

Mineral Resources Tasmania

Mineralogical/Petrology Report

LJN2019-017c

SAND ANALYSES, ROBBINS ISLAND SAND PIT



An unpublished Mineral Resources
Tasmania Report for:

HBMI Pty Ltd

By: R.S. Bottrill and L Unwin

Date: 29 March 2019

Mineral Resources Tasmania

SUMMARY

Representative portions of the sand were examined mineralogically by stereomicroscopy and polarised light microscopy to determine the petrology and mineralogy, particularly related to AAR (Alkali Aggregate Reactivity) potential.

The Robbins Island sand has low-moderate AAR potential as it contains only a low proportion of stressed quartz, quartzite and chert.

INTRODUCTION

A bag of sand was submitted by HBMI Pty Ltd to determine the mineralogy of some aggregate, from Robbins Island.

The main objective of this study is to determine the potential for alkali-aggregate reactions (AAR) in the aggregate/sand.

Alkali-aggregate reactions, particularly alkali - silica reactions, are a potentially deleterious form of reaction in concrete, which may cause significant cracking and deterioration (British Cement Association, 1988). The reaction is relatively well known in some parts of the world, but has been rarely reported in Australia (Shayan, 1991). The reactions are usually related to unstable silica minerals such as stressed quartz, chert and chalcedony (British Cement Association, 1988). Recent studies suggest that there appears to be more potential with coarser aggregates containing stressed quartz, than with finer aggregates (Cement and Concrete Association of New Zealand, 1991). There are a few proven cases in Tasmania, and the potential for reactions with some Tasmanian aggregates is probably quite significant, given appropriate conditions (Alderman, et al., 1947; Threader, 1992, Bottrill, 1992).

The sample details are given in Table 1.

Mineral Resources Tasmania

TABLE 1: SAMPLE DETAILS

<i>MRT Reg. No.</i>	<i>Sample ID</i>	<i>Location</i>	<i>Sample Description</i>
G409254	Dune sand	Robbins Island	sand

METHODOLOGY

To determine the AAR potential of the rock, a representative portion of the material was prepared as grain mount thin sections to study the mineralogy and textures. Some was tested by XRD to confirm the quartz content.

PETROGRAPHIC EXAMINATION

In hand specimen, the sample G409254 consists of natural quartz sand. It is pale brown in colour, well sorted, fine to medium grained, between 0.2 – 0.5 mm in size, and is relatively homogenous siliceous sand with minor white shell fragments, but no obvious organic particles or other particles or contaminants.

Mineral Resources Tasmania



Fig. 1. Sample G409254, Sand sample, Plain light, FOV (field of view) ~120mm.

In thin section the sample consists mostly of natural quartz grains, between 0.1 – 0.6 mm in size, well rounded to subangular, and is mostly homogenous in texture with little indication of any clays, coatings, weathering or alteration. There is about 5% of lithic particles (chert, siltstone, sandstone and quartzite) and about 2% partly weathered feldspars. Trace minerals include <1% each of pyroxenes, opaque oxides, zircon, tourmaline and other heavy minerals. There is about 5% angular to rounded shell fragments but no organic matter.

Mineralogically the sample is dominated by quartz (>95%), but about 3% of this is as chert (very fine grained quartz) (Fig 3) and about 1% is as quartzite, plus similar amounts as sandstone and siltstone. About 5% of the quartz grains contain stressed quartz, possibly derived from metamorphic quartzite (Figs. 2).

Mineral Resources Tasmania

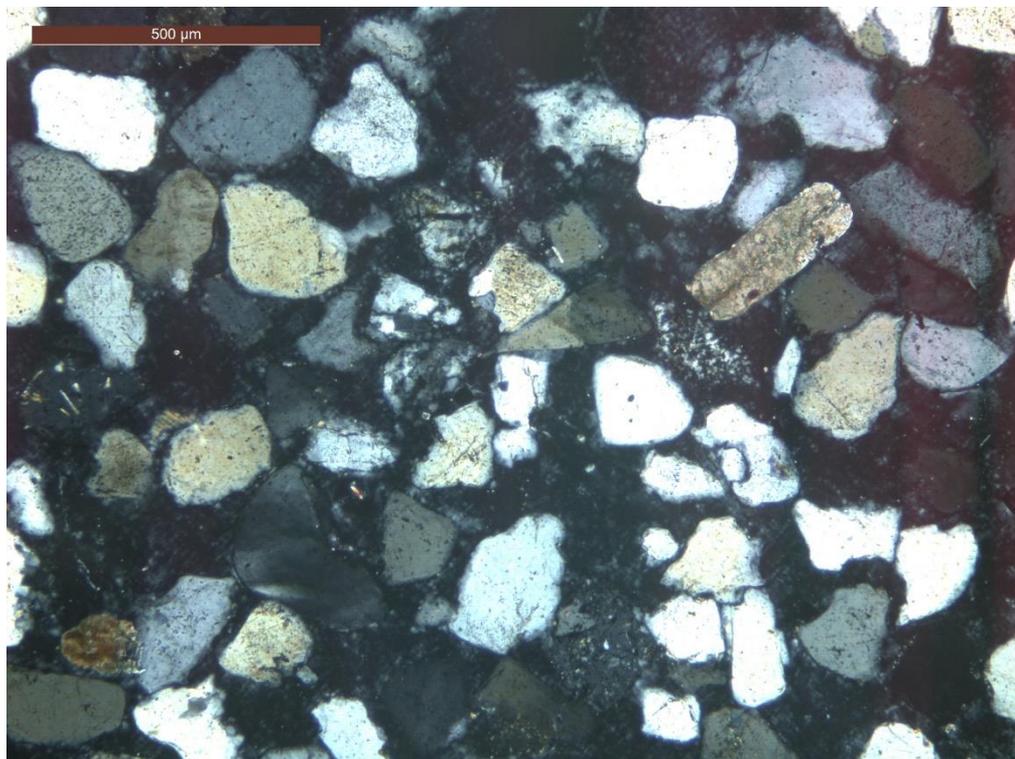


Fig. 2. Sample G409254, Polarised light, crossed polars, showing mostly unstressed quartz grains (grey to white and creamy), with sparse, more stressed quartz and partly recrystallised quartzite grains. There is a shell fragment in the upper right.

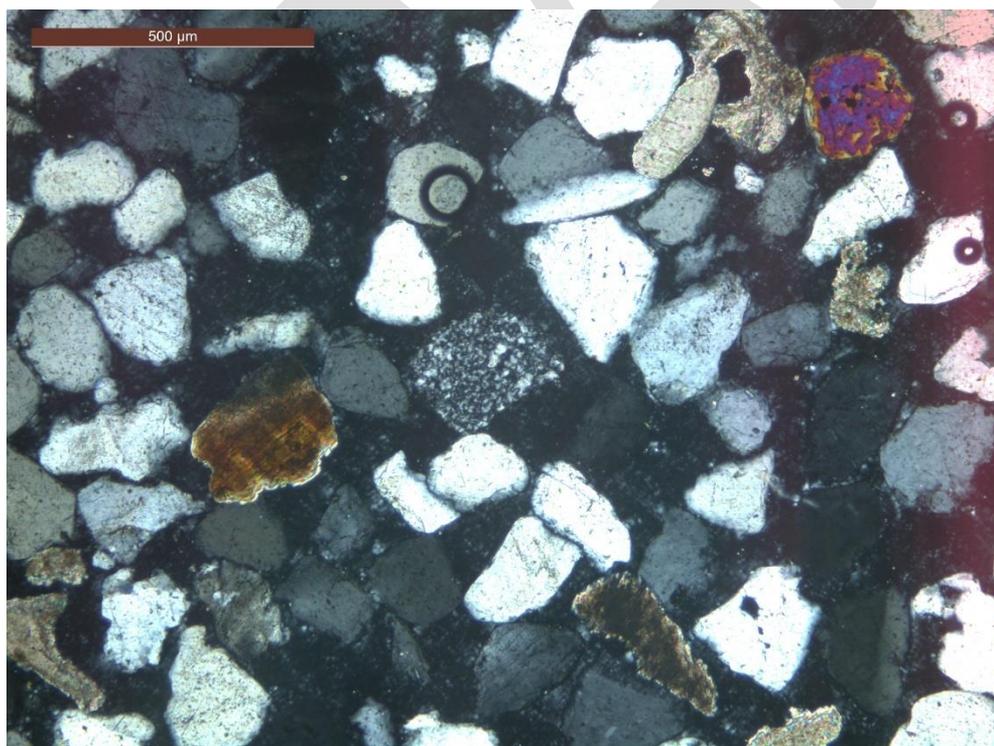


Fig. 2. Sample G409254, Polarised light, crossed polars, showing mostly unstressed quartz grains (grey to white and creamy), with sparse, more stressed quartz and partly recrystallised quartzite grains. There is a chert in the centre and a tourmaline in the upper right, plus two brown shells.

Mineral Resources Tasmania

XRD ANALYSES

The samples were prepared, examined and analysed in the MRT laboratories, Rosny Park, Tasmania. They were run on a Rigaku Miniflex 600 X-Ray Diffractometer system: a 600W generator 150mm goniometer with a Cu tube; 40kV/15mA, sample spinner and a D/teX Ultra High Speed 1D Detector with Be window, -3° to $145^{\circ} 2\theta$ scanning range and 2° - $140^{\circ} 2\theta$ measuring range, with a scanning speed of 0.01 to $100^{\circ}/\text{min}$, A graphite monochromator and a K β Ni- filter, The analysis software used is the PDXL2 using the ICCD database.

The results are shown in Appendix 1 and indicate mostly quartz and trace calcite (shell grit?). There is about 98% quartz and no detectable secondary minerals,. No sulphides, sulphates or other deleterious constituents were detected.

DISCUSSION AND CONCLUSIONS

There is a small amount of moderately stressed quartz, quartzite and chert grains in this sand which can indicate a potential AAR risk. However the proportions are low and the sand is relatively fine and such fine sands are rarely know to pose a significant AAR risk.

The AAR potential of this aggregate is Low-Moderate.

REFERENCES

- Alderman, A.R., Gaskin, A.J., Jones, R.H. and Vivian, H.E., 1947. Studies in cement aggregate reaction, Part 1. *CSIRO Bull.* 229, p.7-42
- Bottrill, R.S., 1992. Petrography of some concrete from the Gordon damsite. Unpub. Rept. from the Tasm. Dept. Mines to the H.E.C., Hobart.
- British Cement Association, 1988. The diagnosis of alkali-silica reaction. British Cement Association, London. 36 pp.
- Shayan, A., 1991. Alkali - aggregate reaction and its prevention. CSIRO, Melbourne.

Mineral Resources Tasmania

Threader, 1992. Potentially reactive aggregates in Tasmania. Concrete Institute of Tasmania, Hobart

R.S. Bottrill

MINERALOGIST/PETROLOGIST

Disclaimers

While every care has been taken in the preparation of this report, no warranty is given as to the correctness of the information and no liability is accepted for any statement or opinion or for any error or omission. No reader should act or fail to act on the basis of any material contained herein. Readers should consult professional advisers. As a result, the Crown in Right of the State of Tasmania and its employees, contractors and agents expressly disclaim all and any liability (including all liability from or attributable to any negligent or wrongful act or omission) to any persons whatsoever in respect of anything done or omitted to be done by any such person in reliance whether in whole or in part upon any of the material in this report.

These analyses collected in the MRT laboratories, along with some other data on the samples submitted, may enter the MRT databases but every attempt will be made to ensure the data remains closed file and not be available externally, except at your request.

Mineral Resources Tasmania

Appendix 1: XRD Analyses

MRT Laboratory Report

Client: G. Russell, HBMI

Sample Source: Robbins Island

MRT Job Number: LJN2019-017c

Analysis: Approximate Mineralogy

Method: X-Ray Diffraction

Analyst: L. Unwin

Date: 26/2/2019

Analysis Results – G409254

General information

Analysis date	2019/02/26 11:42:42		
Sample name	LJN2019-017	Measurement date	2019/02/14 11:38:28
File name	G409254.ras	Operator	lunwin
Comment	Shifted 0.05		

Quantitative analysis results

Phase name	Content(%)	Formula
Quartz	97.1(2)	SiO ₂
Calcite	2.9(2)	Ca(CO ₃)

Peak overlap (e.g. Clinopyroxene and K-Feldspar) may interfere with identifications and quantitative calculations.

Amorphous minerals and minerals present in trace amounts may not be detected.