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REPORT ON BLYTHE RIVER IRON MINES Ltd

Blythe River Iron Mines
by
J. H. Darby 7-12-1900.

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REPORT of Mr. JOHN H. DARBY, M.I.C.E.

(Iron Expert from England)

on the

BLYTHE RIVER IRON MINES, LTD.

To the Directors of

THE BLYTHE RIVER IRON MINES, LIMITED.

Gentlemen,

I understand, by instructions received from you at Melbourne on the 6th. September, you wish me to report on:-

(1). The deposit of Haematite Iron Ore on the Blythe River, near Burnie, Tasmania.
(2). The site of the proposed iron and steel works you intend to erect having regard to assembly of the iron and steel making materials, application of surplus power from the blast furnaces, and the distribution of the finished (rolled) steel.
(3). The source of the fuel (coal and coke) and limestone.
(4). The finished articles to be produced: the output and extent of the proposed works and cost of producing steel.
(5). Estimate of outlay.

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1. -- THE DEPOSIT OF HAEMATITE IRON ORE.

The land on which the deposit of Haematite occurs is nearly seven miles from the mouth of the Blythe River, and is on land leased from the Crown by Mr. Quiggin.

R. Quiggin, Mining Lease 1061-91M the N.E. end of deposit	40	acres
D. O'Keefe purchased minerals and surface rights	50	"
R. Quiggin, Mining Lease 1009-91M	73	"
R. Quiggin, Mining Lease 951-91M	78	"
R. Quiggin, Mining Lease 856-91M	80	"
R. Quiggin, Mining Lease 4640-91M	15	"
R. Quiggin, Mining Lease 4509-93M	40	"
R. Quiggin, Mining Lease 3285-93M	40	"
R. Quiggin, Mining Lease 4006-93M	40	"
W. Jones, Mining Lease 4185-93M	20	"
Atkinson Purchase	12	"
Total	488	acres

The acres of mining lease and purchase lands respectively are as follows:-

On mining lease from Government for twenty-one years at £1 per acre per annum and power to renew for twenty-one years more ...	426 acres
On purchase	62 acres
	488 acres

I am informed that the properties on which the deposit is known to exist are to be transferred to the Blythe Iron Mines, Limited, together with building sites near Heybridge. The 3 feet 6 inch railway from the ore deposit, now in course of construction joining the Government line near Heybridge, will also be transferred when completed. This will give direct railway communication with deep water at Burnie, where the ore can be shipped into large ocean-going, whale-back or other steamers at all states of the tide and weather. The pier at Burnie has to be extended and the wharf accomodation completed. The distance from Burnie to the mine is about eleven miles.

The Blythe River deposit probably occurs as lenticular masses formed at the same time as the country rock and deposited between the Silurian schists on the north-west and the mataphoric sandstones on the south-east. With this opinion, Mr. Twelvetrees, the Government Geologist at Launceston, who has seen the deposit, agrees.

I have thoroughly examined the deposit on various days (between)

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between the 12th. and 28th. September.

Starting at an elevation of about 775 feet above the sea on the north-eastern end of the deposit, 8 chains N.E. of the southern boundary of lot 1061-91M the ore is seen in a bold outburst about 107 feet wide on the surface and descends into the hill at a steep angle, as shown by the trenches I had put in on each side to define the deposit. About 5 chains S.W. from the boundary of the above lot the ore had been exposed under cover of basalt. Moving S.W. the deposit is covered with basalt for about 25 chains, but it is again shown in the great cross-cut made by the Blythe River, which has exposed the ore on both banks.

On the north-east at about 600 feet above sea level, there is a bold cliff projecting from the ore body, and at lower levels there are other projecting cliffs of ore until the river is reached at a level of 150 feet above the sea.

The ore has been exposed at many places on the northern slope.

On the southwestern slope two large cliffs of iron ore and quartzite stand out some 320 feet above the river. These mark the western and eastern sides of the deposit, and between them there is a width of above 300 feet of ore.

Numerous trenches have been cut on the south-western slope exposing good ore in a variety of places. On this side the ore is seen to the top of the hill 700 feet above sea, and ends in a fine outburst on the south-western side of the next slope about 25 chains from the river.

The ore is well marked in the river-bed, and washed boulders are to be seen for a considerable distance.

The specific gravity of average Blythe furnace is 4.80/, equals 299 lbs. per cubic foot or 3.6 tons per cubic yard of solid ore.

The ore is NON-MAGNETIC.

As I only saw the cross-cut of the deposit made by the Blythe River, and the solid ore blasted out in a few places, I am unable to say how many millions of tons are actually to be obtained nor can I state definitely whether the ore unacted on a depth by the atmosphere is as pure as near the surface or whether the deposit continues beneath the basalt, and what proportion obtains of quartzite reefs to ore.

I can, however, say that after thoroughly examining the surface, there are overwhelming indications at many points in over a mile of country of an immense deposit of Haematite.

Tunnels are now being driven into the ore body at points indicated on the plan herewith, and when the work in hand is completed, there will be positive proof of the existence, extent, and quality of the ore at a considerable depth.

The tunnel at the 330 level above river struck solid ore at about 62 feet from the surface, and is being continued across the deposit as well as turning north-east alongside the ore body. When under the basalt another cross-cut will be driven across the deposit.

On the southern boundary of Lot 1061-91M a second tunnel is driven to cross-cut the ore body at 565 feet above river or 75 feet below the outcrop of ore.

Mr. Twelvetrees (Government Geologist, Tasmania) reports on the tunnels and cross-cuts with analysis of ore by Dr. Helms, M.A. F.C.S., 8 Bridge Street, Sydney, as per copy attached.

In estimating the probable quantity of ore I have taken the river bed as the bottom, although it is nearly certain to extend down much further, and have measured the width of the deposit where the sides are well defined. The cubical contents of the deposit which I have thought it advisable to divide by two, at three tons per cubic yard yields 24,500,000 tons of selected ore.

QUALITY OF ORE.

I divide my samples in four portions.

1. Taken over the outburst to the N.E. of the basalt cover: Ferric Oxide 93.64 per cent; Iron 65.54 per cent; Silica 5.19 per cent.

2. Taken over the slope to River on N.E. side; Ferric Oxide 85.93

(per cent)

per cent: Iron, 60.15 per cent; Silica 12.41 per cent.

3. Taken over the S.W. slope; Ferric Oxide 85)38 per cent; Iron 56.76 per cent; Silica 11.09 per cent.

4. Water-worn boulders in river and north of deposit: Ferric Oxide 97.08 per cent; Iron 67.95 per cent; Silica 1.13 per cent.

An average sample over the whole deposit gives the following complete analysis:

Ferric Oxide	86.954 per cent	) 63.259 per cent.	
Ferrous Oxide	3.074 "	) iron.	
Silica	7.312 "		
Alumina	1.756 "		
Lime	0.068 "		
Magnesia	0.071 "		
Sulphur Trioxide ...	0.060 "	0.024 per cent.	
Phosphorus pentoxide ...	0.083 "	0.036% sulphur	
Titanic acid ...	0.03 "	phosphorus	
Copper	Trace "		
Arsenic	Trace		
Manganese	Trace		
Chromium	Absent		
Combined Water	0.324 per cent		
Moisture	0.160 "		
	99.892 per cent.		

I have further taken the sample of ore with lime flux and reduced it with coke to a metallic button with the following results:-

Carbon	1.800 per cent.
Silicon.....	0.032 "
Phosphorus.....	0.062 "
Sulphur.....	0.092 "
Manganese, Titanium and Chromium.....	Nil "

As the coke ash used would give .05 per cent. Phosphorus, and as the reduction of so small a quantity in a crucible is certain to absorb sulphur which can be largely prevented in a blast furnace, I have no hesitation in saying that the average sample I treated is capable of producing, with good coke and limestone, very superior haematite pig iron suitable for the manufacture of high class steel.

The yield of iron I obtained was 66.5 per cent of the ore used, and to make afusible slag with the silica of the ore and coke ash 12.5 of limestone on the weight of ore was employed.

It is expected that one locomotive and sufficient hopper-bottom 20-ton cars will move four trains of ore per day (250 tons per train) from the mine to Burnie.

The cost of transit to the steamer, f.o.b., including interest on £100,000 capital, will probably be 8d. per ton. In my opinion, based on the cost of getting, loading, and dumping stone in Tasmania, to win the Blythe River Iron deposit will cost 5s/- per cubic yard.

Allowing one cubic yard of refuse to one cubic yard of ore, the cost per ton will be:-

Ore in cars.....	2 :10d.
Freight, mine to Burnie.....	8d.
	3 : 6d.

My general impression is:

That there is sufficient ore near the Blythe River to supply Iron and Steel Works, capable of making 3,000 tons of finished steel per week, for many years to come.

That the quality of the ore is excellent and rarely surpassed by any in Europe or America.

That it is easily reduced to pig iron.

That, judging by the cost of similar quarrying operations in

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Tasmania, selected ore should be delivered in railway cars at 2/10 per ton.
That there may be half-ton of refuse to one ton of ore, or equal bulk of each.
That the deposit is admirably situated for quarrying operations, including working, selecting, loading ore into cars, and dumping refuse.
That there is ample power in the Blythe River for compressing air for drills and any other machinery.

II. - SITES FOR PROPOSED STEEL WORKS.

Having in view the various considerations that may arise in the selection of so important a feature as the site of the proposed works, I have visited the following places;-

1. On the Parramatta River East of the Railway, and between it and Bray's Bay near Rhodes Station, 225 chains from Strathfield Station, and ten miles from General Station, Sydney.
2. On the Parramatta River from Mortlake Point towards Mortlake, near the Australian Gas Company's Works.
3. At Newcastle, between the Waratah Coal Jetty and Throsby Bay (the old site of the Hunter River Copper Works.
4. At Port Kembla, North of Allan's Creek and between it and Tom Thumb's Lagoon -- flat and sandy.
5. On the River, Yarra below Melbourne.
6. Near Illawarra Lake, North of Mullet Creek and between it and Koong Burry Bay.
7. Near Heybridge, Tasmania, on land near the junction of the Blythe River Railway with the Ulverstone -Burnie Railway.

In a country where Government owns the Railways and conducts the traffic, I think it absolutely essential to be in direct connection with a deep water wharf where the works may be quite independent of the railways, should necessity arise.

A glance at the maps herewith will show the relative positions of the sites named.

SITES NOS. 1 AND 2. - These are in the neighbourhood of Sydney, about ten miles from the railway station by the railway route, and are well situated with frontages to deep water on the Parramatta River.

It seems to me that there is no doubt about the fact that Sydney will be the business centre of Federated Australia. The railways centralise here and branch off again in all directions. The shipping in the Port is very varied, and is in direct communication with most parts of the world, and there is a large surplus population from which to draw supplies of labour. It is a distinct advantage to be in close touch with consumers, and no doubt other trades,- as shipbuilding, sheet-rolling, and wire-drawing,- will be attracted by the convenience offered to settle near by. I anticipate that the requirements of the town of Sydney will consume all the electrical energy the works have to spare and if the low price of.4d. per unit is obtained over the whole twenty-four hours, and .12d. allowed for interest and expense of working the electrical plant, there should be considerable revenue from this source.

A site in Sydney harbour with a deep water frontage seems convenient for assembling slack from North and South, and whenever the Sydney Harbour Collieries at Balmain commence operations, additional supplies of fuel at a low rate of freight may be obtained, The output of coal for New South Wales in 1899, according to the annual mining report, was:-

Northern District (Newcastle).....	3.259,000 tons
Western District (Lithgow)	217,000 "
Southern District (Port Kembla).....	1,119_000 "

This is likely to be considerably increased during the present year 1900.

Limestone can be conveniently brought into Sydney by sea from the Tamar, or supplies may be brought by rail from Portland, 111 miles. Good limestone may also be obtained from Marulan, 114 miles.

More particularly with regard to No. 1 site; the 46 acres to the west of the railway is sufficient for steel works having a capacity of 6,000 tons per week, with railway connection across the

(intervening)

intervening land; and also a pipe line for the fresh water, as the Water Companies' main runs along the railway. The price for fresh water, according to schedule, is 1/- per thousand gallons for the first 20000000 gallons, and 9d. per thousand afterwards. This would make the average cost at 300,000 gallons per day and 300 working days, £3,625 per annum for water,- equal to 6d. per ton of steel. This must be reduced by collecting the waste water and returning same.

Deep water can be obtained by a wharf along the river frontage, and the land reclaimed behind this will enable all vessels required - up to 45 ft. width - to come right up alongside from Sydney Heads. This ground would require some excavation, but on the whole it is well adapted for steel works; and in my opinion is the best site, taking everything into consideration that I have seen in Australia. In the neighbourhood are Lysaght's wire and other large works.

The second site, near Sydney, is also well situated and satisfactory; it is, however, a considerable distance from the railway, nearly two miles, and water would probably have to come the same distance in pipes. I understand that there may be some difficulty about obtaining the land for works' railway, between Mortlake Point and the site of the steel works.

With regard to the distribution of the finished steel, Sydney seems to stand unrivalled in Australia, either by sea or land; and although, from such information as I have been able to get, the cost of assembling materials to make one ton of steel comes to 10s/10d. per ton, I have no hesitation, - if either of the sites in question can be obtained,- in saying that the Sydney District has advantages over all the others.

SITE NO. 3. - I have visited a site in Newcastle Harbour formerly used by the Hunter Copper Works, which have now been partly dismantled. The ground is flat and low-lying. The copper slag about could be used for levelling and raising the same. There is a fine water frontage, and the Minister of Mines, who accompanied me, said the Government would dredge up alongside the wharves. The wharf will have to be constructed and the foreshore filled in. The site is favourable, the harbour first-class. Fresh water is to be obtained by pumping in the swamp on land side, I was informed. The railway communication with the Waratah Coal Company's line can be arranged (so Dr. Robertson, Managing Director of the Company, assures me). The area is about 35 acres, and the price asked about £14,000 (through Dr. Robertson.)

The cost of assembling materials for one ton of steel would be about 9/10¼d. per ton.

Newcastle, although well situated for shipping and distribution, is not equal to Sydney. The map herewith will show its position, and appended are some particulars of the port charges and collieries in that district.

SITE NO. 4.- I visited Port Kembla where there is a convenient site available for works as shown on plan. It is some distance back from the Wharf, and will necessitate transfer of all incoming materials by trucks. Arrangements will have to be made for fresh water and a considerable sum spent in building a wharf for unloading purposes, as existing wharf is only intended for outward material. The breakwater is now being extended by the Government, and when finished the harbour will be satisfactory. There is plenty of deep water.

The cost of assembling iron-making materials for one ton of steel is 8/0½d.

Port Kembla is not well situated for distributing the finished steel, and in this respect it does not compare favourably with Sydney. I estimate it is 2/6d. per ton worse off in this respect.

SITE NO. 5:- A suitable site near Melbourne can be selected on the River Yarra, between the city and the bay. The assembly costs for one ton of steel, work out at 12/5¼d. It would have similar advantages, as compared with Sydney, for distributing and utilising surplus electrical energy. Works might be established along the river, and no second handling of materials would be necessary.

On the other hand, most of the fuel would have to be brought from New South Wales. I have failed to locate any suitable coking coal in Victoria.

For distribution of finished product it would be inferior to Sydney, and there are not so many works where steel is consumed in the Melbourne district.

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SITE NO. 6.- Illawarra Lake, not far from Port Kembla, has fine sites for works where material could be unloaded direct and used without any intermediate handling. (See plan). Water can be obtained by a dam in the Mullet Creek.

I have made as many enquiries as possible, and I think the balance of opinion goes to show that even if the sea entrance to the lake can be dredged to a sufficient depth and a channel opened to the wharf to be erected, it will be very difficult to keep the sea end open and I fear for this reason sites on Illawarra Lake must be abandoned, in spite of their inherent advantages.

SITE NO. 7.- Heybridge Township, near Burnie, Tasmania. A good site for works may be obtained here (see plan). There is plenty of fresh water in the river Blythe, and it would be advantageous to be near the mines with concentration of the works. The cost of assembling materials for one ton of steel is 9/8¼d. per ton, but almost the whole of the finished product would have to be shipped, much of it to Melbourne and Sydney for redistribution. Labour and supplies would be difficult to obtain.

The distance from fuel and any distributing centre, and the inability to utilise surplus electrical energy are the chief disadvantages. On the other hand, it must be remembered, that Tasmania is not so democratic as New South Wales.

APPENDICES II.

(A) NOTE ON COST OF ASSEMBLING MATERIALS AT SITES NAMED.

I have arrived at the cost of assembling materials in the following way. It is assumed that the production of the proposed works based upon the statement made later, will be 3,560 tons per week. For this there will be required:-

Iron ore for blast and steel furnaces.....		6,500 tons
Limestone.....		1,250 "
Fuel for blast furnaces; 2/3 Northern Slack	3,890	
1/3 Southern Slack	1,945	
		5,835 "
Coal for gas producers and heating furnaces.....		2,136 "
Total raw materials		15,721 tons

To assemble these materials:-

	Tons	@ s d	Total £	s	d.
(a) AT SYDNEY:					
Iron ore from Burnie	6,500	2:5	785	8	4
Slack from Newcastle	3,890	2:2	421	9	2
Slack from Port Kembla	1,945	2:2	210	4	2
Coal from Port Kembla	2,136	2:2	231	8	0
Limestone from Portland	1,250	4:7	286	7	6
Total raw materials...			£1934	17	2

£1,934 : 17 : 2d. / 3,560 tons = s d 10 : 10 per ton.

	Tons	@ s d	Total £	s	d
(b) AT NEWCASTLE:					
Iron ore from Burnie	6,500	2:8	866	13	6
Slack from Newcastle	3,890	1:0	194	10	0
Slack from Port Kembla	1,945	2:2	210	14	2
Coal from Collieries	2,136	1:0	106	16	0
Limestone from Tamar	1,250	4:0	250	0	0
			£1,628	13	8

£1,628 : 13s : 8d. / 3,560 tons = 9/1¾d. per ton.

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(c) AT PORT KEMBLA:

	Tons	& s	d	Total £	s	d
Iron ore from Burnie	6,500	2 :	5	784 :	8 :	4
Slack from Collieries	4,500		7½	140 :	12 :	6
Coal from Collieries	2,136		7½	66 :	15 :	6
Limestone from Portland	1,250	7 :	0	437 :	10 :	0
				£1,430 :	5 :	10

£1,430 : 5 :10d. / 3,560 tons — 8/0½d. per ton.

Cost of transfer not included (vide Page 10)

(d) AT MELBOURNE:

	Tons		s	d	£	s	d
Iron ore from Burnie	6,500		1 :	5	460 :	8 :	4
Slack from Newcastle	3,890		4 :	6	875 :	5 :	0
Slack from Port Kembla	2,136		4 :	0	427 :	4 :	0
Limestone from Lilydale	1,250		1 :	0	62 :	10 :	0
					£2,214 :	7 :	4

£2,214 : 7 : 4 / 3,560 tons — 12/5d. per ton.

(e) AT BURNIE:

	Tons		s	d	£	s	d
Iron ore from Mines	6,500		0 :	4	108 :	6 :	8
Slack from Newcastle	3,890	1:0 &	3 :	0	778 :	0 :	0
Slack from Port Kembla	1,945	7½d. &	2 :	0½	340 :	7 :	6
Coal from Port Kembla	2,136		do.		373 :	16 :	0
Limestone from Railton	1,250		2 :	0	125 :	0 :	0
					£1,725 :	10 :	2d.

£1,725 :10s : 2d. / 3,560 tons — 9/8¼d. per ton.

The CARNEGIE COMPANY shipped iron ore from Duluth to Conneaut on the season, 1899, charter for 60 per cents. a ton, a distance of 830 miles, insteamers of 3,000 to 7,000 tons.

Taking these figures and assuming that boats are of equal loading and unloading facilities, the freight from Burnie to Sydney, 521 miles, will be 1/9d. per ton, say 2s/-.

Newcastle to Sydney, a much shorter distance, to cover contingencies and allow for the very considerable time the vessel is in port, say 1s/6d.

Port Kembla to Sydney, 45 miles, the same.

To the cost of freight, Burnie to Sydney, 1/9d. must be added pilotage, harbour and light dues, 1?58d., and the discharging of the vessel. By the Hulet discharging machine 90 per cent. of the cargo can be unloaded for 2 cents. per ton or the whole cargo for 5 cents, as carried out by the Pittsburg and Conneaut Dock Company. To make an allowance for smaller steamers and other contingencies I preferred to take the cost at 6d. per ton, which lands the ore into stock or into furnace bunkers.

This will make the cost of the ore:-

F.O.B. Burnie, per ton.....	3s: 6d.
Freight.....	1s : 9d.
Harbour and Pilotage.....	1.58d.
Unloading to bunkers.....	0 : 6d.
	5s :10.58d.

(B) MEMORANDUM OF SURPLUS POWER.

100 tons pig iron per 24 hours = 2,000 B.H.P. = 1,492 B.T.U.
3,000 " " " " week = 430 tons per 24 hours.

1,492, say 1,400X 4.3 = 6,120 units (K.W.)

Price asked per unit	0.4d.
Cost of production, &c.	0.12
Net profit per B.T.U.	0.28d.

6,120 x 0.28 = 142s/9d. per hour x 18 hours per day -128s/-5/11d. per ton of pig iron clear profit.

(C) OTHER ORE RESOURCES OF THE COUNTRY.

(a) Iron Ore on the Tamar.

I examined a deposit of iron ore near Beaconsfield, on the Tamar, about 4 or 5 miles from Beauty Point, where it would have to be shipped, and from which place to the deposit a tramway would have to be made.

The deposit was formerly owned by Mr. Evans, soap boiler, Launceston, and he can give particulars.

The ore deposit seems to be of some size and could be mined in the open cheaply. It is probably limonite. An analysis gave:-

Ferric Oxide	64.99 per cent.	45.49 per cent. iron.
Silica.....	2.98 "	
Alumina.....	11.79 "	
Chromium sesquioxide...	77.07 "	
Loss by ignition.....	11.86 "	

2.12 per cent. of chromium sesquioxide is present as chrome iron ore.

For the purpose of making ordinary steels the amount of chromium present puts this deposit out of consideration.

(b) IRON ORES OF NEW SOUTH WALES.

I have examined the reports made by Mr. Pitman, Government Geologist, and have had long interviews both with him and Mr. J. B. Jaquet (see the latter's report to the Mines Department N.S.W. 8th. June 1900). They agree that the only known deposits of any extent are at Carcoar and Cadia, both near Orange, and about 95 miles from Lithgow, the nearest coal, which is of inferior quality.

The Carcoar deposit is of large extent, and can be cheaply worked. At Dapto, the Australian Smelting Company use it as flux and it contains:

Iron.....	54.55 per cent.
Silica.....	10 to 11 per cent.

Some portions also carry phosphorus. One sample I saw contained 0.3 per cent of phosphorous.

The surface ore is probably limonite, and it must be classed as phosphoric, and, therefore, only suitable for steel making by the basic process.

The position of the deposit, 186 miles from Sydney, puts it out of consideration for the present.

The deposit at Cadia, eleven miles from Milnthorp, is probably much larger and consists of oxidised and unoxidised stone. It is a mixture of haematite and magnetite. The property is owned by a Company, of which Mr. Crowdace, of Newcastle, is the Representative. The deposit has formerly been worked for copper and gold.

OXIDISED ORE:- Iron 57.65 per cent; silica 5 to 15 per cent; phosphorous .013 to .05 per cent; 1,000,000 tons of this ore estimated in sight.

UNOXIDISED ORE: Contains both iron and copper pyrites in places. One sample I saw gave: Sulphur 0.6 per cent; copper 0.3 per cent.; 40,000,000 tons estimated in sight.

This fine deposit is under the same disadvantage as Carcoar regarding transit. Both will require careful selection, if this is possible, and for the reason I have given may be disregarded at present. The Government carry these ores over the railway at ½d. per ton per mile.

I think, if arrangements can be made, the fine ore of New

Caledonia will be worked in preference to the Orange deposits. The ultimate competition, if it ever arises, will come from this source and not from Orange. I look to New Caledonia as the source of magnesite required for linings.

(D) DISTANCES BETWEEN VARIOUS PORTS ON THE AUSTRALIAN COAST.

Burnie to Port Pirie Bar	742	miles.
Burnie to Adelaide	569	"
Burnie to Port Adelaide	578	"
Burnie to Melbourne	222	"
Burnie to Port Kembla	473	"
Burnie to Sydney	521	"
Burnie to Newcastle	581	"
Fremantle to Albany	350	"
Albany to Adelaide	1030	"
Adelaide to Melbourne	514	"
Melbourne to Port Kembla	535	"
Melbourne to Sydney	580	"
Port Kembla to Sydney	45	"
Sydney to Newcastle	60	"
Newcastle to Brisbane	460	"
Brisbane to Rockhampton via Straits	328	"
Brisbane to Rockhampton via Spit	399	"
Rockhampton to Townsville	400	"
Townsville to Cooktown	274	"

(E) SYDNEY HARBOUR DUES.

Harbour and light dues 4d. per ton on net register, which covers steamer for six months.

Pilotage 2d. per ton on net register inward and outward. Should steamer be in ballast, however, it is charged half rates.

If net register is, say, half the load carried, one steamer bringing 6,500 tons per week pays:-

Harbour and light	0.08d.
Pilotage	1.50d.
Pence per ton ore	1.58d.

(F) NEWCASTLE PORT CHARGES.

PILOTAGE-- 1d. per ton in ballast; 2d. per ton with cargo.

Harbour and light rate - 4d. per ton exempts vessels from any charge at any port in N.S.W. for six months.

TONNAGE RATES:- Discharging cargoes on wharf 1s/4d. per ton per day, during period of discharge. 1s/2d. per day on gross tonnage, for charging cargoes.

PILOTAGE.- Vessels in ballast 1d. per registered ton, arriving in ballast; leaving with cargo 2d.

FACILITIES FOR SHIPPING:- There are the following appliances:-
Twelve hydraulic and three steam cranes at the dyke.
Twelve steam cranes at Stockton.
Three shoots belonging to the A Company.
One shoot belonging to the Waratah Colliery.
Two shoots at Hexham.
The capacity of the cranes is 20,000 and shoots 3,200 tons per day.

III. - THE SOURCE OF FUEL AND LIMESTONE.

FUEL.

As stated previously, the total coal production in 1899 was:

Northern District (Newcastle)	3,259,000	tons.
Western District (Lithgow)	217,000	"
Southern District (Port Kembla)	1,119,000	"
	4,595,000	Tons.

This will be considerably increased for the year 1900.

As the Western Coal is inferior and out of the way it need not be considered, therefore supplies for the steel works must be drawn from 4,378,000 tons of output.

I suggest that one-third Southern fuel - which although it contains a good deal of ash, about 11 per cent, and is not capable of economic treatment by washing,- should be intimately mixed with the product of two-thirds Northern fuel well washed. The mixture should be well ground, possibly compressed and cooked in an oven of the Coppee type about 20 inches wide. I contemplate no recovery of by-products, except steam from the waste heat.

To prove my statements that the Southern coals will not wash I selected samples of coke from the Southern Coke Company's ovens at Unanderra, made from unwashed Corrimal slack. The sample of coke looked of first-rate quality, and according to Mr. Pitman, Government Geologist, one cubic inch withstood a pressure of 3,300 lbs. before crushing, which is far the highest figure I have seen. My sample gave:-

Ash.....14.09 per cent.
Sulphur.....0.519 "

I also picked two samples of Clean Corrimal Colliery lump coal which, so far as the eye could detect, contained no shale or substance likely to yield ash. They gave:-

	1	2
Moisture at 100° C.....	0.85	0.84
Volatile Hydrocarbons.....	22.59	23.07
Fixed Carbon.....	63.61	67.91
Ash.....	12.95	8.18

Coke made from an equal mixture of the above samples of Corrimal coal would contain 13.82 per cent. of ash; and, as coke, from unwashed slack only contains 14.09 per cent. ash, I do not think that washing of the small coal would be of much use.

The best coking coals in the Southern District are probably between Clifton on the North, and Port Kembla on the South. It is not known how far they extend in a westerly direction; but near Mittagong, on the Melbourne to Sydney Line, they were found to be of little value for any purpose.

From what I have seen, in both the Northern and Southern Districts, Iam certain this will make a first-rate coke.

The Northern small slack washes freely, and when so treated and mixed with the unwashed slack of the south, will make, I anticipate, a hard coke containing about, 9 to 10 per cent. ash and about 0.5 per cent sulphur.

I feel certain, in my statement, as I have seen very fair coke made by the Purified Coke Company, Newcastle, chiefly from Wallsend slack washed and about 5 per cent. Southern slack added.

I therefore propose that fuel supplies be drawn as under:-

2/3 Northern Slack, 10% allowance for washing 3,890 tons per week.
1/3 Southern Slack ..... 1,945 " " "
Total coke 5,835 tons per week

From this the yield of coke will be:

From Northern Coal, at 60 per cent .....2,100 tons per week.
From Southern Coal, at 75 per cent.....1,458 " " "
Total coke 3,558 tons per week

In addition there will be required 2,136 tons of coal for gas producers rolling, heating &c. The full requirements of coal will therefore be:-

For blast furnace coke.....5,858 tons per week
For gas producers &c.....2,136 " " "
TOTAL 7,971 tons per week

or say, 400,000 tons per annum.

The low percentage of sulphur in all Australian coals I have examined is characteristic of them, and will be of great value in the production of high class pig iron.

I have visited several of the Collieries in the Southern field and some of the principal ones in the Northern, and I find that the large demand for slack for coke-making, which is used at the smelting works and other purposes, has absorbed the greater proportion of the available quantity. I doubt if anything like 175,000 tons per annum can be bought at anything like the present prices.

I anticipate about 150 coke ovens will be required. Although not perhaps at first, still ultimately it will be necessary to control a colliery, and I advise that a suitable Mining Engineer, who knows the district intinately, should be instructed to look out for a good Southern Colliery within 15 miles of Port Kembla, if possible, and thus within the 7½d. per ton rate to the port. The colliery should be capable of producing up to 1,000 tons per day of good coking coal for 20 to 25 years and the run of the mine in ordinary times will be delivered f.o.b. Port Kembla for a little over 4s/- per ton, no washing required. When this Colliery gets into full swing the supply of Northern fuel may be discontinued, and the Compny's position as against a corner in the coal market is assured.

In ordinary times slack is to be bought at 3s/6d. per ton f.o.b port(this does not apply now, but probably will when the present boom passes and when the works are ready to start). I have adopted this figure in estimating my cost of coke.

LIMESTONE.

There are indications of a deposit of limestone seen on the side of the road in the Blythe River at Dukkers Bridge, about three miles above the iron deposit. The quality is good, but I could form no reliable opinion as to the quantity. Analysis:

Calcium Carbonate.....92.17 per cent = Lime 51.61 per cent.
Insoluble..... 5.45 "

About seven miles from Beauty Point, on the Tamar, from which place a tramway would have to be made, as shown on the plan herewith, is a splendid deposit of pure limestone; particulars may be obtained from Mr. Evans, soap boiler, Launceston. Analysis:-

Calcium Carbonate.....92.17 per cent. = Lime 51.61 per cent.
Insoluble..... 2.95 "

It is probable that this sample contains some magnesia, which for fluxing purposes in the blast furnace, may be added to the lime.

This limestone could probably be delivered at Sydney, if in sufficient quantity, at:-

	£	d
Quarrying.....	2	0
Cartage and interest on trams.....	1	6
Freight to Sydney.....	2	5
Delivered to blast furnaces	5s:	11d.

Limestone from Portland, on the Mudgee Line, is used at the Dapto Smelting Works. It seems to be of first quality, and only contains 1.5 per cent. insoluble. The cost in trucks, rough crushed through 6-inch ring:-

At Portland.....	3s :6d.	per ton
Cartage to Sydney.....	4s :7d.	"
	8s : 1d.	per ton

There is also good limestone which I have not seen at Marulan, 114 miles from Sydney. It can probably be delivered at the works at the same price as Limestone from Portland.

IV. - THE FINISHED ARTICLES TO BE PRODUCED AND THE EXTENT AND PRODUCT OF PROPOSED WORKS.

The statistical register published in Victoria, New South Wales, and Queensland and South Australia, shows the amounts of imports for 1899; but the amount of imports for West Australia and Tasmania are not shown. The quantities used by these two Colonies are

(small)

small and have been estimated. Ten per cent. per annum has been allowed for increased consumption to July 1903.

The returns appended show that the forms most used are; Rails, Galvanised and black sheets, bars, rods, wire, and pig iron. I therefore propose that the works be laid out in accord with these returns but leaving out black and galvanised sheets, the manufacture of which I do not think it would be wise to contemplate at this stage, and I think there will be gound to be ample orders for a make of 3,500 tons pig iron per week.

My plan shows how the works may be arranged, keeping in view extensions to double their present suggested size.

IMPORTS INTO AUSTRALIA DURING 1900.

	From the U.K.	Other Countries
Pig iron	34,246 tons	15,222 tons
Bars, Angle, Bolts & Rods	36,366 "	8,262 "
Railroad	68,402 "	27,669 "
Wire	8,385 "	25,343 "
Hoop, sheet & boiler plates	12,804 "	5,837 "
Galvanised	65,991 "	10,160 "
Tin Plates	19,961 "	
Cast & Wrought Iron	54,642 "	7,342 "
Steel, unwrought	39,318 "	7,627 "
Manufactures of Steel	3,211 "	6,653 "
Steel		27,263 "
Sundries	17,000 "	10,035 "
Hardware	55,730 "	
	416,056 tons.	151,413 tons.

I estimate that the cost of coke, taking a make of 55 tons of coke from 90 tons of fuel, will be as follows:

Thirty tons of slack at Port Kembla at 3/6d	105s.
Freight to Sydney at 2s/2d	65s.
Sixty tons slack at Newcastle @ 3/6d	220s.
Freight to Sydney at 2/2d	130s.
Cost of washing 60 tons at 9d	45s.
	565s.

The produce of coke will be fifty five tons, and the cost per ton of coke produced will be:

Fuel (washed & unwashed) at Sydney	10s : 3d.
Labour	1s : 6d.
Repairs	6d.
Stores	9d.
Depreciation	1s: 0d.
Total cost of coke delivered at blast furnaces	13s : 0

As far as I can ascertain, having regard to the best practice in America and elsewhere, the cost of pig iron will be 31s/- per ton and of rails 69s/- per ton.

I should expect a considerable income by the sale of electrical energy and, taking into consideration the figures I have had access to, have little doubt that the cost of manufacture will be under rather than over what I have stated.

V. ESTIMATED COST OF WORKS.

I have in preparation, in accordance with the instructions contained in your letter of the 22nd. October 1900, plans and estimates for the proposed works which will follow the fore-going portion of my report with as little delay as possible.

I have the honour to be,
Your obedient servant,
(Sgd.) John H. Darby, M.I.C.E.

7th. December 1900.

It will be noticed by a glance at the following table, where the approximate distances are given, that Sydney is more favourably situated for the supply of steel in the East than any other producing point. The Union Iron and Steel Works, San Francisco, are at present in the best position.

San Francisco to Hong Kong	6,919	N.M.
Sydney to Hong Kong	4,660	"
" " Shanghai	4,640	"
" " Batavia	3,870	"
" " Calcutta	5,810	"
" " Bombay	6,110	"
" " Capetown	6,137	"
Liverpool to Calcutta	7,668	by Canal.
" " "	11,379	by Cape.
" " Batavia	11,023	by Cape.
" " HongKong	12,776	by Cape.
" " New Zealand	11,625	by Cape Horn.

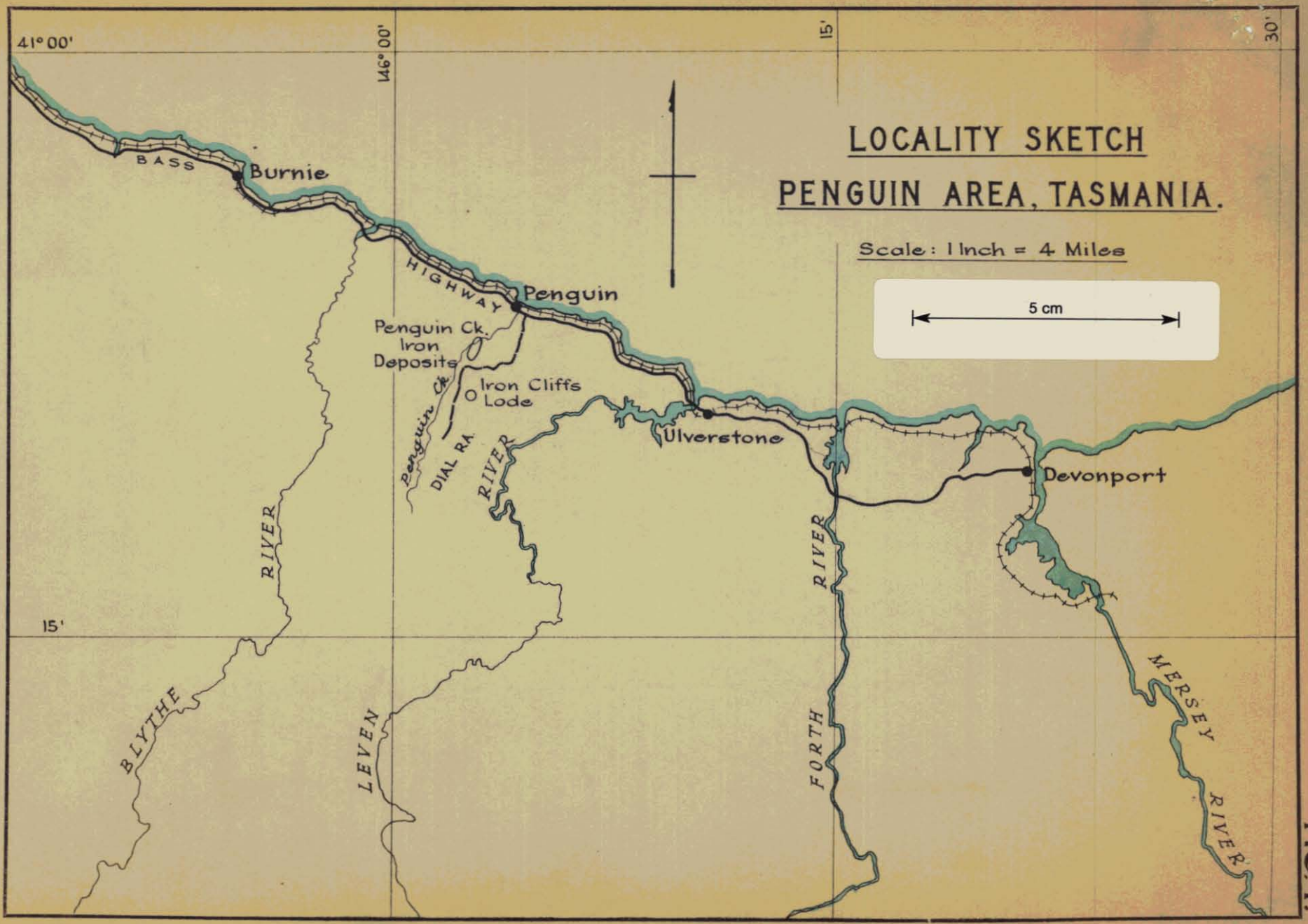
41° 00'
146° 00'
15'
30'
LOCALITY SKETCH
PENGUIN AREA, TASMANIA.
Scale: 1 Inch = 4 Miles
5 cm
BASS
Burnie
HIGHWAY
Penguin
Penguin Ck. Iron Deposits
Penguin Ck.
Iron Cliffs Lode
DIAL RA.
Ulverstone
Devonport
RIVER
RIVER
RIVER
RIVER
BLYTHE
LEVEN
FORTH
MERSEY
RIVER
15'

FIG. 1.