DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 80/113

RHYOLITE SEALING AGGREGATE DEPOSIT KINGOONYA

By

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EXTRACTIVE MINERALS

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D.M.E. No. 506/79

CONTENTS

PLANS

PLATES

APPENDICES

PLATE 1. KINGOONYA RHYOLITE DEPOSIT (October, 1978)
Drilling rig with massive outcrop in background.
(Photo J.N. Steele, Highways Department).

RB 80/113

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ABSTRACT

An outcrop of porphyritic rhyolite adjacent to the Stuart Highway, 21 km east of Kingoonya was identified as a potential sealing aggregate deposit in 1975.

Diamond drilling and testing of cores in 1978 proved the required 100 000 m^3 of in situ material below an average of 30 cm of silty soil overburden.

INTRODUCTION

An outcrop of porphyritic rhyolite adjacent to the Stuart Highway was identified as a potential sealing aggregate deposit during a reconnaissance by officers of the Department of Mines and Highways Department in 1975, prior to the selection of a route for the new Stuart Highway.

Three diamond holes were drilled using a Highways Department rig in September 1978 to provide samples for testing and establish reserves.

During August 1979, additional sealing aggregate deposits were identified between Kingoonya and the Northern Territory border (Pain and Johnson, 1978).

Sealing aggregate will be supplied from the dolomite quarry at Woocalla to the south, and from a site yet to be proven in the Fitzgerald Dam-Mount Woods area to the north.

LOCATION AND ACCESS

The rhyolite outcrop occupies a low rise adjacent to the present Stuart Highway, 21 km east of Kingoonya and 20 km west of Glendambo homestead (see Fig. 1).

Access to the proposed quarry site is by 0.9 km of graded track which runs northwards from the Stuart Highway, 4.8 km west of Bitter Well. The proposed realignment of the Highway will pass within 10 km to the northeast of the site.

MINERAL TENURE

The deposit is on Glendambo Station, on Crown Land held under Pastoral Lease No. 2349 by Mould Nominees Pty. Ltd. No mining tenements are current over the area.

Although access to construction materials can be obtained under the Highways Act, 1926-1975, it is recommended that the Highways Department obtain continuing exclusive tenure to this deposit under the Mining Act. Appropriate action should be discussed with the Mining Registrar.

ENVIRONMENTAL ASSESSMENT

The deposit lies in grazing land of low scenic value in a remote area within the Far North Planning Area.

Vegetation is sparse and very little would need to be disturbed during quarrying operations (see Plate 1).

Quarry operations will be substantially hidden from the highway, and the site will not be visible after quarrying operations have ceased.

GEOLOGICAL SETTING

The Gawler Range Volcanics of Carpentarian age comprise a suite of extrusive acid igneous rocks of rhyolitic to dacitic

composition. Similar rocks are widespread throughout northern Eyre Peninsula, the Gawler Ranges, and as far north as Perfection Well, 14 km south west of Ingomar homestead.

On KINGOONYA, these rocks are overlain by flat lying clayey and pebbly Cretaceous sandstone of the Cadna-owie formation, which is in turn overlain by silcrete and Pleistocene to Recent sand and soil (Daly and Thomson, 1972).

SITE GEOLOGY

The proposed quarry site is located on the north-eastern flank of a low rise underlain by rhyolite (see Plate 1).

The rock is intensely jointed with joint spacings of approximately 5-30 cm. The most prominent joint set trends about 145^{o} and dips at 60^{o}-80^{o} to the southwest.

Outcrop is bold and subdued over approximately 25% of the site, the remainder is covered by brown silty soil up to 30 cm thick.

DRILLING

Three vertical diamond holes totalling 26.3 m were cored by a Highways Dept. drilling rig during September 1978.

Logs and photographs of the core are presented as Appendix A.

Hole locations are shown on Figure 2.

STONE QUALITY

Petrographic Examination

Two selected samples of drill core were described by AMDEL as rhyolitic ignimbrite or ignimbritic rhyolite. The rock comprises small phenocrysts up to 2 mm in diameter of quartz and potash feldspar with lesser amounts of plagioclase feldspar, in a very fine grained matrix of quartz, iron stained feldspar and sericite. Full descriptions are presented in Appendix B.

Apart from trace amounts of chlorite, which are insufficient to adversely affect the in-service performance of the rock, no other components or properties deleterious for road aggregate were detected.

The mineralogical composition suggests that the rock should have adequate bitumen affinity, and should be similar to material from Mount Monster in the Upper South East. This is confirmed by Highways Department stripping tests as listed in Table 2.

Aggregate Testing

Two samples of diamond drill core were submitted to the Highways Department Laboratories at Northfield for testing. Detailed results are presented in Table 1.

TABLE I

AGGREGATE TESTING

Hole No.	DDH1	DDH2
Depth	8.45-12.45 m	2-6 m
Los Angeles Loss%	19	18
Washington Degradation	N.D.	85
Soil Constants, L.A. Fines		
Liquid Limit %	17	Non-plastic
Plastic Limit %	15	"
Plasticity Index	2	"
Linear Shrinkage %	0.8	"

TABLE 2

BITUMEN STRIPPING TESTS

	Per Cent Stripping	
	No Additive	Megamine BA Additive
Dry	80%, 70%	0%, 0%
Wet	67%, 48%	2%, 3%

QUARRY DEVELOPMENT

Reserves of in situ material in the deposit probably exceed 30 million tonnes, so that many quarry configurations are possible. A quarry capable of yielding the required 100 000 m^3 of in situ material from one 15 m bench is outlined in Figure 2.

The rock is intensely jointed and little or no secondary blasting should be needed.

The most prominent joint set trends 145^o and dips at 60^o-80^o to the southwest. Consequently, care will be required with the southern and western quarry faces. A potentially unstable situation may be caused by slabbing off along the joint planes.

Outcrop extends over 25% of the proposed quarry site, and less than 30 cm of overburden comprising soft, silty soil is expected to cover hard fresh rock over the remainder of the site. The soil should be easily scalped and no stripping operation should be necessary.

CONCLUSIONS AND RECOMMENDATIONS

Large reserves of porphyritic rhyolite, shown by testing and petrographic examination to be suitable for sealing aggregate, underlie a low north-south ridge crossing the existing Stuart Highway,

21 km east of Kingoonya.

A proposed quarry to yield the required 100 000 m^3 of in situ material will be substantially hidden from view from the existing Stuart Highway 900 m to the south, and the site will not be visible once quarry operations have ceased.

No major problems should be encountered during quarrying. Overburden comprises a thin layer of silty soil which should scalp out easily. Care will be necessary with a potentially unstable situation in the southern and western quarry faces.

Adequate reserves are available for future crushing contracts.

AMP:AF

A.M. PAIN

REFERENCES

Daly, S.D. and Thomson, B.P., 1972. KINGOONYA map sheet, Geological Atlas of South Australia, 1:250 000 series preliminary edition. Geol. Surv. S. Aust. (unpublished).

Pain, A.M. and Johnson, P.D., 1979. Potential sealing aggregate sites for the Stuart Highway. S. Aust. Dept. Mines and Energy report 79/128 (unpublished).

APPENDIX A

Logs and Photographs of Diamond Drill Core

APPENDIX A LOGS OF DIAMOND DRILL CORE

KDH No. 1

Depth (m)	Description
0-0.28 m	Overburden. Red-brown silty soil (No recovery)
0.28-13.74	Rhyolite. Greyish pink ignimbritic rhyolite with small quartz and pink feldspar phenocrysts 1-2 mm diameter and some lithic fragments up to 10 mm diameter in fine grained groundmass.
	Some flow banding at 65° to core axis @ 2 m, 70° @ 6 m, 70° @ 10 m.
	Brown weathering discolouration common adjacent to joints.
	Jointing at 10-30 cm spacing common throughout core. Most commonly at 40°-60° t core axis, some at 20° and some sub-parallel to core axis.
	Petrographic specimen @ 7.5 m
	13.74 m END OF HOLE

KDH No. 2

Depth (m)	Description
0.0-0.38	Overburden. Red-brown silty soil (No recovery)
0.38-0.48	Rhyolite. Core rubbly broken
0.48-10.44	Rhyolite. Greyish pink ignimbritic rhyolite with small quartz and pink feldspar phenocrysts 1-2 mm diameter and some lithic fragments up to 10 mm diameter in fine grained groundmass. Some flow banding at 35° to core axis at 2.5 m, 40° @ 4.5 m, 70° @ 8.5 m.
	Brown weathering discolouration common adjacent to joints. Jointing at 10-30 cm spacing common throughout core, are set at less than 10° to core axis and one or more other sets of approx. 45° to core axis.
	Petrographic specimen @ 8.45 m
	10.44 m END OF HOLE

KDH No. 3

Depth (m)	Description
0-0.20	Overburden. Red-brown silty soil (No recovery)
0.20-2.08	Rhyolite. Greyish pink ignimbritic rhylite with small quartz and pink feldspar phenocrysts 1-2 mm diamter, and some lithic fragment up to 10 mm diameter in fine grained groundmass. Some flow banding.
	2.08 m END OF HOLE

KINGOONYA SEALING AGGREGATE DEPOSIT
DIAMOND DRILL HOLE KDH1

(Neg. No. 31828, 31829)

RB801
113-2

KINGOONYA SEALING AGGREGATE DEPOSIT DIAMOND
DRILL HOLE KDH 2 (Neg. No. 31830)

RB 80/113-3

APPENDIX B

Petrographic Descriptions of Acid Volcanic Rocks

AMDEL report GS 4381/80

By
Sylvia Whitehead

DESCRIPTION OF ACID VOLCANIC ROCKS

Sample: 6036 RS 1; TS43106

Location:

Diamond Drillhole KDH1 at 7.5 m

Hand Specimen:

A greyish-pink rock containing small phenocrysts of quartz and pink feldspar 1 to 2 mm in size and also a few lithic fragments up to 10 mm in size in a very fine-grained orange to pink groundmass. The rock is massive but has split along two parallel joints 3.5 cm apart which are inclined at a moderate angle to the direction of the drillhole.

Staining with cobaltinitrite shows that some of the feldspar phenocrysts are potash feldspar and there are also elongated fragments containing potash feldspar. The matrix, however, contains relatively minor potash feldspar. This etching and staining emphasizes a fragmental structure in the rock strongly suggesting that it was a pyroclastic, possibly an ash-flow tuff or similar ignimbritic pyroclastic.

Thin Section:

The composition varies and as much of the matrix is extremely fine-grained, it is not possible to give an accurate quantitative estimate of the various minerals. The rock does, however, contain a fairly high proportion of quartz, moderately abundant potash feldspar and probably minor plagioclase. There is trace to minor sericite and up to 1% of leucoxene.

The rock contains quartz phenocrysts 0.5 to 1 mm in size, some potash feldspar phenocrysts 1 to 2 mm in size which are now partly stained by reddish-brown iron oxide and there are a few plagioclase phenocrysts up to 1.5 mm in size which have been partly replaced by sericite and also stained by iron oxide. There are some visible fragments of volcanic rock, most of them a few millimetre in size and some of the larger fragments contain small spherulites composed of radiating, fibrous feldspar and quartz and many of these are heavily stained by orange to reddish-brown iron oxide. Interstices contain coarser-grained quartz. There is one moderately large fragment showing some evidence of flow-banding and there are other areas of devitrified volcanic glass which now have rather indistinct and diffuse boundaries.

The matrix is now composed mainly of very turbid quartz and sericite stained by iron oxide and relict textures suggest that it originally contained a large proportion of shards or other small fragments of volcanic glass which were deformed while still soft and, as a result of compaction, these now curve around the larger phenocrysts. The matrix contains small grains or aggregates of leucoxene 0.05 to 0.2 mm long. In the area sectioned there are two or three patches less than 1 mm in size containing a little partly weathered and stained chlorite associated with sericite and quartz but relict textures are not sufficiently clear to show whether these may represent completely altered, ferromagnesian phenocrysts or rock fragments of slightly different composition.

Conclusion:

This is an ignimbrite of rhyolitic composition which could possibly be classified as a rhyolitic ignimbrite (or ignimbritic rhyolite).

Sample: 6036 RS 2; TS43107

Location:
Diamond Drillhole KDH2 at 8.45 m

Hand Specimen:
A greyish-pink, porphyritic rock very similar in general appearance to sample RS 1 in that it contains small phenocrysts of quartz and pink feldspar and also a few grains which have been replaced by greyish-green chlorite. There are some larger rock fragments which are predominantly pink in colour. If differs from sample RS 1 in that one joint surface is encrusted with a film of greyish-green chlorite.

Staining with cobaltinitrite shows that some of the feldspar phenocrysts still contain some potash feldspar and some of the rock fragments have higher proportions of potash feldspar but there is only minor potash feldspar in the matrix.

Thin Section:
This is similar to sample RS 1 in that it contains phenocrysts of quartz 0.5 to 2 mm in size, some phenocrysts of orange to reddish-brown stained potash feldspar up to 2 mm in size and a few phenocrysts of plagioclase up to 1 mm in size which are also stained by reddish-brown iron oxide. It differs from sample RS 1 in that there are a few clearly defined but completely altered phenocrysts 0.5 to 1 mm in size which have been replaced by chlorite and most of these contain some included grains of opaque oxide. One contains a small crystal of secondary carbonate. There are some moderately large fragments of volcanic rock over 10 mm long composed predominantly of reddish-brown-stained feldspar (probably potash feldspar) and quartz and these show some small spherulitic structure

The matrix is turbid and extremely fine-grained and is probably mainly quartz and iron oxide-stained feldspar with some sericite, but in general it is too fine-grained to be resolved microscopically. Relict textures show that it was probably originally composed predominantly of small volcanic shards which have been deformed while still soft and some of this deformation could have been due to flow as in an ash-flow.

There are a few small fractures or veins less than 0.1 mm thick containing quartz and a little chlorite and there is one slightly irregular fracture along which there are some small patches of turbid carbonate (not calcite) which has invaded the rock for distances of up to 0.2 mm on each side of the small fracture. There are, however, very few of these small fractures containing chlorite and carbonate and although they may influence the breaking of the rock there is insufficient chlorite to adversely affect the rock if it is to be used for road aggregate.

Conclusion:
Ignimbritic pyroclastic of acid composition which could probably be classified as a rhyolitic ignimbrite.

In these two samples no features were found which would preclude the use of this material for road aggregate.

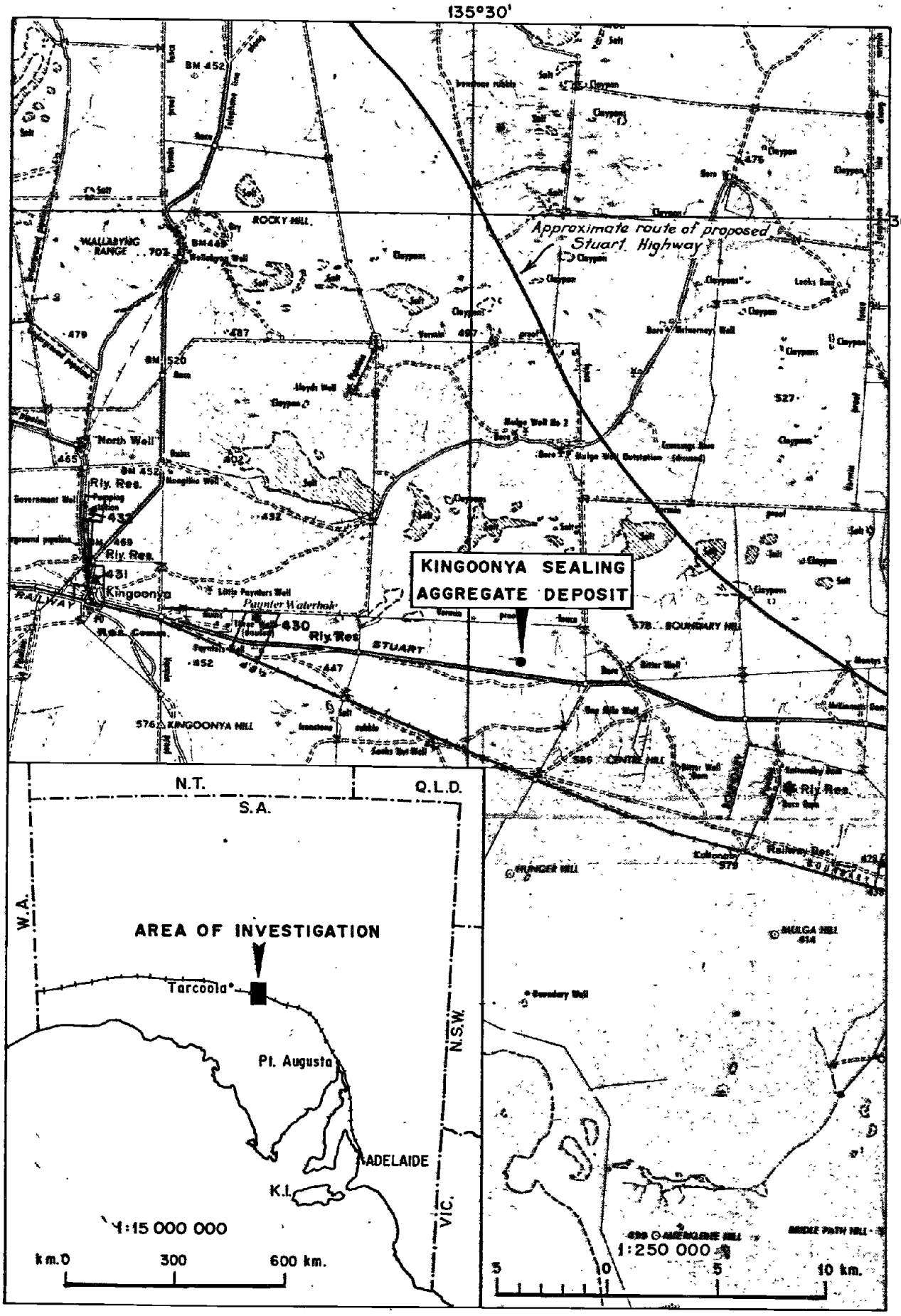

Fig. 1

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE: 1:250 000 1:15 000 000
COMPILED: A.M.Poin.	KINGOONYA SEALING AGGREGATE DEPOSIT	DATE: October 1978
DRN: G.J.T. CKD:	STUART HIGHWAY	PLAN NUMBER
	LOCALITY PLAN	S13715

1617

SCALE 1:500

METRES 10 0 10 20 30 40 METRES

KDH 2
10·44m.

KDH 1
13·74m.

KDH 3
2·08m.

GRADED ACCESS TRACK

STUART HIGHWAY 0·8km.

30·0 29·5 29·0 28·5 28·0 27·5 27·0 26·5

REFERENCE

BOLD OUTCROP OF PORPHYRITIC RHYOLITE.

RUBBLY OUTCROP OF PORPHYRITIC RHYOLITE.

STRIKE & DIP OF PROMINENT JOINT SETS
65 INCLINED
VERTICAL

KDH1 13·74m. DIAMOND DRILLHOLE LOCATION & DEPTH.

29·0 TOPOGRAPHIC CONTOURS (ARBITRARY DATUM)

OUTLINE OF PROPOSED QUARRY.

STADIA SURVEY BY A.M.PAIN AND P.HERRING.

FIG. 2

DEPARTMENT OF MINES AND ENERGY – SOUTH AUSTRALIA

KINGOONYA SEALING AGGREGATE DEPOSIT

STUART HIGHWAY

GEOLOGY, DRILLHOLE LOCATIONS AND PROPOSED QUARRY OUTLINE

	COMPILED A.M.Pain.	DRN G.J.Thorpe	SCALE 1:500	PLAN NUMBER
DIRECTOR GENERAL		CKD	DATE October 1978	78-813