

REPORT ON KINGSTON AREA.Introduction

The work upon which this report is based was carried out for the purpose of investigating the quality and extent of certain clay deposits on Mr. S.D. Scown's property, together with sand and clay deposits on Mr. H. Harrison's property. It consisted of putting down a system of bore holes. Further than this an investigation was made to ascertain the possibilities of a supply of underground water sufficient for the needs of the population of Kingston and Kingston Beach.

Location and Access

This area is situated  $\frac{3}{4}$  of a mile south west of the Kingston Post Office and is reached by means of the Tinderbox Road which deviates from the main Hobart-Margate road a little west of Kingston.

Topography

The land surface rises rapidly from the River Derwent and attains an altitude of 590 feet on the top of the hill, on the North Western side of which the properties mentioned above, are situated. No permanent running streams come within the area.

Geology

Only two series of rocks occur within the district both of which are of sedimentary origin. The older series, probably the Upper Marine of the Permo-Carboniferous Period, outcrops along the lower limits of the hill from the north through east to the south east, and consists mainly of white siliceous mudstones.

The younger series consists largely of sandstones of the Trias-Jura Period corresponding with the Ross series of the Midlands and elsewhere. These sandstones cap the hill and rest conformably on the mudstones below.

Economic Geology

The materials of economic importance in the area consist of clays, clay sands and sand.

Clays: These appear under two sets of geological conditions.

(a) Several strata of siliceous mudstones are found to be interbedded with the sandstones which, at the outcrop, appear in the unconsolidated condition as white plastic clays.

Some of the white clays are of a fine texture while others again are of a gritty nature. The actual extent of the white clays over the area could not be gauged with the plant used, as these are bedded in the sandstones, except at their outcrop, where they lie at different depths under the soil.

To gauge the extent of the deposit generally a power plant of a much larger type than the hand boring apparatus used in the present instance would be necessary.

(b) The subsoil throughout **most** of the district is represented by fine plastic clays which are coloured in different shades from yellow to brown.

Clay Sands: Above and below the white clays are beds of clay sand or softened sandstone formed by the partial disintegration of the sandstones in which they are formed.

The remarks above with reference to the extent of the white clays apply equally to the clay sands.

Sand: In places just under the surface soil are found accumulations of fairly fine white sand. This has apparently been formed into banks of varying depth by the action of the wind, after disintegration from the surrounding sandstones.

### Boring

The boring plant used was a 2½ inch hand-boring plant equipped with an auger and a chisel bit. It was found at the outset that this plant was not suitable for use in boring through the sandstones and so it necessitated the boring for the white clays, near the line of their outcrop.

Trouble also was experienced in boring the fine sand as it was found difficult to extract a core. In some places it was found necessary to dig through the sand to ascertain the depth. Twenty five holes in all were sunk, the actual positions of which may be seen by referring to the plan attached to this report.

Hereunder are shown sections of the strata passed through in the respective bores.

### SCOWN'S PROPERTY

#### No. 1 S. Bore - Surface.

<u>Sample Number</u>		<u>Thickness of Strata</u>	<u>Progressive Depth</u>
	Sandy soil	1' 8"	
No. 3	Yellow plastic clay	2'	3' 8"
No. 2	Yellow clay sand	3' 6"	7' 2"
No. 1	Cream clay sand	1' 3"	8' 5"
	Yellow clay sand	8"	9' 1"
	Yellow interspersed with white sandy clay	2"	9' 3" Total depth
	Hard bottom		

#### No.2 S. Bore - Surface

	Sandy soil	1'	
	Fairly white sand	1' 6"	2' 6"
	Yellow clay sand	1' 9"	4' 3"
No. 4	Stiff Blue Clay	4'	8' 3"
	Yellowish red clay sand	6"	8' 9"

No. 2 S.Bore - Surface Cont.

<u>Sample Number</u>		<u>Thickness of Strata</u>	<u>Progressive Depth</u>
No. 7	Light brown clay interspersed with white	3'	11' 9"
No. 6	Creamy white clay	2'	13' 9"
No. 5	White clay	1'	14' 9"
	Yellow clay sand (still in this)	6"	15' 3" Total Depth

No.3 S.Bore - Surface

	Sandy soil	1'	
	White sand	1' 6"	2' 6"
	Yellow clay sand	1' 6"	4'
	Blue Clay	2'	6'
	Light brown clay sand	2' 9"	8' 9"
	Dark Yellow clay sand	1' 6"	10' 3"
	White clay sand with brown layers	2'	12' 3" Total Depth
	Hard bottom		

No.4 S.Bore - Surface

	Sand soil	1'	
	Yellow clay sand	2'	3'
	White clay sand	1"	3' 1"
	Brick red sand	3"	3' 4" Total Depth
	Hard Bottom		

No.5 S.Bore

	Sandy soil	1' 6"	
	Stiff yellow clay	3' 3"	4' 9"
	Light blue clay sand	2'	6' 9"
	Bright yellow clay sand	1' 3"	8'
	Grey white clay sand	6"	8' 6"
	Yellow clay sand	3"	8' 9" Total Depth
	Hard bottom		

No.6 S.Bore

	Sandy soil	1' 9"	
	Yellow clay	4"	2' 1"
No. 8	White clay	1'	3' 1"

No.6 S.Bore Cont.

<u>Sample Number</u>	<u>Thickness of Strata</u>	<u>Progressive Depth</u>
Dirty white clay sand	1'	4' 1"
Yellow clay (still in this)	1' 5"	5' 6"

No.7 S.Bore

Sandy soil	1' 3"	
Yellow clay	2' 6"	3' 9"
Creamy brown clay sand	6"	4' 3"
White clay sand	1' 3"	5' 6"
Brick red clay sand	1'	6' 6"
Creamy brown clay sand	9"	7' 3"
White clay sand	5'	12' 3"
Light brown sandy clay	4"	12' 7"
White clay sand	1'	13' 7"
Creamy brown clay sand	1'	14' 7"
White clay	1' 6"	16' 1" Total Depth
Stiff reddish brown clay		
Water came in at 12' 8" from surface.		

No.8 S.Bore

Sandy loam	1' 6"	
Yellow clay	2' 6"	4'
Light brown clay sand	1' 3"	5' 3"
White clay sand with a few yellow bands	9' 6"	14' 9"
Light yellow clay sand	1' 6"	16' 3" Total Depth
Water came in at 12' 6" from surface.		

No.9 S.Bore

Sandy soil	9"	
Sand	9"	1' 6"
Hard Cemented sand	9"	2' 3"
Yellow sand	2'	4' 3"
No. 12.Gritty white clay	2'	6' 3"
No. 11.White clay	5'	11' 3"
Yellow clay sand (still in this)	3'	14' 3" Total Depth
Water came at 8' 3" from surface.		

No. 10 - S.Bore

Sandy Soil	1'	
Yellow clay sand	1' 9"	2' 9"

No. 10 S.Bore Cont.

<u>Sample Number</u>		<u>Thickness of Strata</u>	<u>Progressive Depth</u>
No. 9	Gritty white clay	3' 6"	6' 3"
	White clay sand	2'	8' 3"
	Yellow clay sand (still in this)	8"	8' 11" Total Depth

No.11 S.Bore

	Sand	6"	
	Yellow clay	3'	3' 6"
	Red interspersed with white sandy clay	6"	4'
No. 10	White clay	6"	4' 6"
	Brick red clay sand	6"	5'
	White gritty clay	2' 6"	7' 6"
	Light brown clay sand	1'	8' 6"
	White clay sand	1'	9' 6"
	Yellow and red clay sand (still in this)	1'	10' 6" Total Depth

No.12 S.Bore

	Sandy soil	1'	
	Yellow clay	1'	2' Total Depth
	Hard bottom		

No. 13 S.Bore

	Soil	6"	
	Hard yellow clay sand	1'	1' 6"
	Gritty grey clay	1' 9"	3' 3" Total Depth
	Hard bottom		

HARRISON'S PROPERTYNo. 1 H.Bore

	Sandy soil	1'	
	White sand	2'	3'
	Yellow clay sand	1' 3"	4' 3"
	White clay sand (still in this)	3'	7' 3" Total Depth
	Water came in at 5' 3" from surface.		

No. 2 H. Hole

<u>Sample Number</u>	<u>Thickness in Strata</u>	<u>Progressive Depth</u>
Sandy loam	3'	3' Total Depth
Hard sandstone bottom		

No. 3 H. Hole

Sandy loam	1' 9"	3' Total Depth
Yellow Clay	1' 3"	
Hard bottom		

No. 4 H. Hole

Sandy loam	1'	2'
White sand	1'	
Partly decomposed sandstone.	2'	4' Total Depth
Hard sandstone bottom		

No. 5 H. Hole

	Sandy loam	6"	6"
	Yellow clay	1'	1' 6"
	Yellow clay sand	2'	3' 6"
No. 13	White Gritty clay	3'	6' 6"
	Light brown gritty clay	2'	8' 6"
	Yellow clay sand	2' 3"	10' 9" Total Depth
	Hard bottom		

No. 6 H. Bore

	Sandy loam	1'	1'
	Yellow clay	2' 6"	4' 4" Total Depth
	Yellow clay (little clay)	10"	
	Hard bottom.		

No. 7 H. Bore

	Sandy loam	1' 6"	1' 6"
	White sand	1' 10"	3' 4"
No. 14	Yellow clay	4' 6"	7' 10" Total Depth
	Hard bottom		

No. 8 H. Bore

<u>Sample Number</u>	<u>Thickness in Strata</u>	<u>Progressive Depth</u>
Sandy loam	1'	1'
Yellow clay	4'	5'
Yellow clay sand	2' 9"	7' 9"
White gritty clay interspersed with yellow	2' 6"	10' 3"
Yellow clay sand	1'	11' 3"
White gritty clay interspersed with yellow	2' 9"	14'
Yellow clay sand	4"	14' 4" Total Depth
Hard bottom		

No. 9 H. Bore

Sandy loam	1' 9"	1' 9"
Dirty white sand	1'	2' 9"
Hard sandstone bottom		

No. 10 H. Bore

Sandy loam	1'	1'
Dirty white sand	9"	1' 9"
White sand with dirty patches	4' 6"	6' 3" Total Depth

No. 11 H. Bore

Sandy loam	1' 3"	1' 3"
No. 15 White sand	7'	8' 3" Total Depth

No. 12 H. Bore

Sandy loam	1'	1'
White sand	1' 8"	2' 8"
Hard Sandstone bottom		

Composition of the Clays and Clay Sands.

Analyses of a number of the clays and clay sands were made by the Chief Government Chemist and Assayer with the following results:

The samples taken are indicated on the bore sections by their respective numbers alongside the strata from which they were obtained.

No.1 Sample

<u>Constituents</u>	<u>Per cent</u>
Silica	84.16
Alumina	10.43
Ferric Oxide	1 .57
Titanium oxide	0. 20
Lime	Nil
Magnesia	0.07
Loss	3.80

No.2 Sample

<u>Constituents</u>	<u>Per cent</u>
Silica	88.40
Ferric Oxide	1.81
Alumina	7.39
Titanium oxide	0.20
Lime	Nil
Magnesia	0.07
Loss	2.60

No.3 Sample

Silica	55.52
Ferric oxide	7.46
Alumina	23.74
Titanium oxide	0.40
Lime	Nil
Magnesia	0.07
Loss	11.70

No.4 Sample

Silica	73.36
Ferric oxide	3.60
Alumina	16.20
Titanium oxide	0.40
Lime	Nil
Magnesia	0.07
Loss	6.50

No. 5 Sample

Silica	63.60
Ferric oxide	1.91
Titanium oxide	0.60
Alumina	24.89
Lime	Nil
Magnesia	0.14
Loss	5.80

No.6 Sample

Silica	65.00
Ferric oxide	1.78
Alumina	23.72
Titanium oxide	0.70
Lime	Nil
Magnesia	0.21
Loss	5.60

No.7 Sample

Silica	75.00
Ferric oxide	3.07
Alumina	15.83
Titanium oxide	0.70
Lime	Nil
Magnesia	0.14
Loss	5.00

No.8 Sample

Silica	71.40
Ferric oxide	2.00
Alumina	18.86
Titanium oxide	0.40
Lime	Nil
Magnesia	0.07
Loss	5.10

No.9 Sample

Silica	67.00
Ferric oxide	2.57
Alumina	21.63
Titanium oxide	0.40
Lime	Nil
Magnesia	0.07
Loss	8.20

No.10 Sample

Silica	55.80
Ferric oxide	1.86
Alumina	30.74
Titanium oxide	0.60
Lime	Nil
Magnesia	0.07
Loss	11.20

<u>No.11 Sample</u>		<u>No.12 Sample</u>	
<u>Constituents</u>	<u>Per cent</u>	<u>Constituents</u>	<u>Per cent</u>
Silica	59.20	Silica	70.80
Ferric oxide	3.86	Ferric oxide	2.71
Alumina	28.50	Alumina	19.49
Titanium oxide	0.60	Titanium oxide	0.60
Lime	Nil	Lime	Nil
Magnesia	0.07	Magnesia	0.07
Loss	6.00	Loss	6.90

<u>No.13 Sample</u>		<u>No.14 Sample</u>	
Silica	70.68	Silica	67.52
Ferric oxide	2.57	Ferric oxide	3.14
Alumina	18.79	Alumina	20.22
Titanium oxide	0.60	Titanium oxide	0.60
Lime	Nil	Lime	Nil
Magnesia	0.07	Magnesia	0.07
Loss	4.80	Loss	5.10

<u>No.15 Sample (sand)</u>	
Silica	95.80
Ferric oxide	2.29
Alumina	0.31

#### S. D. SCOWN'S PROPERTY

This property extends on both sides of the Tinderbox Road at a distance some eleven miles from Hobart and consists of three surveyed blocks of 13 acres 3 rds. 0 pchs., 9 acs. 2 rds. 4 pchs. and 28 acs. 3 rds. 7 pchs. charted in the name of E. & G Innes, also a block of 23 acres 1 rood 30 perches in the name of W.H. Wise, giving a total of 75 acres 2 roods 1 perch in all. Trias-Jura sandstones extend over the whole of this area while interbedded with these, bands of mudstones or clay are occasionally found.

#### Mining

These clays have been mined in the past and extracted by means of two dip adits together with a shaft 34 feet deep. Apparently no adequate means of drainage was adopted and so the workings eventually had to be abandoned owing to the accumulation of water. During the writer's visit the workings were full of water and the surface has fallen in at many places so it was impossible to make an inspection underground.

#### Uses for clays and clay sands

For some years Mr. Scown has been using the clays and sands on his property for a number of different purposes. The chief use has been for the manufacture of a scowering

brick for cleaning woodwork and stained metal, and also for whitening door steps etc. The white clay sands found in Bores Nos. 3, 6, 7, 8, 10 and 11 would be very suitable as regards quality. Cold water paints, whitening and blocks for cleaning white shoes etc. have in the past been made from the white clays and for these products the white clays in Bores Nos. 2, 6, 7, 9 and 11 could be used if they could be mined economically. For whitening, in the making of which a little grit would perhaps not be objectionable, the gritty white clays exposed in Bores Nos. 9, 10 and 11 could all possibly be used.

Pottery, earthenware and other such like articles are other purposes that might be considered in dealing with some of the clays exposed in the bores put down. In this connection it must be emphasised that as far as these articles are concerned chemical analysis alone can only give a very general idea of the uses that the clays might be put to.

Physical properties such as plasticity, texture, tensile strength, shrinkage, porosity, fusibility, absorption etc. must be taken into account. Until these tests are made no definite statement as to their suitability or otherwise for the above purposes can be given.

However some idea can be obtained from the analyses and it is considered that the clays corresponding with sample No. 5, 6, 8, 9, 10, 11, and 12 would be suitable for the manufacture of earthenware and terra cotta. None of the clays could be used for making white ware as their iron content is too high to allow this.

Their colour after firing would be anything from buff to brown.

#### H. HARRISON'S PROPERTY

Mr. Harrison has an area of some 14 acres extending across Tinderbox Road at a point about 10½ miles from Hobart. The property is a portion of 212 acres originally granted to John Lucas and adjoins S.D. Scown's holding.

#### Mining

Sand on this property is at present being worked by open pit methods and a little over 1000 cubic yards of white sand has been carted away by the present owner. A soil overburden up to two feet in depth has first to be removed before the sand can be worked.

#### Sand Deposit

The largest white sand deposit viewed in the area appears on this property. The depth varies a great deal at different points, but as far as could be ascertained it is never ~~more~~ than eight feet at any one point. The sand in question is very white in colour, of medium fineness and somewhat sharp in grain. The area over which the sand extends is in the vicinity of 3½ acres. It is thought that three feet could be the minimum depth of workable sand and five feet the average depth over the area which it could be worked. At the most, only a quarter of the deposit, excluding that already removed and the portion which the Tinderbox Road covers, is over three feet in depth. Taking this as a basis the approximate reserve of

economically workable white sand would be 20,000 cubic yards.

Uses for clays, clay sands and sand

The white gritty clays as exposed in bores nos. 5H and 8H could possibly be used for some classes of pottery and earthenware. In considering this the general remarks appertaining to clays for these purposes mentioned in dealing with Mr. Scown's property, apply equally in this case. This clay is perhaps too gritty for use in cold water paints, without extensive treatment, but appears to be suitable for making whiting.

The yellow subsoil clays shown in bores Nos. 3H, 5H, 6H, 7H and 8H are apparently suitable for the manufacture of fire bricks. Although this Department has no electric furnace capable of reaching the necessary temperature for testing the fusing point of these clays, it has been ascertained that there was no softening at 1720 degrees centigrade. It might be mentioned that the bricks when fired would not burn white. Mr. Harrison has made and used what appears to be an excellent cold water paint of a buff colour from the yellow clay. Practically only the one colour could of course be obtained from this clay owing to the yellow stain brought about by the iron oxide in its content.

The white clay sand showing in bore No. 1H is of the same type and could be used for similar articles to these mentioned previously in dealing with the adjoining property. The white sand is at present being used for a number of purposes in the building trade. Its pure whiteness makes it eminently suitable for plastering work.

For concrete and cement use the absence of salt in its content puts it in a class above beach sands in which the salt is apt to stain the finished work. Although for concrete generally the white sand is perhaps a little too fine in grain it appears to be giving satisfaction. It is being used in the majority of buildings in the course of erection in Hobart at the present time.

For the manufacture of clear glass the sand in question is too high in iron oxide but this and other impurities could be appreciably reduced by washing. In this case if the physical properties were suitable, coloured glass bottles could be manufactured from it.

Medium fineness in grain is a good point with this sand, but the grains are not of very uniform character and this latter would detract somewhat from its value for glass making. The higher the proportion of silicon the better would the quality of the sand be, so in the present case the percentage of silica is not all that could be desired.

Classified by the use of wire woven sieves the white sand gave the following result:-

	<u>Per cent</u>
Retained on 30 mesh sieve	0.40
"    "    40    "    "	1.80
"    "    60    "    "	31.50
"    "    80    "    "	33.55
"    "    100   "    "	14.10
"    "    120   "    "	5.80
Through 120 " "	12.00

By analysis the white sand gave the following composition.

No. 15 Sample

	<u>Per cent</u>
Silica	95.80
Ferric oxide	2.29
Alumina	0.31

Underlying the white sand in some instances is an ironstained sand of dark colour which might possibly be of use in concrete work where a white finish is not altogether necessary. An instance of this would be walls of a building which are afterwards to be covered with some other material.

UNDERGROUND WATER

It was suggested that a number of the test bores be put down to ascertain if enough underground water could be obtained to supply Kingston and Kingston Beach for household purposes. The hand boring plant used for the other boring would not be capable of boring through the sandstones in the area and such a proceeding could only be carried out by a power plant. A number of springs in the district were examined including two on the Glebe Reserve  $\frac{3}{4}$  of a mile from Kingston on the western side of the road to Margate. The most northerly of these springs has a fair run of clear water and according to the analysis given below is very suitable for drinking and any household use. This spring at the time of the investigation was flowing at the rate of 1,400 gallons per day.

The flow of the other springs could not be gauged as the actual source of the supply was not found.

On Mr. Tyndall's property one mile from Kingston on the left hand side of the main road to Hobart a spring of water was seen to be running at a rate of flow somewhat the same as the one gauged on the Glebe, and the water from this spring did not prove as suitable for drinking as the one referred to.

Other springs examined were, one each on Mr. Harrison's and Mr. Scown's properties, and one on the north eastern side of the hill half a mile south west of Kingston Beach.

The sources of supply of the first two of these springs could not be seen as it was impossible from a cursory examination to say whether they were running at the time or not.

The water from the last named spring is being used for household purposes by Lady Davis and Mr. Kurchas of Kingston Beach, but the complete rate of flow could not be gauged at the time. On the basis of 130 houses with an average of four persons to a house, at the peak period of the year, and allowing 100 gallons to each house the daily amount of water necessary for a supply would be 13,000 gallons.

If the six springs quoted all yielded a flow equal to the one gauged, 8,400 gallons per day would be the result, and would, therefore, be inadequate for the purpose.

A further supply might be obtained by boring but this would necessitate the use of a power drill after the style of the Victoria Drill used by this Department in boring for water in the Midlands.

The initial expense of installing pumping plants and storage reservoirs together with the necessary pipe lines for supplying the townships would be fairly considerable. Pumping costs would perhaps not be heavy as if electric power was used for the purpose and pumping carried out at night a minimum charge could possibly be arranged.

The analyses of the water tested are as follows:-

GLEBE

<u>Constituents</u>	<u>Grains per Gallon</u>
Chlorides	5.97
Sulphates	0.17
Total solids	14.00

TYNDALL'S PROPERTY

<u>Constituents</u>	<u>Grains per Gallon</u>
Sodium	3.94
Calcium	4.38
Magnesium	3.33
Iron and Alumina	Trace
Silica	3.50
Sulphates	2.47
Chlorine	6.06
Total solids	46.90

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10th May, 1927.