1976/69. Sources of building stone at Port Arthur.

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A detailed documentation and investigation of various aspects of Port Arthur is being conducted by the National Parks and Wildlife Service, prior to extensive restoration of the township. As part of this programme, the Department of Mines studied and later reported (Cromer *et al.*, 1976) on the geology and availability of clay and building stone in the area. The present report is an extension of the earlier investigation, and is based on further studies of sandstone occurrences and quarries in the district.

Sandstone and brick, both locally produced, replaced timber as a building material soon after Port Arthur was established in 1830. Although many larger structures are a combination of both materials, sandstone was generally used for outer walls. The Commandant's cottage (1834), officers' and overseers' quarters (1834), the guard tower and magazine (1835), church (1836) and hospital (1842) are predominantly sandstone.

Unhappily, most of the bricks are a blend of poor standard materials manufactured by inferior methods, and many buildings in the township are in advanced, and often dangerous, states of disrepair. Sandstone has withstood the ravages of time and weather better, but much of it is of poor building quality.

ORIGINAL SOURCES OF SANDSTONE

All the building stone was probably quarried from Lower Triassic sediments along the eastern flank of Mt Arthur. The Triassic sequence consists broadly of thick sequences of sandstone and mudstone. The mudstone rarely crops out, but the more resistant sandstone commonly forms breaks of slope, large slab-like outcrops and cliffs. In common with similar rocks elsewhere in Tasmania, the sandstone exhibits many lithological variations, often within quite small areas. Accordingly, the quality of building stone varies considerably, not only between various sites, but even within a particular quarry. Initially, therefore, and as a result of such variations, stone was probably worked on a small-scale trial basis from many localities near Port Arthur. The choice of any one particular site was governed not only by the suitability of building stone, but by access (which is often difficult), ease of removal, transport problems, and distance from Port Arthur. Many of these sites have long been abandoned and forgotten, and most would be unidentifiable today. However, three definite quarry sites have been located. Two of these (quarries 1 and 2, *in* Cromer *et al.*, 1976) have already been described. Each was a major excavation, and together they supplied most of the stone used at the settlement. The third quarry was brought to my attention by Mr P. Spratt (consulting engineer of Fowler, England and Newton), and was subsequently visited in company with an officer of the National Parks and Wildlife Service on August 7, 1976.

Quarry 3 area [EN683185]

The quarry is 0.4 km west of the old convict farm house at Safety Cove. The area is covered by dense undergrowth as a result of fires and logging activities, and prior to recent track cutting by the National Parks and Wildlife Service the quarry was relatively inaccessible and difficult to locate. It lies at an elevation of about 40-50 m on the eastern flank of Mt Arthur, topographically about 30 m lower than the intermittent line of sandstone cliffs extending from Port Arthur to Remarkable Cave.

The quarry is only small, and it is difficult to see how it alone justified the construction of a narrow gauge railway, long since overgrown, which

extends 4 km north to Port Arthur. It seems likely that the site is only one of a number of small workings in the area, and it is hard to estimate the full extent of quarrying activities since the convicts left little trace of their activities. (At Quarry 3, some chisel marks on a worked face and a few partly quarried blocks are the sole indicators of their presence). Further uphill to the west, at an elevation of about 80 m, deep chisel marks were found in massive, hard sandstone at the top of a small cliff section.

A hundred metres south of Quarry 3, massive sandstone crops out in an unnamed creek which flows east past the farm house to Safety Cove. At an elevation of about 100 m, the creek cascades over a 20 m high cliff of Triassic sandstone. Further downstream, the creek gradient is steep, and its bed is littered with many very large sandstone boulders, some of which probably exceed 100 tonnes.

Thus, above Quarry 3 and to the north and south are many outcrops of sandstone, all potentially excavable. All are of a quality suitable for building, but lithologies vary between outcrops. The sandstone in Quarry 3 is generally massive, orange-brown and cross-bedded. In hand specimen it is medium-fine grained and contains only small amounts of clay matrix. It is generally hard and partly cemented with silica. In contrast, the sandstone in the small partly worked cliff section higher up the hill is massive, very hard, fine-coarse grained, and grey in colour due to the presence of dark heavy minerals. In places it has a strong silica cement, but it also retains its strength in varieties from which the cement has been partly leached. The stone is of higher building quality than that from Quarry 3. The large sandstone blocks in the nearby creek are fine-coarse grained, very hard and grey-brown in colour. Most would provide excellent building material, and with suitable equipment, could be easily blasted and removed from the creek.

Generally, therefore, sandstone from any of a number of outcrops in the vicinity of Quarry 3 is good building material and is superior to that obtained from either of the two major quarries further north. (Other localities closer to Port Arthur may, of course, be located to supply suitable building stone).

NOTES ON SANDSTONE BUILDINGS AT PORT ARTHUR

The sandstone in the buildings at Port Arthur exhibits a wide variety of textures, lithologies, colour and weathering patterns. The variations reflect local differences in a particular quarry, imprinted on broader differences between quarries. Nevertheless, at least three main types of stone can be distinguished. Assuming no other major sources of material apart from the three quarries investigated, it is possible to assign rock types in buildings at Port Arthur to various sites. The three general divisions are:

Type 1

Generally a pale cream medium-grained quartz sandstone, sometimes tinged with pale blue or grey, with variable amounts of clay or weathered feldspar or both. Tends to be poorly sorted and friable. Weathers rapidly.

Assumed source. Quarry 1 (Plummer's property).

Type 2

Generally a deep orange-brown (rust-coloured), poorly sorted medium-grained quartz sandstone, containing an iron oxide cement and often with a

clay matrix. Often banded with Leisegang rings, and commonly exhibiting contorted bedding and parallel partings. Occasional clay pellets present. Deteriorates rapidly and is friable and sandy to the touch.

Assumed source. Quarry 2 (Palmers Lookout road).

Type 3

Hard, pale cream, grey and sometimes brown strongly cemented (and in places leached) well sorted medium-coarse grained clean quartz sandstone. Dark heavy minerals often produce grey-white colour.

Assumed source. General area of Quarry 3, west of Safety Cove.

The following brief notes relate these sandstone types to various buildings at Port Arthur, and may be useful in recognising more durable building varieties (and avoiding unsatisfactory types) for restoration purposes.

Hospital

The outer wall is a mixture of different stone, but most seems to be of Types 1 and 3.

Officers' quarters (adjacent to magazine)

Mainly Type 1.

Magazine

Difficult to identify. Probably a mixture of Types 2 and 3. Wall in front is mainly Type 1. Western turret of tower is obviously Type 2.

Church

Mixture of types. Generally it is constructed of good stone (type 3) but there are definite sections of differing types. Thus, on the north-west side the sequence is:

Base - Type 2
Middle - Type 3
Top - Type 2
Type 1 stone is absent

The mixture of various types used in all the earlier major buildings indicates either that stone was being quarried simultaneously from a number of sources, or that the buildings were constructed, added to, or repaired, in stages. Such conclusions may need to be amended in the light of historical information, or they may indeed assist in an historical compilation of the settlement.

REFERENCE

CROMER, W.C.; THREADER, V.M.; KNIGHTS, C.J. 1976. Geology of Port Arthur. *Unpubl.Rep.Dep.Mines Tasm.* 1976/36.

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