Steve Sorrell April, 2003





1. Introduction

Zeolites are a large group of minerals exhibiting similar general characteristics and properties. Characteristics of zeolites include the potential for low-temperature dehydration, and the ability to readily absorb other molecules, resulting in zeolites being utilised in industrial activities.

The International Mineralogical Association Commission on New Minerals and Mineral Names have recently published a report that redefines the nomenclature for zeolite minerals (Coombs *et al*, 1997). This redefinition has resulted in around 90 mineral species being included within the zeolite group, a significant increase. In some cases, it has also caused some difficulty for collectors in naming their specimens, particularly the revised approach to what are now referred to as "compositional series" (eg: chabazite series now contains chabazite-Ca, chabazite-Na, etc, based on the dominant cation). The difficulty arises from the need to chemically test specimens (XRD is insufficient), and the fact that a range of "species" may occur in the one location, perhaps even on one specimen. Limited testing of Tasmanian zeolites has been carried out.

In Tasmania, some 27 species of zeolites have been recorded.

This publication is aimed at beginners and serious collectors of Tasmanian zeolites and contains a comprehensive report of all known localities and the species recorded from each. Photographs have been included wherever possible to aid in the identification of specimens found by collectors. Some sites are worked out or otherwise off-limits to collectors. Where this information is known, it is included in the text.

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2. Environments Where Zeolites Occur in Tasmania

2.1 Zeolites associated with Basalts

Zeolites occur in many rock types and geological settings, although most "collector specimens" typically occur in cavities (amygdales) in basalt rocks. In Tasmania, volcanic activity during the Tertiary period has resulted in basalt rocks outcropping in many parts of the State. Much of this has been removed through weathering, resulting in rich soils, particularly in the north and northwest.

In the south of the State, basalt of Jurassic age outcrops, and hosts zeolites. This rock is related to the Jurassic dolerite described below.

Zeolite species recorded from the basalt rocks in Tasmania include analcime, chabazite, clinoptilolite, erionite, gismondine, gmelinite, gonnardite, heulandite, laumontite, levyne, mesolite, mordenite, natrolite, phillipsite, tetranatrolite, thomsonite and wairakite.

2.2 Zeolites associated with Dolerite Rocks

Jurassic dolerite, an igneous intrusive rock forming dykes and sills, sometimes hundreds of metres thick, outcrops widely in Tasmania, particularly through central, eastern and southern areas. It forms a spectacular capping of mountains where it has been less resistant to weathering.

Primary mineralisation of the dolerite comprises pyroxenes (augite, pigeonite, hedenbergite, hypersthene or enstatite), plagioclase feldspar (andesine, labradorite), orthoclase, quartz, hornblende, biotite mica and chlorite, with apatite, ilmenite, magnetite, olivine, pyrite and sphene as accessory minerals. Rarely fluorite or zircon occur.

Joints in the dolerite formed either as shrinkage cracks during later stages of cooling, or as a result of subsequent faulting or slippage. These joints are often filled with calcite, various zeolites, prehnite, quartz, iron and manganese oxides, and various clay minerals.

Examples of the mineral occurring as a result of weathering processes are summarised below from Leaman, 2002:

- Mineralisation along joints: iron oxides and calcite with marginal alteration that includes chlorite, calcite, zeolites and montmorillonite.
- Mineralisation in enclosed deep joints: Feldspar and pyroxene replaced by laumontite, chlorite and calcite.
- Deep whole rock decomposition: Nontronite, kaolinite, halloysite, illite and rarely laumontite.
- Cavities: Surfaces are coated with calcite and montmorillonite with veins of laumontite and chlorite.

Zeolite species recorded in such environments include chabazite, heulandite, laumontite, scolecite, stellerite and stilbite.Page 2 of 30Location Bulletin No. 3 Version 1 © Steve Sorrell, 20035 March 2004

2.3 Zeolites associated with Sedimentary Rocks

Sedimentary rock types in Tasmania include Permian mudstone and Triassic sandstone. Zeolites are generally restricted to near or at the contact of sedimentary rocks with igneous rocks such as dolerite. In these instances, the sedimentary rock is often altered to a hornfels. Zeolite species that occur in these environments include heulandite, laumontite, mordenite, stellerite and stilbite.

In addition, heulandite and stilbite occur in coal mines in the Fingal Valley.

2.4 Zeolites associated with Metalliferous Ore-Bodies

Zeolite minerals occurring in metalliferous ore-bodies are uncommon, but in Tasmania, are associated with a barium-rich zone in a zinc-lead mine on the west coast, in a tin-tungsten deposit at Moina, a scheelite mine, and in a gold mine in southern Tasmania.

2.5 Other Zeolite Occurrences

Other zeolite occurrences in Tasmania, not included in the categories above, include associated with Cretaceous syenite intrusions, and with Devonian granite.

3. Description of Locations and Minerals

3.1 Bass Strait Islands

Let's take a tour of the zeolite locations in Tasmania, leaving the south coast of the large island to the north...

The **King Island Scheelite Mine**, Grassy, King Island, closed in 1990, and the open cut is flooded and in a disused state. Recent newspaper reports (Advocate, May 2002) suggest the possibility of re-opening the mine by Australian Tungsten Pty Ltd who has acquired the retention rights from Rio Tinto. Suggested reserves would mean an operating life of five years, but hopes would be on finding an extension of the orebody and perhaps extending the life of the mine by another 15 years.

Well developed pale brown crystals of "clinohumite" up to 2cm long were collected in the 1970s by a miner from the western side of Bench 11 or 12 of the open cut where the granite comes in contact with the C lens of the scheelite orebody. A specimen acquired and tested by the Museum of Victoria showed that these were in fact **stilbite**. **Clinohumite** has been recorded from the mine as yellow grains distributed through a greyish white marble.



Aerial View, 1990 © Advocate Newspaper

Reid Rocks are situated approximately 20 kilometres southeast of King Island in western Bass Strait and they are the only breeding sites for Australian Fur Seals in western Bass Strait. They were proclaimed as a Nature Reserve in 1978. **Analcime** has been recorded from the basalts here. Other minerals occur in seal-derived "guano" on weathered basalt including **monohydrocalcite**, **struvite**, and possibly **carbonate-hydroxylapatite**.

Page 3 of 30

3.2 The North and Northwest Coasts

Now we've reached the north coast of Tasmania, lets start at Devonport where the ferries come in and head in a westerly direction...

Small basalt cliffs outcrop along the coastline from Don Heads, 2km west of the mouth of the Mersey River at Devonport, through Paradise Cove, almost up to the where the Bass Highway joins the coast at Don Hill. Unspecified zeolites occur sporadically through this area.

A road cutting exposed basalt on **Don Hill**, 6km west of Devonport during road widening operations in the mid-1980s. The outcropping basalt, now covered by the roadway, produced a range of zeolites and other species. Basalt also outcrops on the nearby beach, but the only mineralisation obviously present is **siderite** and **aragonite** although some zeolite specimens have been reported.

The range of zeolites from Don Hill include colourless to orange **chabazite** with varying levels of twinning, white to cream **gonnardite**, **levyne**, **erionite/offretite** as an overgrowth on and perpendicular to levyne (the exact species may never be known as only one specimen is known to exist), **natrolite** as an intergrowth with gonnardite and rarely on its own, **phillipsite** which is the most abundant zeolite and lines most cavities, and rare **thomsonite**.

Other minerals recorded from Don Hill include **aragonite** which occurred in pseudohexagonal crystals up to 6cm, but were usually broken due to the nature of the roadwork, **calcite** in a number of habits, **siderite** as light or dark brown hemispheres up to 3cm across, octahedral **pyrite**, **opal** (as hyalite) and clay minerals.



Chabazite, Don Hill



Phillipsite, Don Hill



Chabazite, Don Hill



Levyne, Don Hill Brian Carney Specimen



Chabazite, Don Hill Brian Carney Specimen



Calcite, Don Hill Brian Carney Specimen



Seed for Chabazite, Don Hill Brian Carney Specimen



Aragonite, Don Hill Brian Carney Specimen

The Bass Highway crosses the **Forth River** a few kilometres further west. At the footings of the bridge over the river, basalt boulders contain similar minerals to those from Don Hill. The bedrock under the river alluvium is Precambrian quartz mica schist (Hughes, 1957), so it is unlikely that the basalt occurs here naturally and may have come from the Don Hill cutting.

Species collected so far from the Forth River bridge include **calcite**, **chabazite**, **phillipsite**, **siderite** and a blue-grey clay mineral, possibly **montmorillonite**.



Chabazite, Forth River Bridge



Chabazite, Forth River Bridge



Phillipsite, Chabazite, Forth River Bridge



Phillipsite, Siderite, Chabazite, Forth River Bridge



Unusual Habit of Chabazite, Forth River Bridge



Siderite, Chabazite, Phillipsite, Forth River Bridge



Chabazite, Phillipsite, Forth River Bridge



Montmorillonite? coating Siderite, Forth River Bridge

The small coastal township of Leith is situated about 10km west of Don Heads. Basalt platforms exposed in the intertidal zone, although barren in places, comprise many vesicles containing zeolites. Mineralised areas outcrop at both ends of the rock platform, but many of the best specimens have been extracted from small boulders found along the tide line. Chabazite is the most common zeolite, occurring as small pale orange rhombohedral crystals and twinned crystals. Other zeolite species that have been found include levyne with epitaxial overgrowths of erionite or offretite (initial tests to confirm which of the fibrous zeolites are present have indicated no levyne! More tests are planned), rare phillipsite, and more common pearly aggregates of thomsonite. In addition, calcite, mainly as massive infillings, but with occasional small ragged crystals, and small amounts of secondary copper minerals, possibly connellite and paratacamite, have been found.



Basalt Foreshore, Leith



Levyne, Leith Brian Carney Specimen



Chabazite, Leith





Calcite, Leith



Paratacamite, Thomsonite, Chabazite, Leith



Thomsonite, Chabazite, Leith



Connellite, Chabazite, Thomsonite, Leith



Thomsonite, Leith

A few specimens of **natrolite** and **phillipsite** were recovered during bridgework at **Ulverstone** a number of years ago.



Natrolite, Ulverstone



Phillipsite, Ulverstone

Penguin hosts a silver mine, discovered in the 1850s, and iron ore mines that extracted botryoidal and massive hematite. The silver mine is on the beach and **azurite**, **malachite**, **connellite**, **cerussite** and **possible laurionite** have been collected.

Basalt outcrops over a fairly large area at Penguin, but amygdales only occur in small patches. The exact location of where **natrolite** occurs is unknown, but is suspected to be at the western end of the township near the mouth of the Penguin River. Analcime is reported from the Penguin River.





Basalt Foreshore, Penguin

Connellite, Penguin



Laurionite?, Penguin

At **Bonney's Quarry, South Burnie**, radiating groups of composite crystals of acicular **natrolite** tipped with **analcime** averaged 2mm in length. The current status of the quarry is unknown.

Tertiary volcanic rocks occur in an elongate belt up to 8km wide, stretching southwest from the coast at **Table Cape** approximately 5km west of Wynyard, northwest Tasmania. The present outcrop belt of volcanics is the remnant of a once extensive sheet that was extruded on to a surface of moderate relief and with a northwest drainage direction (Gee, 1971).

Rising 170m above sea level and standing about 70m above the general level of the surrounding basalts, Table Cape is the prominent topographical feature in this area. It is a flat topped, more or less circular volcanic plug of dolerite containing olivine, titanaugite, **labradorite**, **sanidine**, **analcime**, and rare **nepheline**.

In **Chambers Bay**, immediately west of the volcanic neck, a layer 18m thick of scoriaceous and amygdaloidal lava underlies the main pile of lavas. Vesicles, vughs and veins of **aragonite**, **prehnite** and zeolites were reported as common by Gee.

Analcime is a common zeolite usually forming masses of trapezohedral crystals lining cavities in the basalt. It is commonly associated with natrolite.

Most **chabazite** occurs as the phacolitic form, often associated with drusy phillipsite, and usually as small colourless crystals to 6mm across. Although not common, the brilliant lustre of these specimens makes them visually very attractive. Chabazite also forms as simple rhombohedral crystals or interpenetrant twins less than 1mm, usually perched on natrolite.

Gmelinite is relatively common associated with natrolite.

Radiating **natrolite** occurring in amygdales and in irregular cavities was recorded by Gee (1971). It is an easy mineral to collect, being one of the most common zeolites at this location. Large vesicles containing colourless or pure white coatings of natrolite crystals, as well as yellowish (iron stained) or pink, can readily be found. Sprays with crystals up to 1cm in length occur and may be associated with either analcime or phillipsite and chabazite.

Phillipsite occurs generally as white or colourless simple twinned 'fourlings', usually less than 3mm in length. It is often found as a drusy coating of vesicles.

The presence of **thomsonite** was confirmed by XRD as one of the minerals occurring as a chalky white fibrous material at the base of natrolite sprays. The results indicated the presence of natrolite and thomsonite, probably as an intergrowth. Thomsonite has since been visually identified as thin prismatic crystals and is actually quite common. Most specimens are intergrowths with natrolite and occur rarely as individual sprays on phillipsite.

Other minerals that occur in Chambers Bay include **aragonite** as prismatic transparent crystals to 1.5cm in length, **calcite**, as scalenohedral colourless crystals to 5mm in length overgrowing natrolite/thomsonite and chabazite, prismatic dark brown ferroan calcite to 8mm in length associated with chabazite and natrolite, or as minute colourless rhombs perched on natrolite or ferroan calcite, and sometimes at the centre of 'bow-ties' of natrolite, a blue-grey clay mineral, possibly **montmorillonite**, occurs as linings to some vesicles, orange coated crystalline spheres of **prehnite** to 3mm, and graphite-grey globular masses usually occurring on phillipsite thought to be a manganese oxide, possibly **todorokite**.

Access to Chambers Bay is through private property, Capelands farm. Permission must be sought from the manager, Mr Nigel Wade.

5 March 2004



The township of **Stanley**, on the north coast of Tasmania, is nestled around **The Nut**, a prominent headland formed from a basalt pipe through which lava flowed during the Tertiary period. The Nut, at around 192 metres, can be climbed, but for those who are not so energetic, a chair lift will take you to the top for spectacular views. Stanley is the oldest settled town on the north west coast, with many historic buildings. Originally known as Circular Head, it sprung up from the early days of colonial settlement, and was used as a major port by the Van Diemens Land (VDL) Company, where they had their original headquarters.

The coastline in this region is quite rugged, and consists of small basalt cliffs and shore platforms, and a low tide is a must. The collecting area is a few kilometres to the north of Stanley, a pleasant gentle downhill walk from historic Highfield, the original homestead built for the chief agent of the VDL Co, Edward Curr, that dates from 1832. It is believed to have been designed by Henry Hellyer, the famous surveyor. Permission is required to walk through this property.

The cliffs in the region are often undercut by wave action and basalt columns and blowholes occur. The basalt also exhibits signs of flow patterns, and zeolites occur in amygdales, mainly at margins of the flows, which average around two metres thick, with phillipsite and natrolite predominating. Other minerals that occur, although more rarely, include **chabazite**, which are usually as pseudohexagonal twins with a bluish-grey tinge, **analcime** and **aragonite**. **Gonnardite** and **thomsonite** have also been recorded from here.

The **phillipsite** occurs in two forms, one as perfectly transparent and lustrous prismatic twinned crystals to 4mm long, the second as radiating spherical groups to about 3mm across. Phillipsite appears to be the only zeolite found at the northern edge of the accessible collecting area, which is approximately 20 metres and truncated where the sea has cut into the rock platform. In other areas, it is often the first mineral to form and may appear overgrown by natrolite.

Natrolite is found abundantly as colourless to white slender acicular sprays and groups to 10mm, or as short stubby prisms, often iron-stained. Attractive groups of crystals occur where the natrolite has seeded on a pre-existing mineral, forming arches, branches, or even as floater groups. One area produced an occurrence of opaque pale green natrolite.

Natrolite and **analcime** have been found around the base of The Nut at Stanley, on the shore platform about 150m east of the cemetery, and 100m northeast of the wharves, **natrolite**, **analcime**, and possibly **chabazite**.



Natrolite, Stanley



Natrolite, Stanley



Natrolite, Stanley



Phillipsite, Stanley

Marys "Island" is near Cap Guyot Point, Robbins Island, in the far north west. **Phillipsite**, **analcime**, **smectite** and possibly **nepheline**, occur in the groundmass of a Tertiary alkali-olivine basalt.

At the western end of the Woolnorth property in far northwest Tasmania is the famous **Cape Grim**. Volcanic activity during the Tertiary period has created extensive basalt shore platforms with vents located in what are now the off-shore islands known as the **Doughboys**. This area has produced the finest zeolite specimens in Tasmania and many of these rival the best in the world.

This locality is on property belonging to the Van Diemens Land Company. Access to Cape Grim is along VDL Co. roads and permission to visit the area must be sought from the manager. Outcropping basalt in the intertidal zone is crown land. Access to the shore platforms south of **Slaughter Bluff** is easy only immediately south of the bluff (**Suicide Bay**) and from **Valley Bay** beach. In rough weather, much of the shore platform is inaccessible, even at low tide.

Zeolites and other minerals are abundant in vesicles, some of which are quite large. **Analcime** is abundant and occurs as either clear transparent, or sand included trapezohedron crystals to 35mm. The most aesthetic specimens are those with individual crystals scattered here and there in cavities. **Chabazite** is uncommon and occurs as colourless or flesh-coloured translucent crystals in the form of rhombohedra. Some exhibit simple interpenetrant twinning. Opaque white hexagonal dipyramidal crystals of **gmelinite** up to 25mm have been recorded. Radiating clusters with crystals reaching 6cm form the best **natrolite** specimens in Australia. Specimens are colourless to white and sometimes iron-stained. Radiating clusters of **phillipsite** are common as colourless to white twinned crystals to 2cm. The phillipsite is in places altered to the rare mineral thaumasite. **Gonnardite** has been reported but not confirmed.

Other minerals recorded from Cape Grim include pink to purple to brown pseudo-hexagonal twinned **aragonite** crystals up to 6cm, **calcite**, as yellow to honey-brown scalenohedral (dogtooth) crystals to 2cm, **gypsum** in clear massive seams, **hydroxyapophyllite** as colourless flat prisms, **tacharanite**, soft white milky fibrous masses of **thaumasite** apparently as an alteration product of phillipsite, **tobermorite**, and **whewellite** associated with calcite.



Cape Grim from Marrawah



Ferroan Calcite, Doughboys



Hydroxyapophyllite, Cape Grim Brian Carney Specimen



Natrolite, Cape Grim



Fluorapophyllite, Cape Grim



Phillipsite, Cape Grim Brian Carney Specimen



Analcime, Cape Grim ex Westbury Collection



Analcime, Cape Grim

Mt. Cameron West, about 5km north of Marrawah is comprised of a basalt flow overlying limestone near sea level, although the basalt extends below sea level to the west. **Analcime** and an unnamed radiating zeolite occur about 30m above the base. An isolated small basalt dyke about halfway along **Ann Bay** has numerous small vesicles lined with layered carbonate, and filled with **calcite** and/or **analcime** and "other zeolites".

Page 8 of 30



Mt Cameron West from Marrawah

A large but overgrown and weathered quarry on the **Marrawah** Beach Road exposes a basalt section about 70m long and about 7m high. The basalt is primarily pillow lava with mineralisation surrounding the breccia. Minerals recorded include the zeolites **analcime**, **chabazite-Na**, **natrolite**, and **phillipsite**, as well as **aragonite** and **calcite**. There has in the past been some confusion in the literature, and amongst some collectors, around specimens from this locality, Cape Grim, and Redpa.

A second quarry is located about 1.5km north of Marrawah along the old sand road towards Montague where a 5 metre section of basalt is exposed. Although amygdaloidal basalt has been reported, it is not known if there is any mineralisation present.





Calcite. Natrolite. Marrawah

Calcite, Marrawah



Calcite on Natrolite, Marrawah

3.3 Inland from the North Coast

Leaving Marrawah, let's head inland, then south and west...

Redpa is a small township some 15 kilometres east of Marrawah in north western Tasmania. The Redpa quarry is about three kilometres south-west of the Redpa township, just off the road, and on private property. No quarrying operations have been carried out for many years and the floor of the quarry, and the boulders scattered across the quarry floor (said to have yielded the finest specimens, are now covered in soil and grass. Cattle enter through the narrow entrance and graze in the quarry itself (you have to watch where you walk!). Mineralisation is still visible in the quarry wall, however for the most part, minerals from all of the accessible pockets have long been extracted.

Heron (1988) described 18 mineral species, including eight zeolites. **Analcime** occurred as white to colourless trapezohedral crystals reported to have reached 1cm across, associated with **tacharanite** and other zeolites. Intergrowths of chabazite and gmelinite occur with a quartz-like morphology. Initial analyses of this material suggested that the chabazite was probably *herschelite*, but this is no longer recognised as a separate species, and is now referred to as **chabazite-Na**. Rhombohedral single and simple twinned crystals of **chabazite** also rarely occur, but no chemical analyses of these are known. **Gmelinite** at Redpa is white rather than the more common pink or orange, and occurs as long or short hexagonal prisms. The short or tabular prisms are amongst the more attractive specimens from this quarry and occur as crystals up to 2cm across. **Mesolite** has been recorded but possibly only identified visually. Filiform to acicular radiating crystals of **natrolite** are reported as scarce. **Phillipsite** is common and occurs as twinned crystal clusters, generally to 1 to 3mm. **Thomsonite** is reported to occur with analcime, gmelinite-chabazite, natrolite and apophyllite.

Other species recorded include **aragonite**, blocky, pyramidal and tabular crystals of **fluorapophyllite** to 3cm, although one analysis shows a specimen close to the mid-point in the fluorapophyllite-hydroxyapophyllite range, **calcite** of varying habits, **gyrolite** as cream to white spherules, **nontronite**, **opal**, **saponite**, **stevensite**, **tacharanite** which is abundant at Redpa as white porcellaneous masses, and **tobermorite** as a decomposition product of tacharanite.



Redpa Quarry, 2002



Gmelinite, Redpa



elinite, Redpa



acharanite, Redpa



Fluorapophyllite, Redpa

Basalt from the **Ridgley Quarry** hosts aesthetic specimens of **natrolite**, **calcite**, and **hydroxyapophyllite**. **Chabazite** and **phillipsite** also occur. The current status of the quarry is unknown.



Calcite, Ridgley Brian Carney Specimen



Hydroxyapophyllite, Ridgley Brian Carney Specimen



Phillipsite, Hydroxyapophyllite, Ridgley



Natrolite, Hydroxyapophyllite, Ridgley

Drillholes in the region of **Guildford (Lockwood Creek** and **Cam River**) have produced the zeolites **analcime**, **chabazite**, **chabazite-Na** (recorded as herschelite) **gonnardite**, **heulandite**, **phillipsite**, and **thomsonite**, as well as **aragonite**, **calcite**, **montmorillonite** and **pyrite**. These occurred in vesicles up to 50mm across. Basalt outcropping at surface has also provided specimens of **chabazite**.



Chabazite, Guildford

The enigmatic **Hampshire Silver Mine** was reported to have produced a range of interesting and unusual minerals, including the only reference to **wulfenite** in Tasmania. A number of zeolites have also been reported from at or near the mine, which is situated in Devonian granite. Access along the river, although possible, is difficult as it is overgrown with gorse and other species.

Laumontite is recorded by Petterd as forming druses in the hornblendic veinstone. Petterd also lists thomsonite but without a description. Phillipsite-Ca has been confirmed, as has stellerite as small tabular brown crystals with arsenopyrite in veins in altered granite, found about 50 metres downstream from the main adit.

At the **Kara Mine**, a magnetite-garnet skarn in the Hampshire region, **chabazite**, **apophyllite** and **actinolite** were reported from a "basaltic spot" by the late Keith Lancaster. This mine has received a lot of attention since Keith's visit but although actinolite and fluorapophyllite have been verified, chabazite has not. This is a working mine and permission must be sought.

In a road cutting along the Hampshire to Waratah Road, about 100 metres south of where the road crosses the Hellyer River, are small boulders of a vesicular weathered brown basalt containing the zeolites chabazite and phillipsite, as well as other minerals. Mineralisation is patchy, with many vesicles empty. Zeolites were also found in situ in the cutting on the opposite side of the road. It is becoming increasingly difficult to find fresh material at this location.

Chabazite is the most abundant mineral found in the vesicles. It generally occurs as water-clear bright transparent interpenetrant twinned rhombs to 5mm across, and doesn't appear to readily dehydrate, as often happens with zeolites. It often occurs with no other minerals present, but may be associated with phillipsite or coated by goethite. Among the most attractive specimens are those from vesicles where only a small number of individual twinned chabazite crystals occur.

After chabazite, phillipsite is the next most abundant mineral found. It invariably occurs as simple twinned "fourlings" to 4mm long and occurs either alone or with chabazite. Unlike the chabazite crystals, the phillipsite does tend to alter on exposure to whitish crazed crystals.

Other minerals present include calcite as colourless transparent acicular ragged crystal groups up to 12mm, massive, completely infilling vesicles, and as irregular greyish translucent rhombohedral crystals to 3mm. Some vesicles are filled or lined with either a brown or blue-green clay mineral dehydrating to black and crazing. The exact species has not yet been identified but is probably nontronite. Many of the vesicles containing the zeolite minerals are lined with goethite, providing an attractive dark background. Goethite also forms as brownish films or as iridescent spheres on chabazite and phillipsite. Pyrite is relatively scarce as bright brass yellow cubes to about 2mm completely coating the surface of vesicles, and rarely as octahedral crystals.

Although this was thought to be a new discovery, particularly as the road has only been in use for a few years, it is related to a locality recorded as "...near the railway bridge crossing the Hellyer River..." (Petterd, 1893). This railway bridge is approximately 1.5km east of the current road. Petterd recorded chabazite, phillipsite and mesolite at this locality. The reference in the Catalogue of the Minerals of Tasmania (Anon, 1969), where both chabazite and phillipsite are recorded as occurring at the Hellver River, with no more precise location details given, is probably the same location. Interestingly, Petterd records chabazite occurring both as "obtuse rhombohedral crystals" and also the more complex twinned phacolite form. The latter is not evident in recent material collected.

Petterd's description of mesolite as "...a zeolite occurring as small globules of a fibrous structure..." is likely to be thomsonite or gonnardite, both of which have been recorded from drill cores in the area (Seymour, 1989), although no specimen matching his description has been found at the current locality.



Chabazite, Hellyer River



Chabazite, Hellver River

Phillipsite, Goethite, Hellyer River



Phillipsite, Hellyer River

Tertiary basalt outcrops at a number of places around Waratah, a township about 55km south of Burnie. Waratah is the town situated alongside the Mt. Bischoff tin mine, the first major mineral resource developed in western Tasmania. A spectacular waterfall, Waratah Falls, pours over a basalt cliff.

Stillwell records two unidentified zeolite minerals in a thin section sample from Mt. Bischoff. The first is described as having a refractive index a little higher than balsam, with low birefringence, and is intimately associated with, and replaces, talc. The second has a very low refractive index, low birefringence and has cleavage and occasional twining. Groves also records minor amounts of zeolite as one of a number of replacement minerals. No further detail is available.

Zeolite species recorded from the Waratah region include chabazite, heulandite, and natrolite.

A road cutting on the Cradle Mountain Link Road, near the Iris River, Middlesex Plains, has exposed a brown to black basalt with abundant amygdales containing zeolites. Species confirmed include analcime, chabazite-Ca as twinned pseudo-hexagonal crystals to 1.5cm across, gonnardite, natrolite, phillipsite, and pearly spheres or bladed crystals of thomsonite. In addition, pyrite and possible **prehnite** have also been found. It is becoming increasingly difficult to find fresh material at this location.



The **Bridal Veil Falls** are located on a track near the Lemonthyme Lodge, Moina. A small cutting on the side of the track near the falls has exposed a small outcrop of basalt in which colourless pseudo-cubic crystals of **chabazite** and simple twinned **phillipsite** occur. Very little material is exposed and is generally of poor condition.



Chabazite, Bridal Veil Falls



Phillipsite, Bridal Veil Falls

In 1893, Thomas Shepherd and Thomas Murphy found the tin-tungsten-bismuth lodes later developed as the **Shepherd and Murphy Mine**, Moina, one of the largest such deposits in the area. A specimen of pinkish **laumontite** from the Shepherd and Murphy analysed by the Geological Survey of Canada contained a trace of mercury, which was possibly present as cinnabar. **Stilbite** has also been recorded from this mine. Dump material is accessible but generally overgrown. There are a number of shafts in the area and extreme care must be taken.



Laumontite, Shepherd & Murphy

Stilbite is rare in Tasmanian basalts, but has been recorded as yellow-brown divergent masses in amygdaloidal Tertiary basalt at **Bell Mount**, Middlesex. Gmelinite reported by Petterd as occurring in quantity in a vugh at Bell Mount has been confirmed as **gmelinite**-**Na**.

Other zeolites to be recorded from Bell Mount include chabazite, mesolite and phillipsite.

Tertiary basalts outcrop over a large area in the vicinity of **Gads Hill** that lies between Mole Creek and Moina in the northwest of Tasmania. There are two main collecting sites, although with some searching, more should be found.

The best known site is on the eastern side of the hill along the Mole Creek to Sheffield highway alongside a scenic lookout, and is the locality documented by Anderson (1984). It is here that vesicles many metres across have produced specimens with large **chabazite**-**Ca** crystals. **Chabazite-Na** as herschelite has also been reported from Gads Hill (Sunderland and Bottrill, in prep). Two occurrences of note were reported by Anderson, one, a cavern measuring 8m by 3m by 1m (yes metres!), the second, 5m by 2m by 1m. **Phillipsite**, **thomsonite** and **calcite** occurred with the chabazite in these vesicles. Rare **levyne** was also recorded from this locality, the first reported occurrence of this mineral in Tasmania. Other minerals recorded by Anderson include **apophyllite**, **nontronite**, **tacharanite** and **tobermorite**. It is still possible to collect specimens from the boulders on the eastern side of the road, but the area is quite overgrown and leeches are common.





Levyne, Don Hill Brian Carney Specimen

Thomsonite, Don Hill



Phillipsite, Don Hill



Chabazite-Ca, Don Hill

The second site on Gads Hill, known as Addison's Creek, is a road cutting on the side of the road about 7km down the Lemonthyme Dam road. Here, much smaller vesicles produce specimens of **chabazite**, **phillipsite**, **thomsonite**, **calcite** and **fluorapophyllite**. In addition, a few specimens of **analcime** were found, the first time that this mineral has been reported from Gads Hill. The habits of thomsonite here are interesting and unusual. The most common form is colourless to grey, yellow, or brown globular spherules with a pearly lustre. Less commonly, open aggregates of white or yellow flat bladed crystals occur, generally on phillipsite. There are also two rarer forms, the first as white curved wisps on globular thomsonite, and the second as white fibrous masses usually stretching across vesicles with fibres branching out in a number of directions. Both of these habits are reminiscent of some of the thomsonite from Jindivick, Victoria. Little fresh material is now available.





Thomsonite, Addison's Creek



Thomsonite, Addison's Creek



Phillipsite, Addison's Creek

Small crystals of **chabazite** and cruciform twins of **phillipsite** have been recorded from basalt in the vicinity of **Maggs Mountain** south of Gads Hill. Maggs Mountain is capped by basalt and outcrops in a road cutting below the summit. Basalt boulders are widespread over a large area. Recent investigations have been unable to confirm any mineralisation.



Basalt Outcrop, Maggs Mountain

Lake Mackenzie high up on the Great Western Tiers is the upper most lake in the Mersey-Forth Hydro scheme. Water from the lake flows by flume, canal, tunnel and pipeline to the Fisher Power Station and its journey involves a drop of some 650 metres. Prior to the lake levels rising, Mathew Latham of Devonport collected specimens of stilbite from dolerite boulders.



Lake Mackenzie © Hydro Tasmania

At **Sheffield**, ploughed fields often turn up small boulders of basalt containing abundant vesicles with the zeolites **chabazite**, **phillipsite**, and **thomsonite**.

Analcime has been reported from the Railton-Moriarty area. No further details are available.

Small crystals of chabazite are reported to occur in basalt at Mt. Hand, Deloraine.

3.4 The West Coast

Oops! We've missed a spot in the west ...

The **Rosebery Mine** is a medium-sized underground base metals mine situated at Rosebery on the slopes of Mt. Black. Thomas McDonald discovered alluvial gold and boulders of lead/zinc sulphide in a creek on the southern slopes of Mt. Black in 1893. By

1900, the Rosebery Mine was producing lead, silver, copper and gold. When the Zeehan smelters closed in 1913, production almost ceased until the Electrolytic Zinc Company (EZ) purchased the mine, having perfected an economic method for extracting zinc. Full production from the concentrating mill commenced in 1936, and the mine has been operating ever since.

The deposit is made up of a number of ore-bodies, some of which are barium-rich. Specimens collected in 2001 were thought to be phillipsite and calcite. Brian Carney from Ulverstone correctly identified the zeolite as **harmotome**, and suspected that the "calcite" was in fact witherite. Tests showed that the latter mineral is in fact, **alstonite**. The harmotome occurs as small but superb glassy interpenetrant-twinned (Marburg twin) crystals. The alstonite occurs as white hexagonal bi-pyramids



Alstonite, Rosebery



Harmotome Twin, Rosebery



Harmotome, Roseber

3.5 Launceston and the Tamar Valley

Back towards the Tamar Valley and Tasmania's second largest city...

The River Tamar flows northwards down the Tamar Valley from Launceston in northern Tasmania, and is fed by the North Esk and South Esk rivers. Tertiary basalt extrusions, more resistant than Tertiary sediments, cap the higher areas, and have influenced the course of the river. The volcanic rocks are dominantly basaltic alkaline lavas, with rare pyroclastic deposits. Lava erupted from about a dozen centres spread along the valley, mainly on fault lines (Sunderland, 1971).

The Tamar Valley is some 55km long and flows out to Bass Strait. Zeolites have been recorded from the lower, middle and upper reaches, as well as Launceston itself, and from the upper reaches of the North and South Esk rivers.

Inspection Head lies about 8km from the mouth of the Tamar River on the western side, and slightly north of Beauty Point. Minerals lining amygdales and veinlets in basalt at Inspection Head include the zeolites **chabazite**, **phillipsite** and rare **natrolite**, with **apophyllite**, **calcite** and **siderite**.



Mineralised Boulder, Inspection Head

In the middle Tamar region, **stilbite**, and possible **analcime**, **gonnardite** and **phillipsite**, were recorded from an olivine-nephelinite basalt at **Spring Bay** on the western side of the river. Outcrops are on private property. On the eastern shore near **Deviot**, **analcime**, possible **stilbite**, and an unnamed radiating zeolite, were recorded from a nepheline-bassanite rock. The outcrop occurs about 800 metres south of the Deviot Yacht Club and access is available only when the tide is out as private residences now restrict access from the road.

In a quarry north of **Craigburn** on the eastern side of the River Tamar, amygdales up to 8cm across contained either **chabazite** or **thomsonite**, which occurred as translucent, pearly spherulitic linings. Small radiating spherules of **gyrolite**, with rarer **apophyllite** and **calcite** were also present. Many of these amygdales contained watery fluid when broken open. Other parts of the basalt were reported to contain **scolecite**, **thomsonite** and **possible gonnardite**. There is little evidence of the quarry now, except for a few overgrown and grassy depressions.

At East Arm, analcime, "potash analcime", and unnamed fibrous radiating zeolites were recorded.

Scolecite was identified with dolerite from near Hillwood.



Basalt Outcrop, Craigburn. Taken from what is suspected to be the site of the quarry



Weathered Chabazite on Basalt, Craigburn Foreshore

Analcime, stilbite, natrolite and "other zeolites" were recorded from basalt outcrops on the hillside in the Strathlyn area between Atkinson's Creek and Muddy Creek on the eastern shore of the upper reaches of the Tamar River.

A small flow of olivine-nephelinite basalt overlies Jurassic dolerite and Tertiary sediments northeast of **St. Leonards** in the South Tamar area. Amygdales are commonly lined with **natrolite**. The margins of some dolerite xenoliths were reported to contain pockets of **natrolite** and skeletal **nepheline**.

On the bank of the North Esk River, near **Corra Linn**, Jurassic dolerite xenoliths appear to have partially melted on incorporation with the basalt. Sporadic amygdales containing **analcime**, **natrolite**, and "other zeolites" were reported.

In a quarry above **Talisker Farm** south of White Hills, massive basalt carries sporadic amygdales containing **natrolite** and **analcime**. The current status of the quarry is unknown.

A small cut in basalt below Mt. Oriel Farm near Breadalbane, has sporadic amygdales containing natrolite.

Scolecite has been recorded as white prismatic crystals, acicular tufts, and aggregates with a fibrous radiating structure from Jurassic dolerite in the vicinity of Launceston. It can still be seen on one face of the dolerite exposed in the Cataract Gorge.

3.6 The East and Northeast

Now we are off to the north east, down the east coast, and then head back inland west along the Fingal Valley...

The Lefroy district is one of Tasmania's major gold-producing areas. Basalt rarely outcrops at Lefroy, instead forming a red clay soil. However, there are multiple lava flows forming auriferous deep leads and filling ancient valleys. Chabazite was recorded with ferroan calcite by Petterd in his first published catalogue (1893) and was probably found during mining operations. Groves (1965) records amygdales of calcite being common. Recent investigations have not produced any zeolites but gold, arsenopyrite, galena, chalcopyrite, sphalerite and bournonite have been collected.



Gold in Quartz, Lefroy



Bournonite, Lefroy

Scottsdale is about 70km east of Launceston with the main industries being agriculture (potatoes, onions, beans, carrots, poppies, pyrethrum, beef and dairy cattle, sheep and much more) and forestry. In a small basalt quarry (nephelinite) at **Springfield**, 3km southwest of Scottsdale, small complex twins and radiating aggregates of an unusual stalactitic or coralline form of **phillipsite** have

been recorded, as well as hexagonal **chabazite**, **gonnardite** and **natrolite**. Some medium to coarse-grained mafic xenoliths collected from the quarry contained **Ti-augite**, **ilmenite**, **apatite**, chabazite, and a **rhönite** group mineral requiring further study.

The quarry is on private property, and permission must be sought from the landowner who lives nearby. It is quite overgrown but small boulders of basalt with zeolites can still be located.









Natrolite, Springfield

The **Blue Tier** is a district rich in tin and to a lesser extent, minerals containing tungsten, molybdenum and copper. The Blue Tier granite responsible for these mineral resources also hosts pegmatites containing **topaz**, **fluorite**, **andalusite** and **tourmaline** in addition to the ore minerals. In an unusual occurrence, **analcime** was reported as a secondary mineral, probably derived from soda feldspar, as an interstitial part of some pegmatite minerals.

A small working quarry located a few hundred metres off the main road at the top of the hill at **Weldborough Pass** contains vesicular basalt with abundant zeolites, particularly close to bent columnar structures (a vent?). The current workings are referred to as **Fieldwick's Quarry**, but the location is also known as Weldborough or Lottah.

Analcime is a common zeolite, occurring as drusy trapezohedral crystals. Chabazite has only recently been found, as has levyne.

Gismondine has been tentatively identified (by XRD) finely intergrown with **natrolite** that commonly occurs as white or colourless prismatic crystals. Some natrolite has a delicate pink hue due to **hematite**.

Gmelinite is quite common and occurs in a range of habits, including fine pink complex crystals to about 10mm, colourless tapering crystals, and occasionally orange or bright red crystals or groups.

Fibrous gonnardite occurs overgrown by natrolite.

Phillipsite is also common and occurs associated with natrolite or as a fine grained alteration product in and about felsic (anorthoclase) xenoliths.

Tetranatrolite occurs in crystals up to about 20mm usually finely intergrown with **thomsonite**. Thomsonite also occurs as bladed crystals intergrown with natrolite, and associated with analcime, chabazite and gmelinite.

Other minerals recorded include rare **gyrolite**, as small aggregates of radiating crystals, **hydroxyapatite** as small xenocrysts (<3mm) and inclusions in some felsic (plagioclase), **sanidine** in syenite xenoliths, **tobermorite** a massive white material filling vesicles, and **ulvöspinel** as abundant but fine grained in one basalt from Fieldwick's Quarry.

The quarry is privately owned and operated and permission must be sought to collect.



Gmelinite, Weldborough



Gmelinite, Weldborough





Thomsonite, Natrolite, Weldborough

Gmelinite, Phillipsite, Weldborough





Natrolite, Weldborough



Analcime, Weldborough



Analcime, Weldborough

At **Mayfield Beach** on the east coast, thin veins cut through a Jurassic dolerite outcrop a little south of the camping area. These veins contain small crystals of **heulandite**. There is little collectable material.

Barium-bearing bright red heulandite-Ca occurs in carbonaceous Triassic mudstone in a diamond drill hole near Fingal.

The Merrywood Coal Mine in the Fingal Valley is now closed and rehabilitation has taken place. A few veins of calcite with heulandite, stilbite and pyrite have been found.



Calcite, Merrywood



Heulandite, Merrywood





Calcite, Merrywood

The **Stanhope Mine** is a coal mine north of Avoca that has operated intermittently since about 1904. The mine produces fragile fossils of carbonised tree ferns and horsetails in grey arkose sandstone that encloses the coal formations. A vein running vertically through the sandstone contained scalenohedral **calcite** crystals to several cm and white **stilbite** crystals to 4mm. The mine was being reworked for coal a few years ago but that activity has now ceased. The current status of the mine is unknown.



Calcite, Stanhope



Stilbite, Stanhope



Stilbite, Stanhope



Stilbite, Stanhope

Dolerite at **Ben Lomond** is said to carry **chabazite**. No further details are available.



Dolerite Capping on Ben Lomond

3.7 Central Highlands

Up the Tiers to the Great Lakes area...

A large highland area in central Tasmania is known as the Central Plateau. This region comprises alpine and sub-alpine environments with extensive outcrops of Jurassic dolerite, which form spectacular cappings to the "Tiers", Tertiary basalt, and glacial remnants such as lakes and moraines.

Stilbite was recorded with calcite in "basalt seam material" and "vesicular material" from the Central Plateau, with the exact location not known.

In and around **Great Lake**, basaltic rocks are exposed as lava flows overlying Jurassic dolerite. In the late 1960s, the water level of the lake was at its lowest since it had been dammed in 1923. This allowed inspection of basalt outcrops not normally accessible. The minerals identified include rare **phillipsite** and **natrolite**, **chabazite**, **calcite**, **tacharanite**, **tobermorite**, **opal** and **nontronite**. **Laumontite** occurs with the Jurassic dolerite in the area.

Basalt excavated from the Liawenee Canal contains chabazite-Ca, phillipsite and thomsonite, and in addition, calcite, fluorapophyllite, tacharanite and the very rare carbonate, vaterite. Much of the basalt excavated is located on the southern side of the canal in overgrown dumps. Good specimens of many of the species can still be collected. Dolerite boulders from somewhere in the vicinity have been dumped along the same track a little further west, and there is evidence of laumontite and possibly scolecite.

Tertiary basalt containing zeolites outcrops between Lake Augusta and Lake Ada, and near O'Dells Lake, south of Lake Ada. The species recorded are stilbite, chabazite, and possibly phillipsite.



At Shannon Tier, north of Bothwell, a melilitite rock occurs (a rare, silica-poor basalt-like volcanic rock). It contains **natrolite**, **thomsonite** and **gonnardite**. **Phillipsite** has also been recorded. This locality was recently "rediscovered" and care must be taken as a gun club also uses the area. Little of the outcrop remains visible.



Natrolite, Thomsonite, Shannon Tier

At **Wayatinah**, **laumontite** has been recorded from a large cavity (20m x 10m x 5m) in solid Jurassic dolerite, encountered during tunnelling operations for the Wayatinah power scheme in the 1960s. The laumontite occurred as prisms up to 2.5cm long in veins, white with a silky lustre, and crumbling on exposure. Colourless to amber dogtooth **crystals** of calcite up to 10cm long protruded from a crust of calcite that covered fallen blocks and infilled joints.

Laumontite has also been recorded as making up the matrix of Triassic sandstone in this area.

Heulandite occurs with calcite and pyrite at Black Bobs in dolerite.

The **Bashen Quarry, Waddamanna**, is a small dolerite quarry on private property on the side of the road. **Stilbite** and complex twinned **chabazite-Ca** occur. The quarry is no longer operating but it is possible to collect reasonable specimens. Permission must be sought to enter.







Stilbite, Bashen Quarry

Chabazite-Ca, Bashen Quarry

Chabazite-Ca, Bashen Quarry

Laumontite is recorded from joints in dolerite at Bronte.

3.8 The Midlands

Back down the hill towards the Heritage Highway and south through the Midlands...

At Cressy in the northern Midlands, laumontite makes up the matrix of Triassic sandstone.

Stilbite occurs as orange radial-fibrous veins in Triassic mudstone at York Plains. Also at York Plains, Mordenite occurs as white finely fibrous radiating aggregates with pink to red heulandite in joints in Triassic sandstone. Recent investigations have attempted to find accessible outcrops that might provide specimens, but only unaltered sandstone outcrops have so far been located.



Sandstone outcropping on a hill, York Plains

Stellerite occurs as druses in a quartz-rich breccia at a dolerite contact near Oatlands.

3.9 Southern Tasmania

A brief sidetrack to the southeast before turning back towards Hobart...

Identified zeolite localities are rare in this part of the island. **Stilbite** has been recorded from dolerite on **Tasman Island** on the Tasman Peninsula. **Analcime** has also been recorded but no other details are available.

In Tertiary basalt at Dunalley, chabazite, aragonite and a clay mineral ("smectite") have been recorded.

3.10 Hobart and Surrounding Suburbs

Approaching Hobart from the east, we cross the Derwent River, go up through the western suburbs, then head off to the southwest...

Investigation of a road cutting through Jurassic dolerite on **Flagstaff Gully** Link Road, behind the Hobart Technical College Clarence Campus, revealed the presence of the zeolites **laumontite** and **stilbite**, with **pyrite**, **calcite** and **quartz**. At the contact of the dolerite and Triassic sandstone, **biotite** and **muscovite** mica occurs.

On the western side of the River Derwent, **laumontite** is relatively common and occurs in joints and breccias in Jurassic dolerite at **Lutana** and at **New Town**, and **stilbite** from dolerite at **Collinsvale**. **Scolecite** occurs in faults and joints within Jurassic dolerite near **Glenorchy**. This occurrence was originally mistaken for gonnardite.

Also in the west, Chabazite has been recorded from basalt at Goodwood.

Perhaps the best known locality in the Hobart region is the large multi-level Jurassic dolerite quarry at the end of Giblin Street in Lenah Valley. The **Giblin Street Quarry** no longer operates but specimens of **chabazite-Ca**, **stilbite**, and aesthetic golden **calcite** can still be found.



Chabazite-Ca, Giblin Street



Stilbite, Giblin Street



Calcite, Giblin Street

There are two dolerite quarries along **Proctors Road**, and an old quarry in mudstone at the top of the Southern Outlet, all of which are referred to as "Proctors Road Quarry". In both of the dolerite quarries, which are now fenced off, **calcite**, **pyrite** and **stilbite** can be found. Permission to access should be sought from the University of Tasmania. Similar minerals can also be found in the road cutting on the side of the Outlet, or in material from that cutting on the lower side.

The older disused quarry is in a Permian impure limestone (or limey mudstone) and has been cooked by the nearby dolerite. **Laumontite** occurs around the edge of fossil shells, associated with **grossular**, **wollastonite**, **vesuvianite**, and **opal**. This area is becoming overgrown and will soon be inaccessible.



Grossular, Laumontite Proctor's Road



Proctor's Road

3.11 The Huon Valley Area

Follow the Southern Outlet out of Hobart towards Huonville and beyond, then east to Cygnet and back up through the Channel Region...

Jurassic dolerite is extracted at the working HBMI Quarry operation at Leslie Vale. Mineralisation is scattered and not abundant, with most of the dolerite being hard and fresh. Only a few zeolite minerals have been identified.

Chabazite occurs as simple pseudo-cubic rhombohedral crystals to a few mm across. Stilbite sprays to 2mm occur in small cracks in the dolerite. Powdery or flaky laumontite is generally very unstable and often is the matrix for the other zeolites. Calcite and pyrite also occur but usually not in association with the zeolites.



Chabazite, HBMI Quarry



Stilbite, HBMI Quarry





Calcite with Pyrite, HBMI Quarry

Another dolerite quarry a few kilometres to the west at Longley has provided an interesting and at times, aesthetic selection of minerals. McCarthy's Quarry, Longley, has provided specimens of chabazite, laumontite, stellerite and stilbite, with calcite, quartz, pyrite, prehnite, and pumpellyite-Fe. Much of the prehnite and pumpellyite occurs enclosed in green massive calcite and is exposed when treated with dilute hydrochloric acid. The prehnite occurs as spheres to 1cm across. The pumpellyite occurs as minute pale-green crystalline masses.

The quarry is a working quarry and permission must be sought from the owner, Terry McCarthy. A section of the quarry wall, towards the western end, produces most of the specimens.





A dolerite quarry, located about 3kms past the bridge over the Russell River at **Lonnavale** near Judbury, in southern Tasmania, contains veins of calcite and various zeolites, occurring in faults and shrinkage veins, typical of Jurassic dolerites throughout the southwest. The quarry was probably used by Forestry for road material and is not being worked. The zeolites include **chabazite**, occurring as untwinned rhombohedral (pseudocubic) or simple interpenetrant twinned crystals to a few millimetres across, usually associated with stellerite, **laumontite** found as uncommon white masses, **heulandite**, stilbite as colourless drusy coatings of fractures in the dolerite with a flat topped prism morphology similar to stellerite, and as more typical twinned crystals with pointed terminations.

Associated with the zeolite minerals are **calcite** as abundant colourless to white scalenohedral crystals, generally up to about 1cm in length, **prehnite** as white veins, small **pyrite** crystals, as slightly modified cubes generally on calcite or stellerite, and a naturally occurring **bitumen** ("Tasmanite") which sparked a series of mini-oil exploration activities in southern Tasmania. The latter "mineral" has seeped into the veins in the dolerite from coal or oil shales in the sedimentary rocks that originally occurred in the sequences above.







Pyrite, Chabazite, Lonnavale



Pyrite, Stilbite, Lonnavale



Tasmanite", Lonnavale

Laumontite is reported as occurring in Jurassic cooling joints at Geeveston.

The **Forster gold prospect** lies in an inlier of Cambrian and Precambrian rocks exposed at Glovers Bluff, near the Weld River in southern Tasmania. Metallic mineralisation recorded from the area includes gold, nickel and zinc, although anomalous copper, lead, silver, arsenic, antimony, chromium and cobalt are also present. This mineralisation is spatially related to magnesian skarns, dolerites and some argillaceous and silicified zones. Access to the area is restricted and requires permission for vehicular access from Forestry Tasmania.

As well as the zeolites **heulandite** and **laumontite**, a number of rare calc-silicates have been recorded including **okenite**, **scawtite**, **tobermorite**, **truscottite**, and **xonotlite**.



Xonotlite, Weld River

Jurassic igneous rocks are common in Tasmania although the vast majority of what we see today is dolerite. This igneous episode may have resulted in the molten rock being extruded over large areas, but only a small amount of this Jurassic basalt can be found exposed today.

Pinkish bladed crystals of **clinoptilolite** occur with **heulandite** and aesthetic rhombohedral **hematite** crystals in a small quarry in basalt at **Lune River**. A second quarry at the same locality produced **stellerite** and **laumontite**. Neither quarry has been worked for some time.

Stilbite occurs in cavities in chalcedonic nodules nearby.



Heulandite/Clinoptilolite, Lune River



Laumontite, Lune River



Stellerite, Lune River



Hematite, Lune River

Jurassic basalt at Catamaran has produced chabazite.

The **Cygnet** district has the distinction of being the site of some of the earliest mineralogical, geological and petrological investigations in Australia. Peron reported on some rocks thrown at him by natives during the sojourn with Nicolas Baudin in 1801, described by von Buch. The mineralogist A.W. Humphrey arrived in 1804 with some early settlers and scientists and also collected and described rocks from the area. Twelvetrees and Petterd conducted some of the earliest petrographic investigations on Australia on some rocks from Cygnet.

The geology at Cygnet is dominated by glaciogene Permo-Carboniferous mudstone and siltstone, intruded by Jurassic dolerites and numerous Cretaceous alkaline igneous intrusives. The latter rocks, a variable group of quartz-poor porphyritic rocks usually described as sanidine, monzonite or syenite porphyries, comprise the Cygnet alkaline intrusive complex, and were formed in response to the rifting of Tasmania from Antarctica about 100 Million years ago. They are the most interesting rocks in the area mineralogically, containing most of the ~80-90 species recorded from the area. They are dominated by sanidine and plagioclase, with minor pyroxenes, amphiboles, garnets and many other minerals. They are also associated with gold mineralisation at several areas (particularly the Mt Mary gold mine, the Livingstone Mine, the King Hill and Black Jack prospects (Bottrill, 2000).

A comprehensive list of minerals was provided by Sorrell and Bottrill (1998). Included amongst these were the zeolites **analcime** as a primary mineral of the porphyries, and **mordenite**, **natrolite**, **scolecite** and **stellerite** as secondary minerals of the porphyries.

Stellerite also occurs in dolerite at Regatta Point.

At the **Livingstone Mine**, one of a number of gold mines in the district associated with the porphyries, small vesicles containing possible zeolites and other minerals occur with large **sanidine** crystals to 10cm long. **Natrolite** has been reported from this mine.



Sanidine, Livingstone Mine



Livingstone Mine

3.12 The Channel Region, Southern Tasmania

This is our last leg on the Tasmanian "mainland", and includes a quick ferry trip to Bruny Island, actually two islands joined by "The Neck"...

The Channel Highway cuts a small dolerite outcrop on a bend in the road at **Gordon**. In the boulders on the lower side, thin veins containing **laumontite**, radiating **scolecite**, and prismatic **stellerite** occur, although not in abundance.





Scolecite, Gordon

Stellerite, Gordon

A small disused quarry, probably used for road material, occurs on a sharp bend on the road leading down into **Adventure Bay**, **Bruny Island**. Vertical seams of cream to white material contain small but well-formed crystals of **stilbite**. Much of the material is soft and weathered.

Heulandite-Ca occurs with native **copper** in a drillhole at **Variety Bay, Bruny Island**. Other minerals found in these drillcores include **chabazite**, **laumontite** and **calcite**. It's a "bit" difficult to collect these specimens. Some of them were found at a depth of 650m below ground!



Calcite, Variety Bay



Calcite, Variety Bay

The rare zeolite **epistilbite** was found in fine joint-fill veinlets in a hornfelsed Permian mudstone near a dolerite contact in an abandoned quarry on private property in **Tabors Road**, **Margate**. It occurs as radiating aggregates to 1cm but crystal forms are obscure. **Chabazite**, **laumontite**, **calcite** and **pyrite** are associated with the epistilbite.



Epistilbite, Margate

A narrow foot track leads down to **Fossil Cove, near Blackman's Bay**. Here, richly fossilised Permian mudstone sequences are to be found on the shore platform. This spot is normally visited for it's arch and abundant marine fossils. **Stilbite** and **laumontite** have both been collected.



Laumontite, Fossil Cove



Stilbite, Fossil Cove

3.13 Macquarie Island

How about hitching a ride towards the Antarctic?

The most southerly part of Tasmanian territory, **Macquarie Island**, is some 1,466km southeast of mainland Tasmania and 1,294km from the Antarctic continent. It is an exposed fragment of the crust of the Macquarie Ridge that runs south from New Zealand and comprises extrusive basalt, Jurassic dolerite, and serpentinised peridotite and gabbro. It's inhabitants include elephant seals, fur seals, of which there are three species, leopard seals, royal, gentoo, king and rockhopper penguins, a wide variety of other seabirds including petrels and albatrosses, feral animals (rabbit, cat, rodents, and wekas), and the occasional scientist or three.

A range of zeolite minerals has been recorded from amygdales in Tertiary ocean-floor basalts.

Heulandite rarely occurs as white bladed crystals to 7mm long. Laumontite occurs in veins up to 2cm wide. Levyne occurs with mesolite and thomsonite. Mesolite is abundant in vesicles and veins, occurring with thomsonite, natrolite and analcime. Phillipsite is also abundant and occurs with the same range of minerals. Fibrous radiating aggregates of mordenite occur with quartz and laumontite. The rare and difficult to identify mineral wairakite occurs in veins with natrolite. Other recorded minerals include calcite, xonotlite, chlorite and clay minerals.



Mesolite, Macquarie Island

4. Index of Locations by Zeolite Species

Analcime

Addisons Creek Blue Tier Bonney's Quarry, Burnie Cape Grim Corra Linn Cygnet Deviot East Arm Guildford Macquarie Island Marrawah Marys Island Middlesex Plains Mt Cameron West Penguin Railton Redpa Reid Rocks, Bass Strait Spring Bay Stanley Strathlyn Table Cape Talisker Farm Tamar Valley Tasman Island The Nut Weldborough Pass Chabazite

Addisons Creek Bell Mount Ben Lomond Bridal Veil Falls, Moina Cape Grim Catamaran Craigburn Don Hill Dunallev Goodwood Great Lake Guildford Hellyer River Inspection Head Kara Mine Lake Augusta Lefroy Leith Leslie Vale Longley Lonnavale Maggs Mountain Margate Mt Hand, Deloraine O'Dells Lake Redpa Ridgley Sheffield

Springfield Stanley Table Cape The Nut Variety Bay, Bruny Island Waratah Weldborough Pass

Chabazite-Ca

Bashen Quarry, Waddamanna Gads Hill Giblin Street Liawenee Canal Middlesex Plains

Chabazite-Na

Gads Hill Guildford Marrawah Redpa

Clinoptilolite Lune River

Epistilbite Margate

Erionite Don Hill Leith

Gismondine Weldborough Pass

Gmelinite Cape Grim Redpa Table Cape Weldborough Pass

Gmelinite-Na Bell Mount

Gonnardite

Cape Grim Craigburn Don Hill Guildford Middlesex Plains Shannon Tier Springfield Stanley Weldborough Pass

Harmotome Rosebery

Heulandite

Black Bobs Forster Prospect Guildford Lonnavale Lune River Macquarie Island Mayfield Beach Merrywood Coal Mine Waratah York Plains

Heulandite-Ca Fingal Variety Bay, Bruny Island

Laumontite Bronte Cressy Flagstaff Gully Forster Prospect Fossil Cove Geeveston Gordon Great Lake Hampshire Mine Leslie Vale Longley Lonnavale Lune River Lutana Macquarie Island Margate Mt Nelson New Town Shepherd & Murphy Mine Variety Bay, Bruny Island Wayatinah

Levvne Don Hill Gads Hill Leith Macquarie Island Weldborough Pass

Mesolite Bell Mount Macquarie Island

Mordenite Cygnet Macquarie Island York Plains

Natrolite Bonney's Quarry, Burnie Breadalbane

Natrolite (cont.)

Cape Grim Corra Linn Cygnet Don Hill Great Lake Inspection Head Livingstone Mine, Cygnet Macquarie Island Marrawah Middlesex Plains Penguin Redpa Ridgley St Leonards Shannon Tier Springfield Stanley Strathlyn Table Cape Talisker Farm The Nut Ulverstone Waratah Weldborough Pass

Offretite

Don Hill Leith

Phillipsite

Addisons Creek Bell Mount Bridal Veil Falls, Moina Cape Grim Don Hill Gads Hill Great Lake Guildford Hellyer River Inspection Head Lake Augusta Liawenee Canal Leith Weldborough Pass Macquarie Island Maggs Mountain Marrawah Marys Island Middlesex Plains O'Dells Lake Redpa Ridgley Shannon Tier Sheffield Springfield Stanley Table Cape Ulverstone

Phillipsite-Ca

Hampshire Mine

Scolecite

Cataract Gorge Craigburn Cygnet Glenorchy Gordon Hillwood, East Tamar Launceston

Stellerite

Cygnet Gordon Hampshire Mine Longley Lonnavale Lune River Oatlands

Stilbite

Adventure Bay, Bruny Island Bashen Quarry, Waddamanna Bell Mount Central Plateau Collinsvale Deviot

Flagstaff Gully Fossil Cove Giblin Street King Island Scheelite Mine Lake Augusta Lake Mackenzie Leslie Vale Longley Lonnavale Lune River Merrywood Coal Mine Mt Nelson O'Dells Lake Shepherd & Murphy Mine Stanhope Mine Strathlyn Tasman Island York Plains

Tetranatrolite Weldborough Pass

Thomsonite

Addisons Creek Craigburn Don Hill Gads Hill Guildford Hampshire Mine Leith Liawenee Canal Macquarie Island Middlesex Plains Redpa Shannon Tier Sheffield Stanley Table Cape Weldborough Pass

Wairakite

Macquarie Island

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