

TAMAR SANDSINTRODUCTION -

This report deals with all but one of the holdings of the Cementoid Silica Ltd. That not included has not yet been opened for investigation. It, however, belongs to the same member of the Launceston Basin Tertiary formation and is similar to the others in all essentials.

At the time of the official examination the Company had acquired a very large area near Beauty Point and the Deviot area. In addition to these W.A.T. Davies, on behalf of a Melbourne group holds an adjoining area near Beauty Point.

The descriptions that follow will be presented in the order of their importance and locality, thus:-

1. Cementoid Silica Ltd. holdings near Beauty Point.
2. W.A.T. Davie's holding adjoining No. 1.
3. Cementoid Silica Ltd. holding at Deviot.

LOCATION AND EXTENT -

The area included in the investigation comprises strips along the Western bank of Tamar River lying between Beauty Point and Deviot, a distance of ten miles. These strips vary in width at Deviot from $\frac{1}{4}$ to $\frac{1}{2}$ mile, and at Beauty Point from $\frac{1}{2}$ to $1\frac{1}{2}$ miles.

NATURE OF THE DEPOSITS -

The unconsolidated materials that build up these deposits consist of white quartz sand and gravel, and white clay. They are the products of washings of submerged materials by slow-moving waters. For that reason these beds of stoneless clay, fine evenly assorted beds of sands, and the thinner and rarer deposits of gravel and coarse sand are spread over a wide area.

These deposits belong to a member of the Launceston Basin Tertiary formation, and lie along the bank of Tamar River in the form of terraces. As such they mark the outline of the western side of the river prior to the last upward land movement, and represent a remnant only of deposits that extended at the time right across the valley floor. The land uplift brought about the rejuvenation of the river which with its tributaries, soon became entrenched in the old beds and swept away all but the terrace remnants now under investigation. The terraces therefore do not extend unbroken from one end of the field to the other, having been cut through to bedrock at many places by tributary streams.

The thicknesses of these sands, gravels, and clays have not been determined at many points. In their aggregate thickness they vary from 10 to 40 feet and are deeper (over 50 feet) at a few points. An average depth of 30 feet may be accepted for the Beauty Point deposits.

The large number of pits sunk into these deposits show very little variation in the nature of individual beds from point to point. At surface a few inches of peat rests directly upon white quartz sand made up of subangular to rounded well-assorted particles and containing very little clay or other cementing material and very little organic matter. It is in fact a remarkably clean sand consisting almost wholly of grains of quartz. Beds of sand of medium grain size are succeeded by fine sands and alternating coarse beds and gravel ($\frac{1}{2}$ inch diameter) and thin beds of white stoneless clay.

1. CEMENTOID SILICA LTD.

This Company is the successor of Cementoid Construction Company which was formed in 1926 for the primary purpose of quarrying sand and using it as the base in the manufacture of a number of articles of everyday domestic use. That, although likely to become a profitable avenue, would provide a market for a comparatively small proportion of the material. The great bulk of the sand and gravel, much too coarse for such use, will be marketed largely in Melbourne for construction purposes.

Cementoid Silica Ltd., has been formed to that end with the object first of purchasing a vessel for the purpose of transporting the sands and gravels in bulk from Beauty Point to Melbourne; second, of establishing depots in Melbourne for the wholesale supply and distribution of the materials and their products.

AREA, ETC.

This Company owns at Beauty Point 260 acres freehold and a mining lease of 25 acres. The quartz sand and gravel deposits extend over the greater part of each holding and have been proved to an average depth of 30 feet over an area of 160 acres.

Within the boundaries of the Beauty Point blocks therefore, the quantity of sand and gravel available amounts to 7,744,000 cubic yards.

TOPOGRAPHY IN RELATION TO EXCAVATION AND TRANSPORT.

A careful examination of the accompanying contour and feature plan, prepared from notes of surveys performed by the State Mining Engineer, shows clearly the position of the holdings in relation to the main highway and to the port of shipment.

The deposits, it will be noticed, lie between the 200 and 275 foot contours, the base being 160 feet higher than the mainroad. Moreover, the sand and gravel areas are situated between $\frac{3}{4}$ and $1\frac{1}{2}$ mile only from the wharf.

The ground rises sharply from the sea-board to the base of the deposits, therefore the conditions for excavating and transporting the materials may be regarded as particularly favourable. Furthermore, the contour interval between the base and the level of the river front is such as to allow of ample space for gravity transport to and treatment through washing and screening plants.

Lying so high above river level mechanical aids to drainage will not be necessary.

TEXTURE.

One of the most important features of a sand is its grainsize, or as it is termed, its texture. The texture is determined as follows:-

A 100-grain sample is passed through a series of screens, the material retained on each screen being collected, weighed, and noted. Since the sample weighs 100 grains, the weight in grains recorded as retained on the screen is the percentage retained on the screen. The cumulative percentage of all material that would be retained on any given screen as if that screen alone were used can readily be determined. In order to gain an idea of the relative fineness or texture and to be able to express this in one figure, the average fineness of the sample is calculated as follows:-

The percentage of material passing through each screen and retained on the next smaller is multiplied by the mesh of the screen passed through. The results obtained are totalled and divided by 100, the resultant being the average fineness. In other words if all the grains of a sample were brought to one average size they would just pass through a screen whose mesh was equal to the average fineness of the sample:-

(For Granulometric Analysis see next sheet)

GRANULOMETRIC ANALYSIS.

Sample No.	87B		2125		2129		2133		13 to 17	
Condition	Unwashed		Unwashed		Unwashed		Unwashed			
Mesh	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per cent.
Retained in 10	0.73	0.73	18.45	18.45	11.00	11.00	32.30	32.30	21.55	21.55
" 20	0.69	1.42	19.70	38.15	32.20	43.20	31.60	63.90	30.90	52.45
" 30	0.80	2.22	10.45	48.60	26.55	69.75	15.20	79.10	17.20	69.65
" 40	0.89	3.11	5.25	53.85	9.10	78.85	5.15	84.25	6.15	75.80
" 60	32.20	35.31	16.55	70.40	8.60	81.45	4.60	88.85	7.60	83.40
" 80	44.52	79.83	14.65	85.05	3.75	91.20	3.30	92.15	6.70	90.10
" 100	53.57	133.40	4.65	89.70	2.05	93.25	1.70	93.85	2.75	92.85
" 120	59.45	192.85	2.15	91.85	1.30	94.55	0.75	94.60	1.40	94.25
Through 120	8.99	201.84	8.15	100.00	5.45	100.00	5.40	100.00	5.75	100.00
Average fineness	62.85		34.97		26.54		20.47		26.34	

SAMPLE NO.	6 to 10		11 to 15		1 to 5		16 to 20		21 to 25			
Condition	Unwashed		Unwashed		Unwashed		Unwashed		Unwashed		Unwashed	
Mesh	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per Cent	Per Cent	Cumulative Per Cent.
Retained in 10	27.80	27.80	24.70	24.70	31.80	31.80	20.60	20.60	28.95	28.95		
" " 20	21.35	49.15	24.20	48.90	16.00	47.80	19.15	39.75	22.85	51.80		
" " 30	9.05	58.20	10.90	59.80	6.50	54.30	11.00	50.75	10.15	61.95		
" " 40	3.00	61.20	3.85	63.65	2.35	56.65	4.35	55.10	3.05	65.00		
" " 60	8.35	69.55	9.60	73.25	7.45	64.10	9.45	64.55	7.40	72.40		
" " 80	11.05	80.60	9.05	82.30	13.05	77.15	12.00	76.55	9.50	81.90		
" " 100	5.05	85.65	3.90	86.20	6.75	83.90	6.60	83.15	4.85	86.75		
" " 120	3.00	88.65	1.55	87.75	3.25	87.15	2.40	85.55	1.70	88.45		
Passed through 120	11.35	100.00	12.25	100.00	12.85	100.00	14.45	100.00	11.55	100.00		
Average fineness	35.75		34.64		38.92		41.63		33.63			

TABLE OF ANALYSES

Registered Number	Texture of Sand	Remarks	Silica	Ferric Oxide	Alumina	Lime	Magnesia	Potash Soda	Ignition Loss
87C	Coarse to fine	Unwashed	95.60	1.79	0.49	Nil.	0.07		0.32
87B	Fine	Before washing	96.32	1.03	1.32	Nil.	0.07		0.36)
		After washing	96.40	1.36	0.64	"	0.07		0.36)

The granulometric tests, appearing in the foregoing tables, convey a fair idea of the range in texture of the material, and the table of analyses shows that it consists almost wholly of grains of quartz.

THE CLASSES OF SAND AND GRAVEL.

The Company has classified the sands and gravels for convenience of description into five grades. Although such classification may be regarded as arbitrary, it serves the purpose and may be followed here without prejudices:

- No. 1. Bed, the top soil or overburden.
- No. 2. " fine sand suitable for finishing work.
- No. 3. " sand suitable for building construction.
- No. 4. " gravel of medium grain.
- No. 5. " coarse gravel.

No. 1 is a dark sandy soil 12 to 18 inches thick containing much vegetable matter. This cover bed will be stripped, removed and dumped in order to prevent contamination of the underlying beds.

No. 2 is a fine white quartz sand of excellent quality, almost free of salt and of vegetable matter, adapted to external and internal finishing work of every kind. It is claimed that when gauged with lime, putty, plaster or cement a decided saving in materials can be effected producing at the same time a hard uniform smooth finish. It may find application also in the manufacture of fibrous plaster sheets for internal finish and decoration; and for fibrous cement sheets for external covering, either in sheets for walls, or for tiles and slates for gable or for roofing purposes.

No. 3 makes a good, clean ingredient of strong mortar for brickwork, and is a good sand for all forms of plastering.

Nos. 2 and 3 mixed together produce a strong weatherproof tile of clean and smooth and of uniform finish and colour.

No. 4 can be used for the same purpose as No. 5, and as well makes a lasting gravel path. Mixed with tar a durable asphalt can be made for use in forming footpaths and in other works of a like nature.

No. 5 is a suitable gravel for all forms of concrete and is specially adapted for building construction.

DAVIES REPORT

Adjoining on the north side Cementoid Silica Ltd.'s properties near Beauty Point are the holdings of W.A.T. Davies. The sands and gravels on these holdings are similar in all essential particulars to those just described, of which they are actually the northern continuation.

These deposits have been opened in pits, trenches and cuts and shipments of the ungraded materials have been sent to Melbourne.

The full depth has nowhere been determined, but they may be regarded as of 30-foot average depth. In the faces are shown fine and coarse sands and gravels to depths of 10 to 15 feet. The grit particles are generally of pea size, but occasional pebbles of half-inch diameter are found.

The coarser grits are separated by bands of fine sands, slightly ironstained, consisting largely of vitreous, subangular quartz with very little interstitial feldspathic material. These beds are so compacted that the roots of shrubs have penetrated a few inches only.

Sample 87C is representative of the composition of the sands of main quarry:

Silica	-	95.60	per cent
Ferric oxide	-	1.79	" "
Alumina	-	0.49	" "
Lime		Nil	
Magnesia	-	0.07	" "
Organic matter etc.	-	0.32	" "

The analysis reveals a sand of excellent quality.

Although undoubtedly these properties hold a large reserve of sand and gravel of that grade and quality, sufficient data are not available to attempt an estimate.

All conditions for mining and transporting combine to make this a valuable reserve.

DEVIOT DEPOSITS.

AREA, SITUATION, ETC. -

These deposits are confined within the boundaries of two properties, both of which are owned by Major Room, an orchardist of Deviot. One is of 16 acres, the other of 35 acres.

The deposits lie along the river front on the hillside and hilltop from one quarter to three-quarters of a mile from the jetty. Roads lead to Deviot jetty from both sides. It is reported that the depth of water off Deviot Jetty is never less than seven fathoms and never greater than fourteen fathoms, and that no obstacle lies in the way of navigation.

NATURE OF THE SANDS -

The sands lie close to surface undercover of peat six to nine inches thick, and are made up of fine to coarse grains of vitreous subangular to rounded quartz with a very little feldspathic interstitial material. As a rule the particles are clean white and loosely compacted, but at some points a few feet below surface consolidation has set in and at a few the grains are cemented. The compacted sands disintegrate readily after exposure.

In places, Knight's Quarry for instance, oxide of iron, leaching from nearby diabase hills, firmly cements the sand grains and there also the proportion of clayey material is much higher.

COMPOSITION -

A perusal of the sub-joined table will show that the sand contains only 2 to 3 per cent. of ferric oxide and alumina, no trace of lime and traces only of magnesia. Washing treatment improved the quality of the material but little, and showed that such preliminary dressing before marketing would not be necessary:-

(for table see next page).

Registered Number	Texture of Sand	Remarks	Silica	Ferric Oxide	Alumina	Lime	Magnesia	Ignition Loss
358	Coarse	Before washing	95.88	1.08	2.08	nil	trace	0.16
		After "	97.28	0.94	0.98	"	"	0.04
359	Medium	Before washing	96.80	0.96	1.40	nil	trace	0.24
		After "	97.36	1.28	0.40	"	"	0.10
360	Coarse } to fine }	Before washing	96.64	1.56	1.64	nil	trace	0.12
		After "	96.88	1.36	0.84	"	"	0.10
87A	fine	Before washing	95.84	1.86	0.46	nil	0.07	0.28
		After "	96.00	1.86	0.34	"	0.07	0.26

Sample 358 was taken from the dump of a pit at the summit of the hill. 87A is a general sample of sand taken from a number of dumps at pithead to get an idea of the average quality of the finer material. Numbers 359 and 360 are representative of the material opened in two pits on the 35 acre lot.

GRANULOMETRIC ANALYSIS									
Sample No.	360			359			358		
Mesh	Per cent	Cumulative %	Per Cent.	Per Cent.	Cumulative %	Per Cent.	Per Cent.	Cumulative %	Per Cent.
Retained on 10	36.8	36.8	17.2	17.2	17.2	1.76	50.0	1.76	50.0
" 20	22.5	59.3	12.2	12.2	29.4	2.61	23.2	4.37	73.2
" 30	6.7	66.0	6.5	6.5	35.9	2.61	12.4	6.98	85.6
" 40	2.0	68.0	2.9	2.9	38.8	3.46	2.0	9.44	87.6
" 60	6.4	74.4	15.2	15.2	54.0	18.73	1.36	28.17	89.96
" 80	9.1	83.5	22.8	22.8	76.8	38.52	3.4	66.69	93.36
" 100	1.9	85.4	2.0	2.0	78.8	4.58	0.76	71.27	94.12
" 120	4.8	90.2	11.0	11.0	89.8	16.47	2.0	87.74	96.12
" 200	9.2	99.4	9.6	9.6	99.4	12.21	3.88	99.95	100.00
Average Fineness	45.72		67.23			60.61			28.96

The granulometric analysis shows material of a fairly wide range. These samples were taken from pits only 5 to 10 feet deep. However, the bulk of the material proved of late in deeper holes shows no greater variation.

EXTENT AND QUANTITY OF SAND AVAILABLE.

It is estimated as a result of the tests made by sinking pits and boring that half (25) of the total area (51 acres) contains sand and gravel deposits of similar nature to those of Beauty Point, and that the average proved depth here is 15 feet. Doubtless the aggregate thickness of the beds is much greater, but that has not been determined.

On the basis of the data available, it is estimated that the area contains 605,000 cubic yards of material.

WORKING AND TRANSPORTING CONDITIONS.

Lying between the 250 and 325 foot contours fringing the water-front, and close to Deviot jetty, the facilities for economic excavation and handling are very good. Gravity lines to the jetty can be provided thus obviating the necessity for the provision of power.

PRACTICAL TESTS.

Parcels of sand have been tested by the Company at their Melbourne works with the following results:-

No. 2 Finishing Sand: for external cement finish gauged in the proportion of 6 of sand to 1 of cement produced a clean, hard, weatherproof finish, and showed a saving of 25 per cent on present methods; for internal finish the fine sharp nature of the sand enables it to be used in the very best finishing work. (1 of sand to 3 of lime putty makes a hard smooth finish. With Melbourne sands the proportions are 1 of sand to 9 of lime putty. It is estimated that by the use of No. 2 fine sand a general saving of 33 per cent can be effected).

Again, it may be stated that owing to the difficulty in obtaining suitable finishing sand in Melbourne the ordinary white finish is now secured by gauging lime putty and plaster together. No. 2 finishing sand gauged in the proportions of 1 of sand to 2 of lime putty and plaster makes a strong white even finish with a saving of 33 per cent.

Plaster and No. 2 Finishing Sand, gauged in the proportion of 1 of sand to 2 of plaster makes a hard white finish suitable for dwellings, etc. and effects a saving of 33 per cent as compared with local materials of a like nature.

Victor Hard Cement and No. 2 Finishing Sand gauged in the proportion of 1 of sand to 1 of cement produces a hard glazed polished surface and makes a good substitute for tiles at one-tenth the cost. This finish can be washed down in a similar manner to tiles without injury to the surface. By the addition of sand to Victor Hard Cement a large saving can be effected. For example, one bag of Victor Hard Cement costing 10/- covers 20 square yards and by adding the same quantity of finishing sand (2/6) the covering power is doubled, thus effecting a saving of 75 per cent on material.

Polished Cement gauged in the proportion of 2 of sand to 1 of cement makes a hard-wearing durable polished surface superior to that gained by using neat cement, the addition of finishing sand preventing the cracking that takes place when neat cement is used.

No. 3 Medium or general Building Sand is of high grade.

No. 5 Rough Cast Sand produces a beautiful artistic finish and is economical.

Nos 4 and 5, in addition to the other uses mentioned go to make a good strong concrete in the proportions of 8 of sand to 1 of cement.

It would not be out of place to state here that the foundations of the large buildings and machinery at the Tasmania Gold Mine, Beaconsfield, are composed of gravel 8 parts, cement 1 part. This concrete has withstood without fracture the severe strains resulting from the fibrations of the heavy machinery.

The following is a summary of tests performed at the Laboratory of the University of Melbourne:-

TENSILE BREAKING LOADS OF BRIQUETTES (BRITISH STANDARD).

Neat Cement	3 of Standard Sand to 1 of Cement	3 of Cementoid Sand to 1 of Cement
Aged 7 days, average 427 lbs. per square inch.	Aged 7 days, average 327 lbs. per square inch.	No.2 Sample, aged 7 days, average 327 lbs. per square inch. No.3 Sample, aged 7 days, average 605 lbs. per square inch. No.4 Sample, aged 7 days, average 486 lbs. per square inch.
Aged 28 days, average 568 lbs. per square inch.	Aged 28 days, average 392 lbs. per square inch.	No.2 Sample, aged 28 days, average 583 lbs. per square inch. No.3 Sample, aged 28 days, average 691 lbs. per square inch. No.4 Sample, aged 28 days, average 639 lbs. per square inch.
	<u>GRAND AVERAGE</u>	
Aged 7 days, 427 lbs. per square inch.	Aged 7 days, 327 lbs. per square inch	Aged 7 days, 427-2/3 lbs. per square inch.
Aged 28 days, 568 lbs. per square inch.	" 28 " 392 " " " "	" 28 " 637-2/3 lbs. " " "

126
154
151

The value and strength of these sands will be realised after a perusal of the certificates, which prove that they produce a building material stronger even than neat cement.

PREPARATION FOR MARKET.

These deposits of sand and gravel are found generally in distinct layers showing little variation from point to point. Thus occur layers of sand, layers of gravel, and layers of mixed sand and gravel. In many cases this natural assorting enables the operator to work each layer separately and obviate in part the necessity for classifying the material. Although the materials may be shipped in bulk and applied directly to construction and certain manufacturing uses, it is certain that treatment before application would greatly enhance the value of each grade. The costs of screening, classifying and washing would not add much to the total cost of production.

MARKETS AND VALUE OF THE SANDS AND GRAVELS.

It is stated that the Melbourne consumption of sands and gravels amounts to 25,000 tons a week. The Company cannot expect to gain hold of this market no matter how superior their products be, without encountering strong and sustained opposition. However, a fair proportion will inevitably find a market there if the materials can be delivered at a reasonable figure.

It is possible to find a market for certain grades in Sydney where the demand is increasing year by year.

The Company claims that an almost unlimited market is available at prices ranging from ten shillings per ton for ungraded to sixty shillings per ton for fine and graded materials. At those figures the aggregate values assume very large amounts.

Small lots for special purposes can be sold up to six pounds per ton delivered in Melbourne.

UTILIZATION.

The study of the sands available in the district and the results of tests made on the samples collected have already been referred to in a previous section. From these results it is clear that the sands are eminently suited for use in all classes of construction and for many articles of manufacture. The various uses to which the Company intend putting this material are stated in their prospectus as follows:-

1. to manufacture weather and fire proof material for external and internal sheeting, roofing tiles, ridging, shingles, slates, air bricks, chimneys, hearths, wash troughs, lintels for doors and window heads, sills for doors and window openings, bricks (solid and hollow) for house and factory construction, piles for piers, bridges, etc., poles for electric and telegraphic wires, and for internal and external finishings of buildings.
2. to provide impervious material for the construction of concrete houses;
3. to prepare material for city footpaths, drainage pipes, channel crossings, etc.

Some of the sands may be used for glass making, especially those of very high silica content and of medium grainsize. The better the sand for this purpose the higher the proportion of silica. Objectionable impurities are compounds of iron, lime, alumina, magnesia and alkalies. Iron oxide imparts to glass a green, yellow, or red colour, the intensity varying with the amount of the impurity. Alumina tends to decrease the transparency of glass and increase the fusion point. Magnesia also raises the fusion point of the charge, but lime in small amount is not very injurious. Organic matter colours the glass a dark amber.

In general the samples taken indicate an excess of alumina and ferric oxide for glass making, but for bottle glass the finer sands are suitable.

While considerable latitude is allowable in size of grain in good class sand, uniformity is desirable. Grains larger than 14-mesh are harder to melt than the rest of the batch on charge and combining too slowly with the fluxing ingredients cause stringing of the glass. Summarising, a sand for glass manufacture should be one of uniform grain, medium fineness, as high in silica as possible, and should be almost free of iron and other impurities.

Sands from these deposits have been used with success in Launceston foundries for moulds of castings.

Of their miscellaneous applications it may be stated that articles for household use have been manufactured of these sands with the addition of other necessary ingredients.

SUMMARY.

These very extensive deposits of quartz, sand and gravel of high quality and even grain, are so situated as to allow of cheap excavation and transport, and if handled on a large scale should add greatly to the prosperity of the district. The reserve already proved is sufficient to warrant the necessary expenditure upon lines of transport if a market for 10,000 tons per week can be secured.

Deep water ports at Beauty Point and Deviot provide facilities for shipping, and ample accommodation for workmen can be obtained at Beaconsfield. All local conditions are therefore favourable. The one outstanding difficulty is that of transport cost between Beauty Point or Deviot and Melbourne. In order to reduce the cost to a minimum, it is proposed by Cementoid Silica Ltd., to purchase a 5000 ton steamship for that service.

The Company claims that owing to the peculiar qualities of the material concrete buildings, especially city structures, can be erected cheaper with it than with any other class of material now in use, bringing into prominence at the same time qualities of durability and beauty of finish.

A. McIntosh Reid,
DIRECTOR OF MINES.

11/3/29.