

INDUSTRIAL MINERALS

► Introduction

New Zealand has extensive industrial mineral resources including, amorphous silica, bentonite, diatomite, dolomite, halloysite, ironsand, limestone and lime, perlite, pumice, high grade silica sand, zeolite and a variety of brick clays. Large quantities of geologically-sourced building materials are required for construction, and fertilizer minerals support the high level of agricultural production.

New Zealand trades extensively in various industrial mineral commodities, although the output of most is governed by domestic demand. The main exports are ironsand, clay, lime, limestone and cement, together with smaller quantities of peat, salt, sulphur and pumice. The main minerals imported are fertiliser minerals such as phosphate, potash and sulphur, gypsum for use in plaster and cement manufacture and refractory clays, magnesia, building stone, magnesite, talc, diatomite and cement.

Industrial mineral production in New Zealand is valued at more than \$325M annually, with ironsand production worth an additional \$30M.

► Aggregates

Domestic production of aggregates is currently about 20.5 M tonnes per annum (tpa) of which 14.3 M tpa is consumed in the North Island. The value of aggregate and sand production is more than \$250 M. The industry is dominated by the activities of a small number of major companies, but there are also a large number of smaller producers who cater for localised demand. There are generally adequate local sources of aggregate, but in the Auckland region, aggregate is having to be transported from farther afield as existing quarries are being worked out and potential resources are sterilised by competing land uses.

The most important rock types used for high quality aggregate are greywacke sandstone, basalt and andesite.

Basalt and andesite are quarried, and greywacke is either quarried or won from alluvial gravels. Quartz sand and gravels are also widely used for aggregates for concrete and masonry. In the Auckland area, sand for concrete is supplied from offshore dredging of marine sand and from river sand. In areas that are devoid of more suitable rock types, limestone is commonly used.



Greywacke quarry

► Building stone

Building stone is widely used for decorative walls and paving. Rocks used include limestone, marble, schist, and ignimbrite. Deposits of basalt, dacite, sandstone, serpentine, tonalite, norite and various granites have all been worked for building stone in the past.

► Clays

Halloysite clay is produced from deposits at Matauri Bay in Northland, with product being exported to more than 20 countries for manufacture of high-quality ceramics, principally porcelain but also fine bone china and technical ceramics. The high purity halloysite possesses exceptional

properties which impart whiteness and translucency to the finished product. A coarse by-product is sold on the local market as filler clay, and a silica sand by-product is used in the local building industry and for golf course bunkers.



Halloysite clay mine and plant, Matauri Bay

Kaolinite clays are used widely for domestic brick, tile, pipe, ceramics and pottery manufacture. Some kaolinite is also used as a filler in rubber, bitumen and adhesives. High-purity kaolinite is used by the New Zealand paper industry for paper coating and filling.

Bentonite is mined in the Harper Hills west of Christchurch for use as a binder for foundry sand, in drilling muds, for sealing clay dams and diaphragm walls in construction projects, as a bitumen emulsifier, in fibrous cement and as pellet binder in stock food. Marine bentonitic beds have been worked in the past at Mangatu, north of Gisborne, and at Porangahau in southern Hawke's Bay.

► Diatomite

Diatomite is quarried from several deposits for use as a mild abrasive, insulation, filtration, and pozzolan material. Diatom-rich lake deposits are interbedded with young volcanic sediments in Northland, Auckland, South Auckland, Waikato and Rotorua. There are also diatomite lake deposits at Middlemarch in Otago, and marine diatomite deposits near Oamaru.

► Dolomite

The Mt Burnett quarry in Northwest Nelson produces 25,000-40,000 tpa of dolomite, used as an additive to phosphatic fertilisers for spreading on magnesium-deficient soils, and for aggregate and rip rap.

► Feldspar

Plagioclase feldspar-rich dune, beach and marine sands of Quaternary age found at Ruakaka Flat, Mangawhai, south of Whangarei and near Kaipara Harbour. The Ruakaka deposit is estimated to contain more than 400 Mt of sand.

► Limestone

Limestone deposits are widespread throughout New Zealand and are used for agricultural fertilizer, hydrated lime manufacture and for roading aggregate. Limestone production is valued at more than \$40M annually. High grade limestone and marble suitable for domestic and export industrial use are widespread. The best quality, large-tonnage deposits are in the south Waikato.

Cement

New Zealand has two cement manufacturing plants using local high grade limestones mixed with marl for their feed. The plants at Portland, near Whangarei, and at Cape Foulwind, near Westport, each produce about 500,000 tpa.



Limestone mine for cement manufacture, Cape Foulwind

Lime and limestone for industry and agriculture

Limestones in Canterbury and marble from west Nelson are used for manufacture of industrial grade lime. About 50,000 tpa of high grade limestone is produced near Te Kuiti, in the south Waikato, for use as a filler in paper, plastics, paint and rubber, for paper surface coatings, and in glass.

At Otorohanga, in the Waikato, high grade crystalline limestone is quarried to produce nearly 500,000 tpa of lime products. The principal industrial uses are in agriculture, steelmaking at the Glenbrook mill, in processing gold ore at the Martha Hill gold mine and overseas, in domestic paper pulp manufacture, in the sugar industry, in soil stabilisation, and in sewage sludge and waste water treatment.

In the South Island, a plant at Dunback, near Dunedin, supplying burnt lime and ground limestone mainly for use in processing gold ore at the Macraes Flat gold mine. Other markets include water treatment, soil stabilisation, sewage sludge and waste water treatment, agriculture, plus an expanding market for finely ground limestone for the plastic, rubber and glass industries. There are many other medium and small producers of agricultural lime.

► Marble

Large resources of marble are present in Northwest Nelson and Fiordland. The main production has been from quarries on Takaka Hill in Northwest Nelson, for use as building stone, and in industry and agriculture. The Ngarua quarry, near Motueka, Northwest Nelson, produces 15,000-20,000 tpa of white marble used as a filler, in the surface coating industry, and for agricultural lime.

► Magnesite

Magnesite occurs along with talc in ultramafic rocks in Northwest Nelson, Westland, north Otago and Southland. The main occurrences are in the Cobb-Upper Takaka district, where 21,802 t of magnesite were produced at Cobb until 1981.

► Perlite

Large resources of perlitic rhyolite occur as near surface layers on rhyolite domes and as flows of perlitic, glassy rhyolite lava in the Rotorua-Taupo area and on Great Barrier Island. About 2,000 tpa are quarried at Atiamuri, southwest of Rotorua, for use in the domestic market as an inert insulator and filler, and for horticultural/pot plant mixes. The high expansion capacity of perlite from the Taupo Volcanic Zone makes it particularly good for filtration applications. There is potential for developing this market.

► Phosphate

Phosphate has been mined at Clarendon, southwest of Dunedin. There is potential for a combined phosphate and glauconite operation provided suitable processes and markets can be developed.

Extensive phosphate resources are present in submarine deposits along 400 km of the crest of the Chatham Rise, in water depths of about 400 m, east of the South Island. Dredge sampling has outlined an estimated provisional resource of 100 Mt of nodules averaging 21% P₂O₅. Test trials have demonstrated that the material is suitable for use as a direct application, slow-release phosphate fertilizer.

► Pumice

Pumice is quarried from very large pyroclastic deposits in the Taupo Volcanic Zone and dredged with sand from alluvium in the lower reaches of the Waikato River. Annual production is estimated at 500,000 t. The main uses of pumice are as fill in road construction, for sand in concrete block manufacture, and for foundations and drainage. It is also used in horticultural soil mixes and is exported for use in the stone washing of denim clothing.

► Salt

Salt is produced at Grassmere, south of Blenheim, by solar evaporation of sea water. Low rainfall, high sunshine hours and adequate wind assist in the evaporation of the sea

water with a resulting salt production of about 60,000 tpa. There are associated refineries on the same site and at Mount Maunganui, supplying raw solar and vacuum dried salt to the domestic market for use in chlorine manufacture, as edible salt, and for water treatment, tanning, dairy and agricultural usage.

► Serpentinite

Small quantities of serpentinite are mined and crushed for use as an additive to superphosphate fertilizer to supply magnesium and to assist in the free-running properties of fertiliser required for aerial topdressing.

► Silica

Silica sand

Large resources of quartz-rich silica sand localities are present in Northland, at Parengarenga Harbour on the east coast and around Kaipara Harbour on the west coast. This has been dredged in the past and processed into glass. Silica sands are also concentrated on erosional land surfaces associated with coal measures in the South Island. The main occurrences are at Mt Somers in Canterbury and at Charleston in Westland. There are other deposits in East Otago and Southland.



Silica sand extraction, Parengarenga, Northland

Lump silica

Quartz gravels in Southland are widespread and have potential for use in the production of ferrosilicon or silicon metal. The quartz gravels around Pebbly Hills-Mabel Bush, in central Southland, are inferred to contain more than

350 Mt averaging 98% SiO₂. The availability of abundant low ash coal and hydro-electricity are other factors favourable to a ferrosilicon industry in Southland. There are smaller deposits of similar material elsewhere in Otago and northern Southland. About 1 Mt of ferrosilicon quality quartzite is associated with schist at Aorere, Northwest Nelson.

Amorphous silica

Amorphous silica is deposited by hot springs as silica sinter and by hydrothermal alteration of nearby rocks in volcanically active areas. Three amorphous silica deposits have been explored recently: Tikitere and Taheke, near Rotorua, and Lake Rotokaua, near Taupo. The Tikitere deposit is currently being mined for use as a pozzolanic cement additive to produce high quality, strong and durable concrete, sprayed tunnel linings, mortars and grouts.

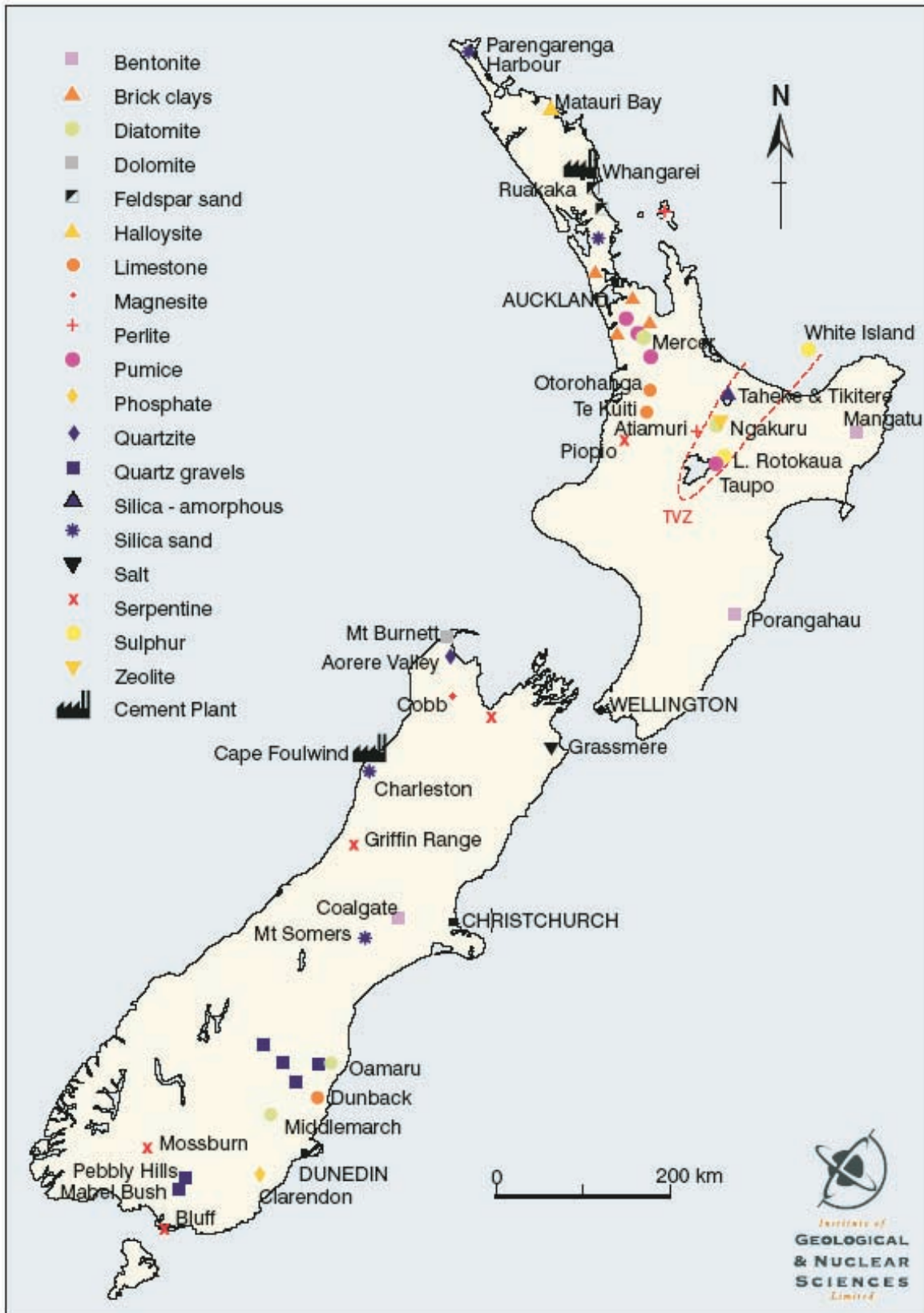
► Sulphur

Deposits of sulphur are associated with present-day and fossil geothermal areas at Ngawha in Northland and in the Bay of Plenty and Rotorua-Taupo districts. The main areas of past production are White Island, Tikitere, Lake Rotorua and Lake Rotokaua. There is currently no significant production.

Lake Rotokaua, northeast of Taupo, offers the best potential for large scale sulphur mining. There is potential for pelletising the sulphur and using it as a direct application fertiliser in specialised agricultural markets, replacing imported granular products. There are also sulphide forms of sulphur deposits found in the Kauaeranga Valley, near Thames, and at Copperstain Creek near Takaka.

► Zeolite

The Taupo Volcanic Zone hosts a number of zeolite deposits formed by hydrothermal alteration of suitable precursors such as vitric tuffs. About 5000 tpa of zeolite is produced from three deposits at Ngakuru, near Rotorua. Ngakuru zeolites have exceptional properties of adsorption, and each of the deposits has unique characteristics. They are specifically suitable as adsorbents for soaking up oil/chemical spills, as pet litter, and as a stockfeed additive; water softening, waste and potable water treatment, sports turf and potting mix amendment; and odour adsorbents and as cosmetic additives.



New Zealand Industrial Minerals

