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BAUXITE AT OUSE AND CAMPBELL TOWN

The testing of bauxite deposits in Tasmania was undertaken with the objective of proving the existence of a minimum commerical quantity of ore, and establishing the average grade thereof by systematic sampling. This purpose has now been achieved as regards one area at Ouse, and, in addition, a considerable amount of scout prospecting work has been carried out in the same district and in the vicinity of Campbell Town. The following statement of the results obtained during this work is preceded by a brief discussion of the nature and origin of the bauxite.

The physical characteristics of the known bauxitic formations of Tasmania differ widely in the various localities, but the geological associations are markedly similar and there is every reason to believe that the deposits belong to the one epoch, and that they have been derived by similar processes. No detailed petrological work has yet been carried out, but the originally stated view that the bauxite had originated from the decomposition in situ of volcanic tuff accumulations is considered sound.

At Ouse, the bauxite is generally preserved in basinal depressions in diabase (dolerite). Apparent bedding planes may be seen in many of the prospecting shafts and there is a strong probability that the majority of the material dips prevailing both in the bauxite and in the overlying Tertiary sediments.

At Campbell Town, water sorting was less prevalent and as the deposits are generally flat lying, or possessed of low dips corresponding with a surface of flowage, there is no evidence of recent faulting. The outcrops broadly comprise a series of flat topped ridges with substantially the same trend as the present valley system. Other similar "flat tops" in the district are capped by "Newer Basalt", and there appears to be a strong analogy between the two types of formation.

In both localities the bauxite is considered to represent the remnants of an early Tertiary volcanic phase, which was succeeded, or perhaps accompanied, by the deposition of sands and clays with isolated areas of lignite. The series in the Ouse district was subsequently covered by extensive flows of Newer Basalt which filled the river valleys, and still cap much of the surrounding high land. At Campbell Town basalt also covered large areas and in all probability extended over the bauxite ridges.

As far as has been observed, the alternational processes bringing about the desilication of the parent material have been less effective in the Campbell Town area, particularly as regards the vertical extent of the resultant bauxite. At Campbell Town there also appears to have been a more general tendenny for the leached iron to be re-precipitated in the immediate vicinity, and this has resulted, over the bulk of the deposits, in the nonsiliceous produce being an intimate mixture of hydroxides of iron and aluminium, the

iron frequently being dominant.

This fact was not at first evident as the original surface samples were most encouraging, one reaching the grade of 51.3% Al_2O_3, 1.76% SiO_2, 15.87% Fe_2O_3, 1.6% TiO_2 and 27.72% ignition loss. Several other samples were almost as good, and similar material may still be picked up along the surfaces of some of the "flat tops". Sub-surface sampling, for the most part, revealed ore of a much lower grade, the soild formation being richer in iron and poorer in aluminium, although the silica percentage was found to be similarly low in both cases.

One type of enrichment in alumina may be illustrated by the section of Shaft No. 8 at Meadowbank, where sample No. CC18 returned 36.2% of alumina and 6.2% of silica by the caustic soda method. The ore in this section consists of hard nodules in a softer, tougher matrix. Selecting the hard nodules only, the assay result improved to 51.0% of alumina and 1.1% of silica. These nodules are apparently concretionary and have probably been deposited from colloidal solution about neuclei in the partially altered parent rock. The nodules themselves are fine grained, hard and brittle. Similar material also occurs in bands close to the surface, with little or no matrix, but under these circumstances there is usually a much higher proportion of ferric oxide and a lower alumina content. Substantial quantities of this ore could be isolated in bands up to 6 feet in thickness, but the average alumina content would probably not exceed 35%.

In zones of more complete alteration the distinction between matrix and nodules practically disappears, and the whole rock becomes a mottled heterogeneous mass, often quite friable and rotten. This is typically the best ore and provided the material of the higher grade surface samples, but it has only been located in narrow bands of limited areal extent. It is characterized by patches and cavity linings of pale green to iron-stained gibbsite, often exhibiting mammillary structure. Thin seams of limonite are common and small pockets of kaolin also occur. The outlines of large felspar crystals are sometimes perfectly preserved, and recognisable fragments of basalt leave little doubt as to the origin of the material.

Typical ore of the Ouse district, by contrast, is much more constant in texture, particularly in the deeper parts of the basins. There is frequently an iron-rich zone close to the surface where rhythmic precipitation has produced pronounced pisolitic structures. The pisolites may carry alumina in excess of ferric oxide and sometimes comprise first grade ore. At its base the bauxite usually rests on a thin band of clay which, in turn, overlies the partially decomposed diabase. The bottom layer of the bauxitic formation commonly carries a second concentration of iron, usually impregnating dense, finely grained ore. The iron also accumulates as thin inter-stratified bands of limonite, and, more rarely, as hematite. It appears to have been deposited from stagnant solutions trapped by the impervious clay band. The bulk of the commercial ore lies between these two iron-rich zones, and is generally fairly uniform in texture, and grade, but carries

nodules showing the concentric precipitation of iron outwards from a more or less completely leached centre.

The normal type of bauxite formation at Ouse may be described as a lenticular ore-body, often contaminated with clay at the fringes, but relatively homogeneous as regards the central portions. At Campbell Town the ore of commerical grade occurs as small lenses in formations which, in bulk, carry too much iron and too much silica to be regarded as bauxite.

Many and varied suggestions have been made as to the chemical processes by which silicate minerals can yield the hydroxides of aluminium and iron as a more or less silica-free residue, or as a stransported deposit. It is generally agreed that carbonic acid and other solutions from decaying vegetable matter are active solvents of both iron and silica. At Ouse, lignitic formations occur in the overlying sedimentaries in close proximty to the bauxite, and it is feasible that, during the laying down of these lignites, conditions prevailed whereby decomposing solutions could have ready access to the waterlogged and porous volcanic tuff accumulations.

The iron and silica thus taken into solution would be transported as hydrosols and precipated when circumstances became favourable. The ferric oxide would precipitate more readily than the silica, particularly if precipitation were dependent on the presence of electrolytes. This would explain the large proportion of the original iron content retained in the immediate vicinity of the bauxitic formations, as compared with the more complete removal of silica. It also provides a reasonable explanation for the frequent concretions of limonite found in the Tertiary sands immediately overlying the bauxite at Ouse.

The following criteria are suggested as having controlled the formation of the Tasmanian bauxites, and may be invoked to account for the wide variations observed both in the depth and in the fluctuating alumina, ferric oxide and silica contents of the various deposits:

1) The nature of the original material, particularly as regards its chemical composition, its thickness, and its permeability to solutions.

2) The presence of active solutions, such as those from decomposing vegetable matter.

3) Conditions of drainage and their effect on the transport and precipitation of materials in solution.

4) Climatic influences, including the alteration of seaons.

OUSE DISTRICT

Since my report on 23rd October, 1941, a considerable amount of prospecting work has been carried out on the Gladfield and Lachlan Vale areas. In all 1,206 feet of prospect shafting has been completed and the bauxite intersected has been channel smaples in lengths of five feet or less at approximately one pound weight of sample per foot of channel

Appendix No. 1 sets out in schedule form the formations passed through in each shaft. Since these are mainly weathered rock in various stages of alteration, it has not been practicable to use precise petrological terminology. Instand, an attempt has been made to describe the material so that it may be recognised on inspection. After considerable experience in sampling the bauxite at Ouse, it has been found that a reasonabel estimate of grade can usually be made from the appearance and texture of the clean rock as exposed in a shaft wall. Unfortunately this does not apply to nearly the same degree in the Campbell Town area.

The appendix also given the assay returns from the appropriate sections. Unless specifically stated to the contrary the sample channel in each case was cut straight down the wall of the shaft over the interval indicated, clay and other impurities being included in the sample.

All assay figures, unless otherwise stated, refer to determinations of "free" values by the caustic soda method, these being specified as "compounds soluble in 10% caustic soda solution digested at a gentle boil for three hours, one hundred cubic centimetres of solution being utilized for one gram of sample. Iron and titanium are not taken into solution. Spun iron crucibles are used for digestion to allow of the estimation of "free silica". Apparatus is used to prevent the alteration of original volumes of digestion solutions by condensation of steam".

In cases in which the silica content of the ore is low, the "free" values are usually found to be only slightly lower than those arrived at by total analysis. For example, a group of twelve samples of similar ore averaged 41.42% of "free" alumina with 2.14% of silica. A composite sample was then made up and analysed, the result being Al_2O_3 41.83, SiO_2 3.24, Fe_2O_3 27.86, TiO_2 2.15, MnO 0.04, P_2O_5 0.20, ignition loss 24.14. Where the silica content is higher there is a wider variation in the values obtained by the two methods as may be seen from the following comparative results:

No. S20-	Al_2O_3 44.28,	SiO_2 3.56	..	..	..	..	"Free"
No. S20-	Al_2O_3 46.48,	SiO_2 5.42,	Fe_2O_3 22.20,	TiO_2 1.88	"Total"
No. C14-	Al_2O_3 45.87,	SiO_2 6.27	..	..	..	..	"Free"
No. c14-	Al_2O_3 49.28,	SiO_2 10.43.	Fe_2O_3 12.43,	TiO_2 1.73	"Total"

Gladfield Area:

The majority of the work at Ouse has been carried out on Area No. 2 on Gladfield Estate. In this area the basinal structure is most pronounced, and parts of the outcrop within the originally surveyed boundary were found to have the nature of fringes in which the bauxite occurs as thin layers, usually pisolitic in texture and passing in two or three feet to interbedded seams of bauxite and clay. In the more central parts of the basin the ore proved to be substantially free from clay, the few seams encountered being attributable to meteoric waters depositing suspending material in fissures.

Several shafts have been sunk well below the base of the commercial ore, and in some cases it is practicable to identify the wall rock, with reasonable certainty, as partially decomposed diabase. It is also easy to determine the base of the normal bauxite which, as has been mentioned previously, frequently terminates in an iron-rich zone overlying a clay band. Between the recognisable bauxite and the recognisable diabase there is a zone of varying vertical extent comprising material which is essentially too siliceous to be called bauxite, but which may contain interlaminated bands of bauxite and clay. The actual transition point from the volcanic rock, with its associated clays, to the diabase is usually indeterminate, and the boundary shown on the sections is to be regarded only as a probable mean psotion.

No shaft has yet penetrated normal unweathered diabase, although in some cases this may be seen to practically surround the depression in which the bauxite is preserved. From this it is inferred that the solutions responsible for breaking down the silicate minerals of the basaltic tuff also attacked the underlying diabase with, as would be expected, much less efficacy.

When the variable nature of the borders of Area No. 2 became apparent, it was decided to prove by shafting a block of half a million tone of ore taking in the central portions of the area and omitting the greater part of the fringes. This work has been completed and the selected area is deliniated on the grid plan. Sections through the area showing the form assumed for calculation purposes have been prepared, and there are also detailed sections to a larger scale of the individual shafts showing the assay value and texture of each stratum of ore.

In calculating the gross ore content of this zone at 500,000 long tons a conversion factor of 1.6 tons per cubic yard has been used. This figure was originally arrived at by rough displacement and weighing tests. It has since been confirmed by weighing the ore from a measured cubic yard, and while it is not put forward as an exact figure, it could probably only be improved upon by bulk weighing from measured excavations. No allowance has been made for the superficial moisture content, which is variable and may lie between ten and twelve per cent. To obtain 500,000 tons on a "mined and dried" basis, it would,

therefore, be necessary to include more of the fringe areas in the selected block.

In shafts on the area at present adopted, 81 individual samples of commercial grade ore were cut from 344 feet if sample channel. These returned an average value per foot of sample of 41.2% "free" alumina and 3.2% "free" silica. Five of the samples, representing 24 feet of channel exceeded 46% of alumina and averaged 47.2% Al_2O_3 and 3.0% SiO_3 "free" to caustic soda. From this it is apparent that smaller quantities of higher grade ore could be made available by selective mining. The bulk average of 41.2% Al_2O_3 represents a quantity of ore that could be quarried exceedingly cheaply, and is considered to be a fair average figure for the deposit as a whole. From 44 total analyses of Ouse bauxite, the average content of titanium dioxide is set at 2.17%. Area No. 2 has an average surface gradient of a little less than 6 degrees with a natural getaway for drainage. The overburden is generally less than three feet and rarely exceeds six feet.

Prospecting work was suspended at the end of the financial year to permit of the preparation of plans and estimates and of a general assessment of the position. As far as the visible portion of Area No. 2 is concerned, the programme was completed and the selected objective tonnage was realized. In the event of further prospecting being considered desirable, the eastern edge of the area should be tested by deepening Shafts Nos. 49, 67, 69, 78 and 79, and by placing additional shafts further east at both ends of the deposit. If this work were to prove unproductive, attention could then be devoted to some of the other outcrops.

It should be noted that the shaft grid is not quite rectangular. This is due to a deviation in one of the first two lines of shafts to avoid the destruction of large trees. Subsequent lines were kept parallel to the original ones and the deviation, which is less than three degrees, is not sufficient to effect quantity calculations.

It is difficult to assess a tonnage rating for the portions of Area No. 2 outside the 500,000 tons zone. An extension of the bauxite into the unprospected areas at both ends of the eastern edge could materially improve the position, but the remainder of the fringe areas would be unlikely to provide more than 100,000 tons of ore, and the average grade of this would be somewhat lower than that of the dentral block. There are three other small areas on Gladfield, Nos. 3, 4 and 5, on which no work has been carried out. From the originally surveyed areas of outcrop, and with due regard to the conditions found to prevail on Area No. 2, the combined probable yield from these small patches is now placed at 75,000 tons.

Lachlan Vale Areal

Areas Nos. 10, 11, and 12 on Lachlan Vale Estate are the outcrops of formations dipping in an easterly direction at from 6 to 15 degrees, which is somewhat steeper

than the prevailing dips in the other areas. The bauxite also acquires cover more rapidly because the dip is opposed to the surface slope. Prospecting work has consisted of the sinking of six shafts at intervals along the outcrops, and a seventh was set back 125 feet to test the continuity of the formation. This shaft penetrated 20 feet of clay sand before reaching the capping, under which it passed through 14 feet of bauxite.

In considering the Lachlan Vale areas the two main difficulties encountered are the problem of the persistence or otherwise of the ore under overburden, and the high iron content met with in six out of the seven shafts. The average thickness of the normal formation as sampled was over 12 feet. Discarding the samples richest in iron the average thickness of ore was reduced to 10 feet with an average grade of 37.4% Al_2O_3 and 3.3% SiO_2 "free" to caustic soda. Of the fourteen samples from, which this average is made up, only three exceeded 40% of "free" alumina. This may be a reasonable indication of the true average grade of the area, or the limited number of shafts may have chanced to intersect ore either more or less rich in iron than the bulk of the deposit.

The evidence from these shafts confirm the depth factor of 10 feet used in the original calculations, and on this basis, working to an average of about 6 feet of overburden, the prospective ore is set down at approximately 250,000 tons. Beyond the range of observations, under heavy overburden, there may be a great deal more bauxite, but the ultimate quantity and quality of ore in this area are still speculative.

Lentwardine Area:

Areas Nos. 6, 7, 8 and 9 are situated on Lentwardine Estate and conform to the Gladfield type, rather than to that of Lachlan Vale, both in the nature and situation of the ore. With the exception of Area No. 7, the bauxite has a fairly uniform easterly dip coinciding with the surface slope, so that the overburden remains light throughout.

No further work has been carried out in this section and an estimation of tonnage is dependent on the apparent surface areas. With an assumed average depth of 9 feet, the probable quantity of ore is approximately 300,000 tons. The average grade should be a little better than at Lachlan Vale because excessive concentrations of iron are less evident, and the ore is more likely to be of a standard similar to that of Gladfield.

Glen Dhu Area:

The remaining surveyed outcrop is No. 1 on Glen Dhu Estate. Only one shaft was sunk of this area and ore of a poor grade was encountered. The area undoubtedly contains a considerable quantity of average ore, but the exposures are very variable and some of them are quite unattractive. For this reason a depth factor of only

4 feet is applied to the surveyed area of 48,000 square yards, giving a probable content of approximately 100,000 tons.

On this basis the proved and probable tonnages of the surveyed areas are set down as:-

Gladfield	675,000 tons
Lachlan Vale	250,000 tons
Lentwardine	300,000 tons
Glen Thu	100,000 tons

Of this total the half million tons block of proved ore on Gladfield is the dominating factor. Its average grade is fairly definitely known, and if such a grade of ore, coupled with cheap production costs, were to be regarded as satisfactory, many years' ore supply would be assured. During the working of this further prospecting of the other areas could be carried out, and the several deposits further afield could also be investigated.

These additional outcrops are so situated that their extent can be determined only by shaft sinking or boring.

1. Lawrenny Estate:

There is an outcrop of bauxite at the "Red Rocks", near Dunrobin Bridge. This is seen only as a section in the Derwent River cliffs, and the easterly dip revailing elsewhere would carry the formation back under the flat pasture land.

2. Lachlan Vale Estate:

In addition to the surveyed areas there is an outcrop in a cultivated paddock bordering the river flats about half a mile south of the wool shed.

3. Kenmere Estate:

A small outcrop breaks through Tertiary sands in a paddock about midway between the homestead and the new Tarraleah road.

4. Cleveland Estate:

A track, which leaves the new Tarraleah road at 7.2 miles from the West Coast road junction, runs northerly to a bauxite area about 1,100 yards away. The actual outcrop is approximately 6 chains by 4 chains, but the bauxite appears to pass under sands and clays, which in turn underlie basalt.

5. Father of Marbes:

This area is reached by an old saddle pad which commences at Black Bob's River, a quarter of a mile upstream from the new Tarraleah road bridge. The track heads northerly for about 3 miles to a water divide south

of the marshes. Here the bauxite occurs as a dipping formation overlying diabase and underlying basalt. The outcrop is indefinite and largely obscured by talus.

It is emphasised that, while the work so far carried out has proved the extent and quality of a useful block of ore and has given a valuable insight into the nature of the deposits, it has by no means exhausted the possibilities of the district. The aggregate importance of the unexplored deposits is at present indeterminate, but they are sufficiently widespread to encourage the belief that the potentialities of the district as a whole are not less than the originally claimed 2,000,000 tons.

CAMPBELL TOWN DISTRICT

Rosedale-Meadownbank Area:

Prospecting work in the Campbell Town area was commenced on a series of outcrops which extend for over a mile and a half across the boundary between Rosedale Estate and Meadownbank Estate, and are situated about three miles north-westerly from the township. The outcrops have a general north-west to south-east trend and are remarkably level for, from end to end, there is less than a foot difference in elevation between points recognisable as representing the top of the formation. The cross-fall is also negligible, although it is considered from the attitude of the diabase bed-rock that the south-westerly flank is the nearer to the margin of the volcanic accumulation from which the bauxite has been derived. This contention is supported by the presence of remnants of the formation occurring in an easterly direction, whereas to the west such traces are absent.

The formation was once continuous throughout its entire length, but erosion has broken it up into six outcrops with a total area of nearly 41 acres. Basal remnants continue on in a south-easterly direction, indicating that this was the longitudinal trend, and that the areas on Riccarton Estate, which lie about 2½ miles to the east, represent the easterly flank of the same formation.

The first work carried out consisted of the sinking of a group of seven well spaced shafts on the Rosedale, or north-western end. These were all bottomed in clayey formation, which was reached at various depths, as may be seen from Appendix No. 2, which gives full details of the shaft sections with the relevant assay determinations. The results generally were disappointing and indicated, as has already been explained, that even in material with as little as 2% of "free" silica, the alumina content is often quite low and is frequently subordinate to that of ferric oxide.

The best result from this group was obtained in Shaft No. 7, where a 30 inch sample, analysed by the usual caustic-soda method, reached the grade of 49.0% Al_2O_3

and 1.9% SiO_2. The next two feet of ore deteriorated to 39.4% Al_2O_3 and 6.3% SiO_2, below which the formation became too clayey to be regarded as bauxite. Shaft No. 6 is only 260 feet away, and is similarly situated as regards surface indications, but failed to intersect any ore that could be termed commercial bauxite.

Shaft No. 5 cut through 7 feet of material averaging 33.3% Al_2O_3 and 2.8% SiO_2. In No. 4, four feet of bauxite returned 44.7% Al_2O_3 and 3.7% SiO_2, but the remaining shafts failed to reveal any useful formation except an 18 inch band in Shaft No. 2 which returned 36.6% Al_2O_3 and 2.3% SiO_2.

These shafts proved the existence of bauxite of similar quality to that selected in the higher grade surface samples, but they also indicated that such ore is only to be found in relatively thin layers. The inconstancy of these layers is demonstrated by the fact that it is impracticable to connect them up from shaft to shaft.

Two additional shafts, Nos. 20 and 21, were subsequently sunk on the most northerly outcrop on Rosedale. These shafts are apparently similarly situated and passed through corresponding strata. They are only 119 feet apart, but as was the case with Nos. 6 and 7, one shaft met good ore and the other showed a reversal in the relative proportions of alumina and ferric oxide, the average grade falling from 44% Al_2O_3 to 33% Al_2O_3. The silica was low in both cases.

The north-westerly tip of the formation grades over a vertical interval of 60 feet from bauxite to weathered vesicular basalt, to decomposed volcanic tuff, to decomposed diabase and finally to fresh diabase. Samples were broken representing the various stages and the detailed petrology of the section will be undertaken as soon as opportunity offers.

On the Meadowbank end, shaft sinking met with similar results. The first batch of 12 well spaced shafts failed to intersect any first grade ore that could be channel sampled. Samples exceeding 50% Al_2O_3 may be selected from some of the shafts and from surface outcrops, but this grade of material was not encountered in a massive formation.

It was then decided to sink a group of shafts at 25 feet intervals in an endeavour to isolate a definite area of solid bauxite. These shafts were set out on the strongest part of the formation and in an area where surface material of a 50% Al_2O_3 grade could be obtained. The 20 shafts in this group are designed by letters instead of numbers. No shaft was carried beyond 9 feet in depth so that a full section is not disclosed.

Only one shaft encountered ore containing more than 40% Al_2O_3, and the 14 samples cut averaged 34.5% Al_2O_3 and 1.5% SiO_2. The shafts were not completed to

sufficient depths to enable a reliable estimate to be made of the extent of this class of material, but to a depth of 9 feet it would not exceed 3 feet in average thickness.

Shafts Nos. 22 and 23 were sunk on Outcrop Area No. 8, near the abbutal of Meadowbank on the main Hobart-Launceston area. A surface sample from the actual outcrop assayed 40.16% Al_2O_3 and 2.28% SiO_2, but the two shafts, which were 100 feet apart and located only a few feet from the outcrop, both reached a depth of 8 feet without meeting solid ore.

The summarized position as regards the Rosedale-Meadowbank area is that, although 50% Al_2O_3 ore exists in small pockets, a reasonably thorough shafting campaign has failed to locate either ore of this class, or any ore in excess of 40% "free" Al_2O_3, in quantities adapted to bulk mining methods. Ore of good quality could be won in small quantities by exploiting the higher grade patches. This would required extensive prospecting, and careful, competent supervision of the actual extraction as the grade varies quickly with remarkably little change in the appearance of the formation.

There is also a possibility that in some parts the higher grade nodules could be separated from the more siliceous matrix, but since the nodules commonly comprise less than 20% of thw whole, this also would be an expensive and laborious method of obtaining ore.

Riccarton Area:

The Riccarton deposits lie immediately to the north and east of the Campbell Rown boundary. The outcrops have a general flat westerly to south westerly dip, but there are many isolated variations. For example, the southern flank of Area No. 13 dips a little to the west of north at 10 degrees, while the northern flank of the adjoining area has a pronounced southerly dip. These local variations in dip are suggestive either of small basinal structures or of slumping, such as occurs in the partially consolidated surface of a lava flow when there is a delayed withdrawal of molten material from below. Since basalt is known to occur beneath the bauxite in the Rosedale-Meadowbank area, and since the intervening country was once an extensive lava field, the latter explanation appears the more probable.

Surface material in the solid parts of the Riccarton outcrops has a strongly developed pisolitic structure and is obviously highly ferruginous. Prospect shafting was limited to opening up a few faces to test the grade of the ore, the hard capping of which proved to be richer in iron than that of the Rosedale-Meadowbank areas, while the underlying softer ore is apparently similar in both cases. Samples representative of the two classes of ore were cut from Shaft No. 1 on Area No. 14. These returned 32.2% Al_2O_3, 1.2% SiO_2 (pisolitic capping) and

37.1% Al_2O_3, 2.1% SiO_2 (soft ore) respectively). Check analyses were then made and the corresponding total values were shown to be:-

Capping - Al_2O_3 34.59%, SiO_2 1.75%, Fe_2O_3 39.93%, TiO_2 4.23%, Ignition Loss 18.99%

Soft ore - Al_2O_3 39.32%, SiO_2 2.43%, Fe_2O_3 31.18%, TiO_2 4.39%, Ignition Loss 21.71%

It is interesting to note that these titania percentages are higher than any recorded from the Ouse district, although one sample from Rosedale and one from Fordon exceeded 5% of titanium dioxide.

The other shafts on Riccarton revealed similar conditions but it was not practicable to prospect the whole of the area, particularly as the capping was difficult to break with hand tools. There are five outcrops having a total area within the adopted boundaries of 28 acres. The probable value of the formation as a whole may reasonably be assessed by analogy with the Rosedale-Meadownbank area, which is essentially similar except as regards the high grade surface material which is lacking at Riccarton, where the best assay result obtained was 43.16% Al_2O_3 and 3.68% SiO_2 "free" to caustic soda. This sample was broken in a shallow road gravel quarry on the northern tip of Area No. 15.

Fordon Area:

On the York Park area of Fordon Estate, 13 miles northerly from Campbell Town, there are three outcrops of the bauxitic formation. The largest of these covers 40 acres and takes the form of a flat-topped ridge with a north-west to south-east trend similar to that of the Rosedale-Meadowbank area. The dip coincides with the direction of the ridge, being flat at the north-westerly end and steepend as the formation weakens to the south-east. There is no appreciable cross-fall. The bed-rock is diabase and Tertiary sands and clays occurring in the vicinity appear to have overlain the bauxite.

Eight shallow shafts were sunk and the material strongly resembles that encountered in the Rosedale-Meadowbank area, except that it is a little richer in ferric oxide, a little poorer in alumina, and lacks the higher grade patches near the surface. Ten samples averaged 31.1% Al_2O_3 and 1.[illegible]% SiO_2 "free" to caustic soda.

The shafts were not carried deep enough to test the whole of the formation, but the results are regarded as conclusive and place the material outside the present commercial range as a source of aluminium. The two smaller outcrops were not tested by shafts but may be considered to be of similar grade.

Baskerville Area:

Baskerville Estate is 7 miles westerly from Campbell Town, and was taken up as a bauxite area to prospect a formation outcropping in the vicinity of some road gravel pits. This formation certainly bears a superficial resemblance to other occurrences in the district and probably has a somewhat similar origin. A series of nine shallow shafts was sunk but all passed through highly siliceous material and no commercial bauxite was encountered, as may be seen from the shaft logs.

The material, where solid, resembles a hard, baked clay, and is fine grained and fairly uniform in texture, but is a mottled red and white in colour. Assays by the caustic soda method showed that only a low percentage of the material was taken into solution. A complete analysis revealed the following constituents :- Al_2O_3 29.72%, SiO_2 50.60%, Fe_2O_3 1.85%, TiO_2 2.00%, P_2O_5 0.08%, FeO -0.38%, CaO -0.40%, MgO Trace, moisture 3.35%, Ignition loss 12.00%.

There are several possible explanations for the development of this deposit which occurs with geological associations similar to those of the bauxite, but since no part of the formation appears to bear any chemical resemblance to bauxite these need not be considered here.

Bauxitic formations typical of the district were also inspected near the road bridge over the Fingal railway, 7 miles northerly from Campbell Town, and on the Cressy Road, 19 miles north westerly from Campbell Town. The former area would normally have merited prospecting with the other areas in the district, but the land is occupied for military purposes, no work was carried out. At the Cressy Road locality bauxite of attractive appearance may be traced for a considerable distance on both sides of the road, but the outcrop offers no promise of providing ore for bulk quarrying.

D.R. DICKINSON.
EXTENSION OFFICER

Mines Department,
HOBART.

27th August, 1942.