



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

This document is part of a larger publication and is subject to the disclaimers and copyright of the full version from which it was extracted. Information on purchasing the book, and details of other industrial minerals, as well as updates and copyright and other legal information can be found at:

<http://www.dpi.nsw.gov.au/minerals/geological/industrial-mineral-opportunities>



Photograph 5. Diatomite from the Kyooma diatomite mine, Barraba. Diatomite is processed on-site and sold mainly for pet litter and for industrial and agricultural uses. The superior absorbency, chemical inertness and low density of diatomite allow its extensive use in industrial and domestic absorbents. (Photographer D. Barnes)

Potential and Outlook

Australia currently imports about 15 000 tonnes of diatomite annually. The value of these imports is some A\$18 million, i.e. almost A\$1400 per tonne, of which freight costs make up about A\$400 per tonne. Locally produced diatomite therefore has a competitive advantage over the imported material.

Major domestic users of filtration aids in the brewing and winemaking industries apparently have indicated that they will support locally produced diatomite, providing the quality of the product is competitive. There is also potential for exporting diatomite produced in New South Wales to Asian markets.

The development of New South Wales diatomite deposits (Photograph 5) has been constrained by the perception that local diatomite is unsuitable for use in high-quality applications, such as a filtration aid, because of its freshwater origin and high clay content (Bowman 1982). However, Supersorb Environmental NL has developed a processing technique to overcome these problems. The technology will allow production

of material comparable to filter-grade diatomaceous earth produced in the USA, which is currently favoured by Australian food-processing industries.

The potential for developing new commercially viable diatomite deposits in New South Wales needs to be reassessed. Deposits that in the past produced inferior quality diatomite may have potential to be upgraded with new processing methods.

All New South Wales diatomite deposits are Tertiary and, apart from the Middle Flat deposit near Cooma, contemporaneous with volcanic activity (Figure 8). Diatomite deposition took place in lacustrine environments formed within topographic lows. In most cases the deposits formed directly on Tertiary volcanic rocks and, except for the Middle Flat deposit, are capped by a Tertiary volcanic lava flow that preserved the deposit. It appears that the composition of the pre-Tertiary rocks underlying the volcanic rocks has had no influence on the diatomite formation.

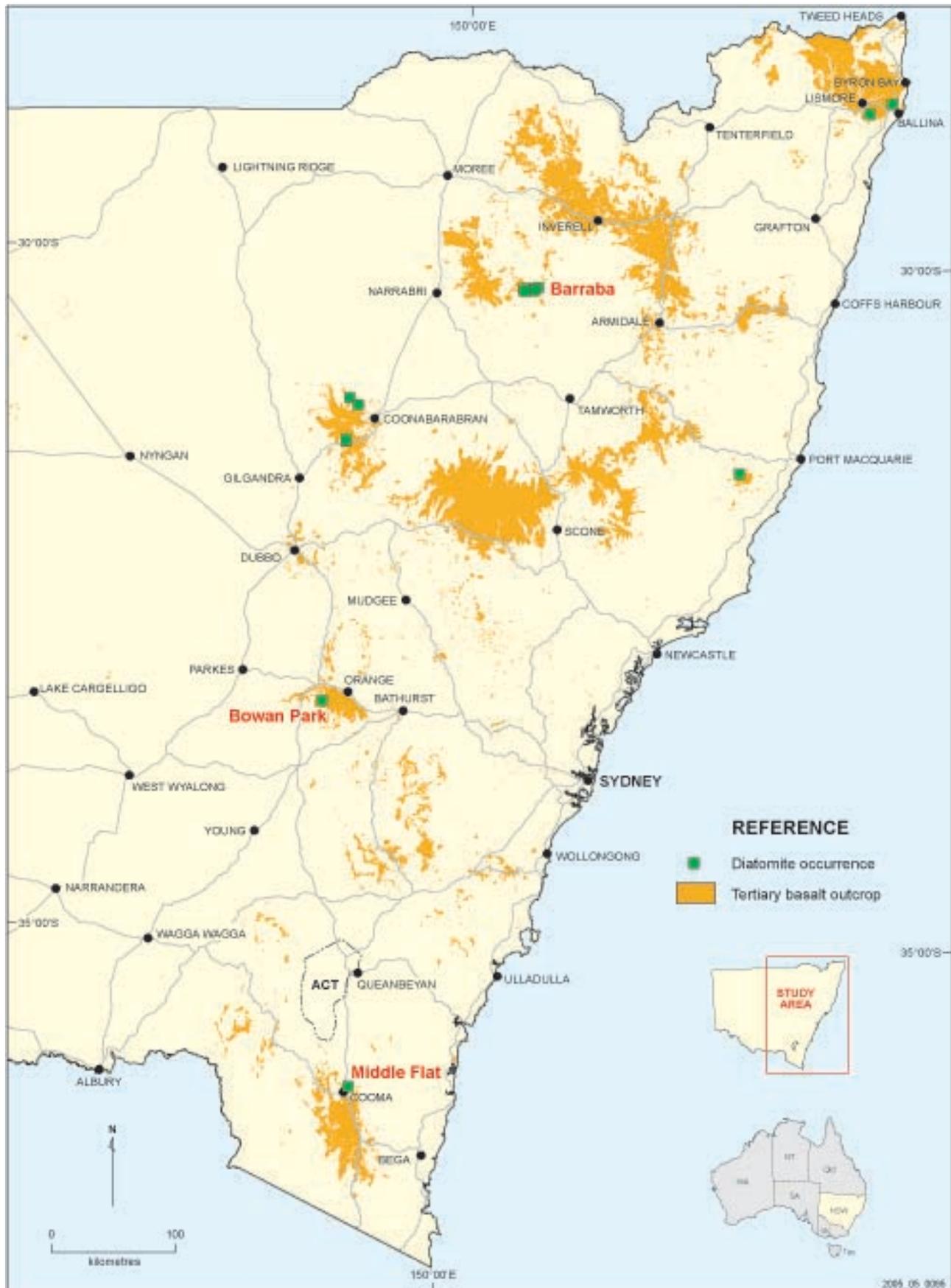


Figure 8. Diatomite occurrences and prospective rocks in eastern New South Wales

Eastern New South Wales contains abundant Tertiary volcanic rocks (Figure 8) and diatomite occurrences are widespread. Systematic exploration in areas where weathering has exposed Tertiary volcanic sequences could result in the discovery of commercial diatomite deposits away from the known localities.

Nature and Occurrence

Diatomite occurs as sedimentary accumulations of the siliceous skeletons (frustules) of microscopic aquatic plants known as diatoms. Deposits of diatomite can accumulate in marine, brackish and lacustrine environments. The commercially important deposits are either marine or lacustrine. The age of these deposits is generally less than 65 Ma.

The formation of these deposits requires tectonically and environmentally stable conditions, a supply of silica and an environment where the accumulated deposits are preserved. Favourable environments are large shallow basins, such as submerged coastal basins and shelves, and freshwater lakes and swamps. The source of silica for diatoms is usually groundwater or upwelling nutrient-rich seawater.

Diatomite deposits formed in marine environments are found on uplifted coastlines of most continents. The largest deposits of this type occur along the Pacific Rim, northern and southern Europe, northern Africa and the east coast of South America. These deposits are usually associated with interbeds of volcanic ash, clay and clastic sediments. Lacustrine deposits are associated with Miocene to Recent volcanism in northwestern USA and central Europe. Some shallow pond and bog deposits that are not associated with volcanism also occur in the USA, Brazil, Australia and the Philippines (Harben & Bates 1990; Harben & Kuřvart 1996).

Marine and lacustrine deposit types are commercially mined. In 2004, global production of diatomite was 2.0 Mt (Founie 2005). Most production is from marine deposits although numerically there are many more lacustrine deposits that are mined. The USA produces over 600 000 tpa, the largest deposits being in California, where over 420 000 tonnes of high-purity marine diatomite are mined each year (Harben 1999). Deposits are also mined in Nevada, Oregon and Washington.

China and Japan are also major producers of diatomite. Other countries which produce diatomite include France, South Korea, Czech Republic, Mexico, Spain, Denmark, Peru and Romania.

Main Australian Deposits

All Australian diatomite is of freshwater origin. The deposits in the eastern states were formed in lacustrine settings and are associated with Tertiary volcanic rocks. The Western Australian deposits occur in Holocene bogs. No economically significant deposits are known to occur in the Northern Territory, Tasmania or South Australia. Total production from Australian deposits has been generally 10 000–15 000 tpa.

New South Wales Occurrences

Large deposits of diatomite have been identified in New South Wales near Coonabarabran and north of Barraba. A number of small deposits at Cooma, Bowan Park near Orange and Lismore–Ballina have been worked on a small scale in the past. In addition, numerous small diatomite occurrences are recorded in various Department of Mineral Resources reports (Ray et al. 2003).

Most of Australia's diatomite production comes from the Supersorb Environmental NL mine at Barraba in the New England region. The diatomite produced is mainly used as an absorbent for pet litter (Photograph 5).

Diatomite deposits in New South Wales were all formed in lacustrine environments, are mostly associated with Tertiary volcanic rocks and are in the age range of 11 Ma to 21 Ma (Holmes et al. 1989). Most deposits occur at or near the base of a volcanic sequence within what were topographic lows and are often underlain by volcanic rock. The only New South Wales deposit not formed with associated contemporaneous volcanism is the Middle Flat deposit near Cooma, which formed in a large lake between 5 Ma and 12 Ma ago.

Other than the large resources of diatomite (11 million cubic metres) that have been identified near Barraba, there are no known deposits in New South Wales with potential for large-scale development. The further development of the Barraba deposits is dependent on the growth of existing diatomite markets in Australia.

Applications

Commercial grade diatomite primarily consists of silica (85–94%) and aluminium oxide (1–7%); various compounds, principally iron and titanium oxides; organic matter; and some rock-forming minerals

(Harben 1999). Diatom frustules in diatomite deposits are irregular, diverse and range in size from 5 µm to 1000 µm but are generally 50 µm to 100 µm. They have a large surface to volume ratio, are porous, and are chemically stable. Diatomite's properties make it ideal for use as a filter aid for separation of suspended solids and filtering water, and in dry-cleaning fluids, pharmaceuticals, liquor, beer, juices, fats, oils and chemicals. Other uses for diatomite are absorbents for pet litters and oil and industrial liquid spillages; fillers for paint, rubber, paper, dental impressions; chemicals and pharmaceuticals; and mild abrasives in toothpaste, polish and buffing compounds. Miscellaneous applications for diatomite include: source of silica; additive to cement mixtures; thermal and sound insulation; and fireproofing.

Alternative Materials

Alternatives to the use of diatomite include:

- Filtration: carbon, perlite, pumice, cellulose, silica sand, asbestos, magnetite and ilmenite.
- Fillers: barite, calcium carbonate, talc, kaolin, feldspar, mica, nepheline, syenite, perlite, microcrystalline silica and wollastonite.
- Abrasives: calcined kaolin, precipitated silica, fused alumina, corundum, diamond, feldspar, magnetite, olivine and perlite.

Health Issues

Diatomite is composed largely of amorphous silica, which is generally not considered carcinogenic. However, it may contain small amounts of crystalline silica which has been classified as a known carcinogen by the International Agency for Research on Cancer. Diatomite that has been calcined at relatively high temperatures or in the presence of a flux may form cristobalite, a variety of crystalline silica.

Like many other minerals, diatomite products must have Material Safety Data Sheets detailing the potential hazards of the material. In many countries, governments set occupational health and safety standards for both use and disposal of many

substances — including silica and diatomite. In Australia, exposure standards for diatomite are set by the National Occupational Health and Safety Commission.

Economic Factors

World production capacity of diatomite at present is about 2 Mt per annum. The biggest market is for use as filtration media for beer, wine, fruit juices, liquor and swimming pools. Australia imports about 15 000 tonnes of diatomite for these applications each year.

Western Australia has numerous deposits of diatomite north of Perth, including the Badgingarra deposit, which has diatomite resources exceeding one million tonnes (Fetherston 2002). Although Hudson Resources Limited has been involved in developing the resources, production has yet to occur.

References

- BOWMAN R. 1982. Are Australian diatomaceous deposits suitable for filter aid production? *10th Australian Ceramic Conference, Proceedings*, 113–121.
- FETHERSTON J.M. 2002. Industrial minerals in Western Australia: the situation in 2002. *Geological Survey of Western Australia, Record 2002/12*.
- FOUNIE A. 2005. Diatomite. In: United States Geological Survey, compiler. *Mineral Commodity Summaries 2005* pp. 58–59. United States Department of the Interior.
- HARBEN P.W. 1999. *The industrial minerals handybook*, 3rd edition. Industrial Minerals Information Ltd, London.
- HARBEN P.W. & BATES R.L. 1990. *Industrial minerals and world deposits*. Industrial Minerals Information Ltd, London.
- HARBEN P.W. & KUŽVART M. 1996. *Industrial minerals: a global geology*. Industrial Minerals Information Ltd, London.
- HOLMES G.G., STANLEY C. & SWEENEY V. 1989 Diatomite in New South Wales. *Geological Survey of New South Wales, Mineral Resources 46*.
- RAY H.N., MACRAE G.P., CAIN L.J. & MALLOCH K.R. 2003. New South Wales Industrial Minerals Database, 2nd edition. Geological Survey of New South Wales, Sydney, CD-ROM.