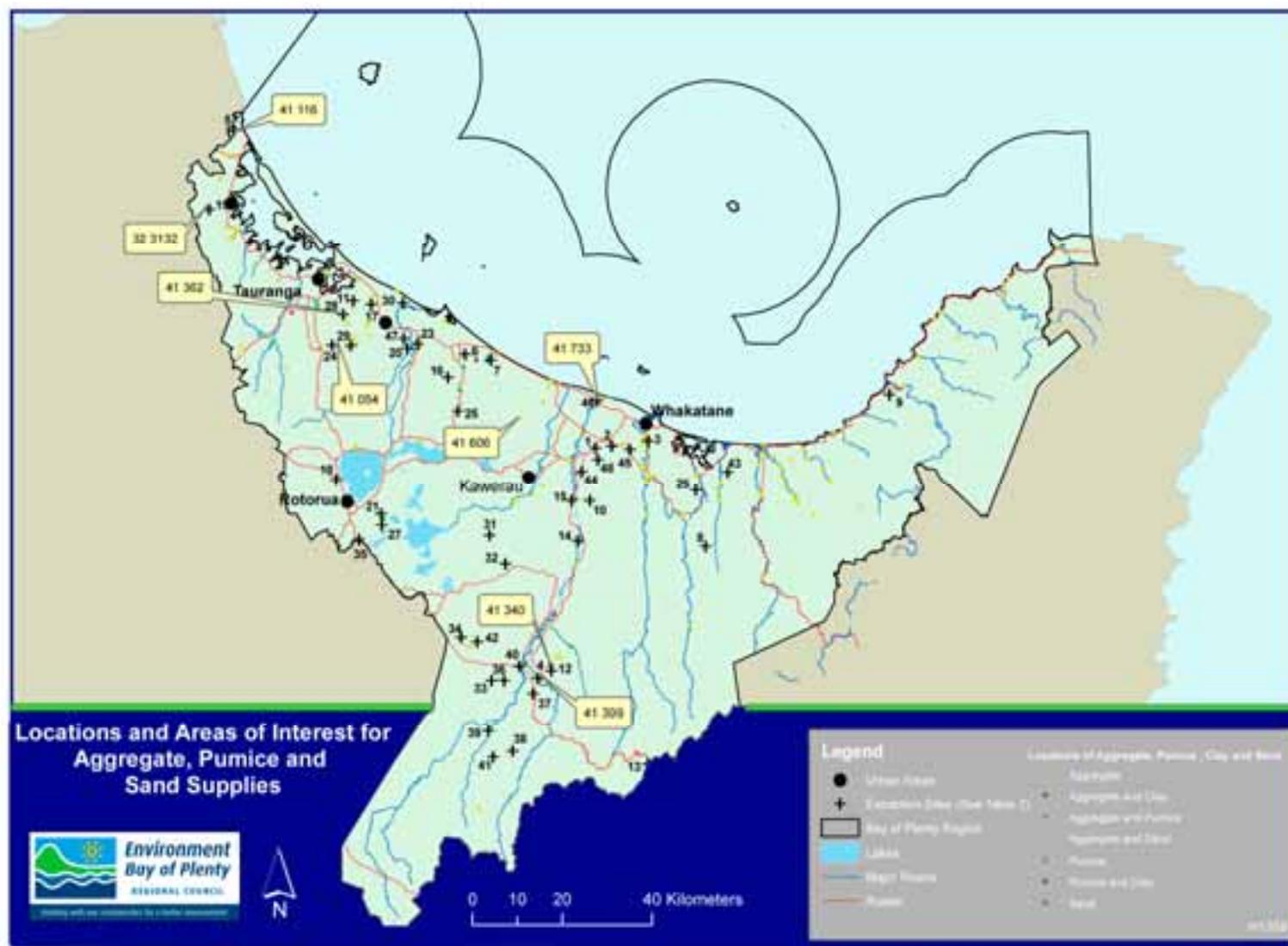
Aggregates play a key role in functioning of the Bay of Plenty economy. Ensuring that sources of supply are located in proximity to demand (generally the main population centres) is important because transport costs are an important factor in the economics of aggregate production. Guaranteeing the supply of certain types of aggregate is also important. For example, certain qualities are required for sealing chip on major roads, while aggregate of lesser quality can be used as base material for roading. Similarly, specific properties are desirable for aggregates and sand used in the production of concrete and for other industrial uses<sup>2</sup>.

While this report provides a general overview at the regional level, these other factors need to be borne in mind because they influence individual decisions about the location of extraction sites and the type of material that is extracted.

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<sup>2</sup> MacFarlan and Barry (1991) provide a good overview of the qualities required for various uses of aggregate and sand.

Figure 9 Locations and Areas of Interest for Aggregate, Pumice and Sand Supplies



Sources: Cody and Christie (1992), Crown Minerals (2004), Weiss (2004).

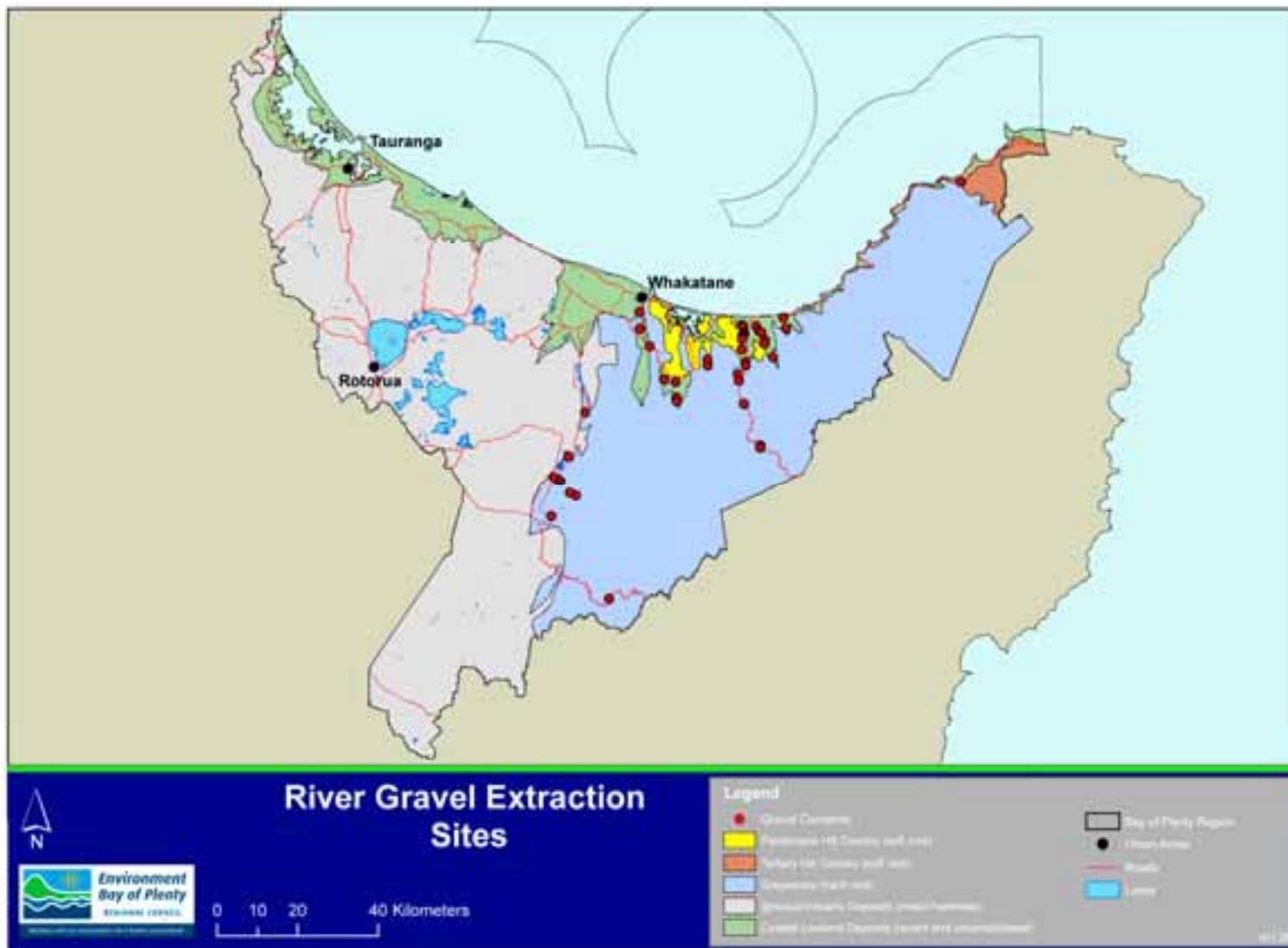
**Table 2** Current / Recent Quarry Extraction Sites for Aggregates, Pumice and Sand

| Map No. | Mineral Resource  | Mining Permit required? | Permit No. | Area     | Date of Grant | Expiry Date |
|---------|---|-------------------------|------------|----------|---------------|-------------|
| 1       | Rock/sand for roading, building   | No                      |            |          |               |             |
| 2       | Pumice  | No                      |            |          |               |             |
| 3       | Rock/sand for roading, building, fill                                       | No                      |            |          |               |             |
| 4       | Aggregate   | Yes                     | 41 399     | 8 ha     | 24/7/1996     | 23/7/2016   |
| 5       | Rock/sand for roading, building   | Yes                     | 41 116     | 5.8 ha   | 24/7/1996     | 17/7/2017   |
| 6       | Pumice  | No                      |            |          |               |             |
| 7       | Pumice/rock/sand for roading  | No                      |            |          |               |             |
| 8       | Rock for roading (forestry)   | No                      |            |          |               |             |
| 9       | Rock for roading (forestry)   | No                      |            |          |               |             |
| 10      | Rock for roading (forestry)   | No                      |            |          |               |             |
| 11      | Pumice  | No                      |            |          |               |             |
| 12      | Aggregate, sand and gravel  | Yes                     | 41 340     | 100.5 ha | 7/11/1995     | 6/11/2025   |
| 13      | No information  | No                      |            |          |               |             |
| 14      | Rock/sand   | No                      |            |          |               |             |
| 15      | No information  | No                      |            |          |               |             |
| 16      | Pumice  | No                      |            |          |               |             |
| 17      | Rock/sand for roading, building, fill and reclamation                       | No                      |            |          |               |             |
| 18      | Rock (rhyolitic) for roading, fill  | No                      |            |          |               |             |
| 19      | Rock/sand for roading, building   | Yes                     | 32 3132    | 29.8 ha  | 9/3/1993      | 8/3/2014    |
| 20      | Pumice  | No                      |            |          |               |             |
| 21      | Pumice  | No                      |            |          |               |             |
| 23      | Rock/sand for roading, building, fill and industry.                         | No                      |            |          |               |             |
| 24      | Rock/sand for roading, building, fill                                       | Yes                     | 41 054     | 7.6 ha   | 16/7/1992     | 15/7/2013   |
| 25      | Pumice  | No                      |            |          |               |             |
| 26      | Rock for roading, fill  | No                      |            |          |               |             |
| 27      | Rock/sand for roading, building, fill                                       | No                      |            |          |               |             |
| 28      | Rock for roading, fill, limited quantities for sealing chip (blue andesite) | Yes                     | 41 362     | 54 ha    | 7/11/1995     | 6/11/2015   |
| 29      | Aggregate for building  | No                      |            |          |               |             |
| 30      | Sand  | No                      |            |          |               |             |
| 31      | Pumice  | No                      |            |          |               |             |
| 32      | Rock (crushed metal) for roading (forestry)                                 | No                      |            |          |               |             |
| 33      | Hard rock quarry (forestry), intermittent use                               | No                      |            |          |               |             |
| 34      | Hard rock quarry (forestry), intermittent use                               | No                      |            |          |               |             |
| 35      | Hard rock quarry (forestry), intermittent use                               | No                      |            |          |               |             |
| 36      | Hard rock quarry (forestry), intermittent use                               | No                      |            |          |               |             |
| 37      | Hard rock quarry (forestry), intermittent use                               | No                      |            |          |               |             |
| 38      | Rock and some pumice  | No                      |            |          |               |             |
| 39      | Rock for roading purposes   | No                      |            |          |               |             |
| 40      | Pumice for roading (forestry)   | No                      |            |          |               |             |
| 41      | Rock roading (forestry)   | No                      |            |          |               |             |
| 42      | Pumice for forestry maintenance purposes                                    | No                      |            |          |               |             |
| 43      | Rock/sand for roading   | No                      |            |          |               |             |
| 44      | Pumice  | No                      |            |          |               |             |
| 45      | Rock/sand for roading   | No                      |            |          |               |             |
| 46      | Sand for roading  | Yes                     | 41 733     | 3.9 ha   | 24/9/2002     | 23/9/2009   |
| 47      | Pumice  | No                      |            |          |               |             |
| 48      | Rock and pumice for roading and maintenance (farming)                       | No                      |            |          |               |             |
| N/A*    | Andesite  | Yes                     | 41 606     | 33.5 ha  | 11/8/1999     | 11/8/2039   |

\*Does not have a current consent (e.g. historical extraction site with current mining permit).



Figure 11 River Gravel Extraction Sites



Sources: Environment Bay of Plenty (2003), Mooney and Pickles (2005).



## Chapter 4: Conclusions

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The Bay of Plenty contains a rich and diverse mineral resource base, comprising both metallic and non-metallic minerals. The diversity of the resource can to some extent be attributed to the underlying geology and the dynamics of the Taupo Volcanic Zone. This results in a mineral distribution that in New Zealand is perhaps only replicated in the neighbouring Waikato region.

Mineral extraction plays an important role in the functioning of the regional economy, particularly in the supply of raw materials for the development and maintenance of infrastructure. Consequently, knowledge of the nature and location of key strategic mineral resources should be factored into land use planning decisions.

The information presented in this report shows that the Bay of Plenty has been, and remains, a region of active prospecting for gold deposits. The current prospecting focus is on epithermal deposits of the Taupo Volcanic Zone, an area of historical gold production near Te Puke, and the northwestern corner of the region adjacent to the Waihi gold production area. Future production from more refined areas within these prospects cannot be discounted.

There is also a history of extraction of minerals primarily associated with volcanic activity in the region, particularly sulphur, diatomite and perlite, while substantial quantities of amorphous silica are extracted currently. Again, there is the potential for future interest in extracting these minerals, particularly from areas within the Rotorua district.

Although the information presented in this report points to some potential areas of interest for 'high value' minerals, it is evident that considerable work is required to identify and refine areas to gain any certainty in terms of future extraction sites. Accurately identifying these sites is the 'commercial edge' that companies seek in their prospecting and exploration activities. Identifying an area with potential is only the beginning of a process that may eventually lead to the extraction of a mineral from a specific site. The uncertainties surrounding this process suggests there is little to be gained from attempting to predict potential extraction sites as a means of protecting access to these minerals.

Industrial minerals such as aggregates, pumice and sand are extracted in significant quantities from many sites in the region. The abundance of these resources and the distribution of existing extraction sites suggests there is greater utility in identifying areas of potential extraction as a first step towards protecting future access to these resources.

The material reviewed in compiling this report raises no apparent issues in terms of the overall supply of pumice and sand in the region. However, high quality sand for building is extracted from a limited number of coastal sites (e.g. Thornton) and, without active intervention, future access to this resource could be constrained by conflicting land use demands. Another factor is that large-scale mining of sand from beaches is no longer considered to be an acceptable option due to the effects of this extraction on coastal processes.

The east of the region is served by a ready supply of aggregate emanating from the eastern greywacke ranges. This aggregate resource is extracted from numerous quarry and river extraction sites.

The lack of adequate supplies of high grade aggregate in the west of the region is a recurring theme in existing mineral resource assessments. The projected population growth of Tauranga and its satellites may exacerbate this situation by generating additional demand, while simultaneously 'locking up' potential extraction sites. From a mineral resource perspective, it would appear that areas of andesite in the western Bay of Plenty (e.g. Kaimai and Papamoa ranges) constitute a key source of quality aggregate. The protection of access to this resource in particular should be a consideration in future resource management decisions.

## Chapter 5: Recommendations

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Method 6.3.1(c) in the Regional Policy Statement encourages the regional council and territorial authorities to recognise known mineral deposits and consider whether the potential for access to those mineral resources could be compromised. This report has considered mineral resources in the regional context as part of a scoping exercise to implement this method. The findings suggest that seeking to protect access to high quality andesite in the western Bay of Plenty subregion should be a priority for future work. This recommendation is based on information that points to the limited availability of this resource and the pace of rural subdivision in the western Bay of Plenty.

Further work is required in two areas:

- 1 A more detailed investigation into the dynamics of supply and demand for high quality aggregates in the western Bay of Plenty subregion and Rotorua. This should focus on factors such as projected demand and the specific requirements of this demand (e.g. how much of each grade of material will be required in the future). There also needs to be further refinement of the areas of potential future extraction of this aggregate.
- 2 Environment Bay of Plenty also needs to initiate discussions with the relevant territorial authorities about what formal protection may be required to protect access to these key sources of aggregate. This may involve proposing new provisions for inclusion in district plans.



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## Appendices

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- Appendix A - Bay of Plenty Regional Policy Statement(Operative 1 December 1999)*
- Addendum 1 - Protection of access to High Quality Andesite in Western Bay of Plenty District*



## Appendix A

### Bay of Plenty Regional Policy Statement (Operative 1 December 1999)

| <i>Policies</i>   |  |
|---|--|
| 6.3.1 (b)(xvi)  | To promote the integrated management of mineral resources including aggregates.  |
| 13.3.1 (b)(viii)  | To discourage uses of land, for example for urban development or settlement growth, which would:   |
| (g)   | Result in the loss of access to minerals including aggregate sources.  |
| <i>Methods of Implementation</i>                                    |  |
| Environment Bay of Plenty and District Councils are encouraged to:  |  |
| 6.3.1(c)  | Recognise known mineral deposits and consider whether the potential for access to those mineral resources could be compromised.  |
| Environment Bay of Plenty and District Councils will co-operate in: |  |
| 13.3.1(c)(v)  | Requiring in any assessment of environmental effects for proposed significant resource developments including infrastructure and utility developments, consideration of the effects of the proposal on finite resources including high quality soils and minerals. |

### SmartGrowth Strategy and Implementation Plan

| <i>7.2.7 Aggregates and other Mineral Resources</i> |  |
|---|--|
| <b>Actions</b>                                      |  |
| 1   | Investigate mineral demand and resource potential and prepare maps showing the location of areas of known or potential resources within the region, and develop management strategies that take into account the findings of this investigation. |



# **Addendum 1 – Protection of Access to High Quality Andesite in Western Bay of Plenty District**

March 2007

Consequent to the recommendations made in the parent report, *Minerals in the Bay of Plenty Region* this addendum describes the outcomes that resulted from investigation into the security of access to hard-rock in the western Bay of Plenty sub-region and Rotorua.

## **CONTENTS**

### **1 BACKGROUND**

- 1.1 Access to Hard-rock Resources
- 1.2 Scope of Further Investigations
- 1.3 Location of Quality Hard-rock in the Bay of Plenty Region
- 1.4 Western Bay of Plenty District Plan Resource Consent Requirements

### **2 QUARRY OPERATOR SURVEY**

### **3 DISTRICT PLAN REVIEW**

- 3.1 Rural Policy and Objectives

## 1 BACKGROUND

The trends in the western Bay could lead to a classic 'resource lock-up' situation where there is high population growth, high demand for good quality hard-rock to provide for infrastructure purposes, and high rates of rural subdivision with potential to simultaneously lock-up suitable hard-rock extraction sites.

### 1.1 Access to Hard-rock Resources

There is seeming little attention nationwide being given to the availability of future supplies of hard-rock to provide for high growth areas [Kavanagh D. 2006 *Councils Accused of Ignoring Aggregate Supply Problems*: in *Asset Management* 7(5) pp9-10].

While there is no shortage of hard-rock resources the difficulty is obtaining and maintaining access to the deposits. Access can be impeded by subdivision of rural land into lifestyle blocks, which in-turn, can 'lock-up' the resource. And access can be impeded by adjoining landowners, who establish after quarrying operations begin, yet hamper continued quarry activities: a syndrome described as 'reverse-sensitivity'.

By allowing such trends to occur, local government may inadvertently make it more difficult to access the raw material required to build the urban and transport infrastructure it needs.

There is every indication that such a trend could prevail in the western Bay of Plenty. It is a sub-region of high population growth where there is concurrent high demand for quality hard-rock aggregate products for infrastructure requirements, and high demand for lifestyle-block subdivision.

### 1.2 Scope of Further Investigations

The parent report, to which this addendum attaches, expressed concern for the circumstances in the western Bay sub-region and Rotorua pertaining to perceived limited availability of high quality andesite, and the fast rate of rural subdivision in the hinterland. Page 25 of the report recommends:

- *a more detailed investigation of the dynamics of supply and demand for high quality aggregates in the western Bay sub-region and Rotorua; and*
- *discussions with relevant territorial authorities about what formal protection may be required to protect access to these key sources of aggregate.*

The follow-up investigation focused on the Western Bay of Plenty District alone. It is in the Western Bay of Plenty District where andesite (good quality hard-rock) deposits are located, and where high rates of rural subdivision are being experienced.

### 1.3 Location of Quality Hard Rock in the Bay of Plenty Region

The parent report mapped andesite deposits in the Bay of Plenty Region (Figure 10 p20). All andesite deposits are clearly seen to be located within the Western Bay of Plenty District. Those areas constitute a key source of hard-rock, where existing quarries are located, and where future extraction sites are likely to be located.

The deposits of andesite directly correlate with the Kaimai and Papamoa ranges. The Kaimai and Papamoa Ranges comprise protected areas of land including the Kaimai Mamaku Forest Park, Papamoa Hills Regional Park and associated scenic reserves. Other associated 'packages' of land considered important for their natural and heritage values include those described in the Western Bay of Plenty District Plan as significant landscape features, significant ecological sites and archaeological sites.

Areas of land protected and/or identified as having significant values constrain other uses of those same lands.

These constraints are taken into account in the consideration of resource consent applications.

### 1.4 Western Bay of Plenty District Plan Resource Consent Requirements

The Western Bay of Plenty District Plan specifies that quarrying requires resource consent as a discretionary activity, demanding rigorous scrutiny. Public notification of a consent application is required, enabling public submissions. Consent may be granted at the discretion of the council subject to regard being given to the potential for conflict with existing and foreseeable values and activities in the area. Given the nature of quarrying activity, such plan provisions are to be expected.

On the other hand, the Western Bay of Plenty District Plan specifies that rural subdivision requires resource consent as a controlled activity. Public notification of such a consent application is not required and members of the public do not have opportunity to make submissions. Subdivision consent is granted as of right, provided that the proposed subdivision meets prescribed District Plan standards, hence the need for the Plan to include specific provisions relating to the protection of access to and use of hard-rock deposits.

## 2 QUARRY OPERATOR SURVEY

To more fully appreciate the problem an industry perspective to the above issues was required. Six key quarry operators in the Western Bay of Plenty District were questioned as to:

- the projected 'life' of current quarry site/s;
- predicted future demand for product;
- plans for expansion (whether they be expansion of existing sites or extraction from new sites);

- incompatible land-use activities currently experienced; and
- any land-use activities that could possibly become problematic in the future.

It would seem that there are no current reverse-sensitivity issues and no operator has immediate, or medium term, plans to extract from new sites. However, resource consent granting procedures, and the potential for adjoining land-use incompatibility, were raised as issues of general concern.

There remains a need to take a strategic approach in order to manage current trends and to protect long-term access to hard-rock deposits. New district plan provisions could assist in enabling such protection.

### 3 DISTRICT PLAN REVIEW

The Western Bay of Plenty District Council will begin a review of its operative Plan in the current financial year (2006/07). It is opportune to feed this rationale for new plan provisions directly into the district plan review process.

To this end, Environment Bay of Plenty and Western Bay of Plenty District Council planning staff agreed that the following provisions be included for consideration in the district plan review process.

The provisions are proposed to be included as component descriptors of Rural G and Rural H Zones and are consistent with current Plan format, terminology and other more general policies and objectives.

#### 3.1 Rural Objectives and Policies

The following objectives and policies are designed to protect the potential for use and development of hard-rock deposits. They are modelled on similar current Plan objectives and policy to ensure that versatile soils will be used and developed to their full potential, and to manage reverse-sensitivity issues related to intensive farming activities.

##### 1 Objectives

- a) Recognition of hard-rock deposits as being an important resource for infrastructural development purposes, and the need for protection of access to those deposits.

##### 2 Policies

- b) Enable subdivision which maintains or increases the likelihood that hard-rock deposits in the District may be used and developed to their full potential in an efficient manner.
- c) Protect hard-rock deposits from activities in close proximity which may compromise the extraction of those deposits and/or unduly limit quarry operations.

### 3 Activity Performance Standards

The following performance standards shall be met by all permitted and controlled activities and shall be used as a guide for all other activities. Any permitted or controlled activity which fails to comply with any of these standards shall be deemed a discretionary activity for the particular non-compliance.

#### (a) Subdivision and Land Use Development

##### 1 General

##### 1.1 Activity Status

Unless expressly stated otherwise within this District Plan subdivision complying with the following rules shall be a controlled activity.

##### 1.2 Conflict with Quarrying Activities

Each lot shall be located no closer than 500 m from an existing quarrying activity. Subdivision applications failing to meet this standard shall be a discretionary activity.

##### 1.3 Security of Access to Deposits of Hard-rock

Each lot shall be located no closer than 500 m from any deposit of hard-rock.

The cumulative effect of the location of lots and house sites shall not impede potential road access to any deposit of hard-rock.

Subdivision applications failing to meet these standards shall be a discretionary activity.

##### 1.4 Discretionary Activity Assessment Criteria

(i) When considering discretionary activities under Rule 3(a)1.2 Council shall have regard to the following matters:

- assessment of noise, vibration, dust, heavy vehicle movement, and views;
- the location of lots and house sites in relation to the quarry site; and,
- the extent of avoidance and mitigation measures.

(ii) When considering discretionary activities under Rule 3(a)1.3 Council shall have regard to the following matters:

- the extent of quarry industry interest in the deposit;
- the potential ability of future landowners to impede quarry use because of probable noise, vibration, dust, heavy vehicle movement, and view problems; and,
- the extent to which any future avoidance and mitigation measures could be effective