

(Private)

Engineering Offices,  
Bank Top, Darlington.  
January 11<sup>th</sup> 1860.

Dear Sir,

Having, as requested by you, explored the Iron and Coal districts in connection with the South Eastern Section of the Manchester Sheffield and Lincolnshire Railway, I beg now to hand you the following report as the result of my labours:-

My principal aim has been to ascertain the quantity, position and quality of the Iron Ores and Limestone deposits of Kilton in Lindsey and how these can best be made available for a profitable addition to your traffic. In forming a judgment on the latter point, I have endeavored to determine and fix the focus or dividing line to which the Ironstone and Limestone should be brought on the one hand, and the necessary fuel for smelting on the other.

First as to quantity - the district in which Ironstone is contained, according to fair geological inference, probably extends from Lincoln to the Humber, - the breadth, say from 2 to 3 miles; but the only points at which the Stone has been penetrated & proved lie in the lands from Kilton to West Hulton.

In the immediate vicinity of Kilton, one bed has been proved of about  $5\frac{1}{2}$  feet in thickness and extends to the northward - the total area of this bed may be taken as 12 square miles. From near Messingham to

Willow Holt, a lower bed of ore is found, which I should estimate to contain some 13 square miles. The intermediate country - i.e., the country between Hirtm on the south and Messingham on the north has not yet been sufficiently tested to warrant the expression of any decided opinion as to its capabilities of production. No Mining operations have, as yet, been carried on in the Hirtm lands. The making of a few trial Pits has proved the seam and its sections, but no stone has been won for Market.

The Appleby district lies immediately north of Hirtm, and from it (viz: from Scunthorpe) about 2,000 tons of Stone have been forwarded. The Mining operations are carried out on the surface - by quarrying in fact. Mr Beal is at present putting down a trial Pit, near the Quarry, which Pit will be completed in a short time, - say, 2 or 3 weeks. Both the quarry and trial pit are marked on the Plan accompanying this Report. No Stone is at present being sent from the Quarry, owing, in a great measure, to the bad state of the roads. It would have very much enlarged the information I can tender to you if more trial pits had been sunk, or if, at any rate, Borings had been made; but this in no measure affects the certainty that a large Mineral Area lies within easy reach of your Railway, and that the Ores contained in it are very abundant. Messrs Rosely and Okey are arranging to bore at Hirtm for a Lower Bed found between Messingham and Willow Holt. Till these or other borings have been made, nothing can be said as to thickness,

extent &c. Speaking generally, I may say there appears to be a great abundance of Stone. Taking the average weight of a Cubic yard at 30 Cwt there is found at Kilton and Appeby Stone to furnish 30 Furnaces for 200 years, without reckoning the upper bed.

In and around Kilton the great Oolite Lime Stone is massed in vast quantity - It is the principal Mineral cut through by the Kilton Tunnel and Approaches. The thickness of the Lime Stone is about 30 feet, and with reference to all demands likely to be made upon it for purposes of Iron making (Fluacing) may be said to be inexhaustible - (The Lime is also of excellent quality for Agricultural purposes)

Secondly, as to position, it will be sufficient to say that the general Dip of strata in the Kilton district, is about South 80 East.

The bed about to be bored at Kilton is about 70 feet below that already proved; and the general run of the beds with reference to your railway, will be at once seen on reference to the accompanying Drawing. This shows the position of the iron stone from the Cliff (the old Roman Road) to the sundry busettings.

The main features of the section are - that the first good bed is found about 60 feet below the Great Oolite Lime stone, and the lower Bed (as already mentioned) about 70 feet below the first. I may here remark that a large portion of the first Bed can be quarried at comparatively trifling expense in point of labour.

Thirdly, quality - The Iron Stone is of calcareous character - of the Oolite series - and

belongs to the Lower Oolite and Upper Liass formation. Of course its constituents can only be determined by chemical analysis, and its practical value by passing it through a furnace. On these points I was enabled to gather some information, which deserves attention.

The Mineral area already under Lease comprises nearly 2000 acres. Of this quantity about 900 acres near Appleby (the property of Mr. Winn) is held by the Mess<sup>rs</sup> Dawes and about 980 acres (at Hinton) by Mess<sup>rs</sup> Rosely and Okey. The 980 acres are made up thus:

From Mr. Richardson (Leased for 40 years . . . . .)	} acres 300
The Crown . . . . .	400
Mr. Tichler of Cleatham (purchased also the Lime stone) . . . . .	} 280
	<hr/> 980 <hr/>

Two other parties - Mr. Fowler and Mr. Beale have the refusal of a plot each - (Mr. Richardson, whose property is situated in the Tunnel lands, reserves the Lime stone.) The Iron stone already won has been forwarded to Mess<sup>rs</sup> Dawes and Beale. Concerning the trial by the former gentleman, I have heard a very favorable account, and which is so far confirmed by the fact that, as stated, Mr. Dawes has now secured a large tract of ore. Mr. Beale informed me the trial in their Furnaces was not so satisfactory, but that that might have been the result of working the Furnace with a new description of Stone.

The same gentleman favored me with a copy of the Analysis they had made of the Stone

at Park Gate which I append with that also made by Mr. Sollitt of Hull.

The Iron Stone, it should be mentioned, works small (granulated), and whether this circumstance will operate seriously against its extensive use can only be determined by further trial - The Iron already made is said to be of good quality -

I examined the Iron Stone at Shire Oaks - The bed is very thin (being about 22 inches) and its best, and possibly its only, use will be for mixing purposes -

Mr. Dawes has 500 acres under Lease from the Duke of Newcastle. It must be expensive to win; - I put the cost at 10<sup>s</sup> per ton at the least.

Having now alluded to the quantity, position and quality of the Iron and Lime Stones, as far as ascertained, it becomes important to notice the relation in which they stand locally, both to coal pits and the various markets.

I have sought information as to the coal best adapted for making Iron the produce of Hinton. I particularly inspected Shire Oaks Colliery, the Staveley and Barnsley - The Shire Oaks property contains two workable seams of Coal; the lowest at a depth of more than 500 yards is the only seam now being wrought. The thickness of the seam is from 3 feet 9 inches to 4 feet. This seam appears to be what in South Yorkshire is called the Barnsley bed. In that district it is about 9 feet in thickness, strong and good, and is a fine seam. It however thins towards the

South and West and is found at Thire Oaks less than half the Barnsley section. The Thire Oaks Colliery is in good working order - almost free from water - and all the surface and underground arrangements are in a capital working condition - I examined the pit both above and below -

The character of the Coal is of the description adapted for Steam purposes, but will I think be found useful for smelting. It is sound and strong - and from enquiries I made at Grimsby I found that Steam Boat people highly approved of it for their purposes. As to the quantity likely to be available, the Pit being only in the course of opening, not more than 240 tons per diem are drawn, but, in a short time, it is expected the yield will increase to 600 Tons a day.

The Pits at Staveley produce 1500 tons a day, and are expected shortly to reach 2000 tons. This Coal is excellent, not only for household and Steam purposes, but also Iron making - The Barnsley Mineral fields abound with Coal suitable for every purpose to which Coal can be applied.

I may now briefly refer to Markets - The Staveley Furnaces have their Iron Stone supplied from Mr. Barrow's shale beds. It makes good iron, but at a cost which impedes success in competition with Iron Makers in other districts where Ore is cheap and plentiful. Mr. Barrow's case applies to several of the Iron Makers in the vicinity of your Line - It seems to me, therefore, that an Iron Stone such as is found in Kilton - found in such abundance

and capable of being cheaply won; as well as being within easy reach of the Iron Works of Derbyshire and South Yorkshire - must find a ready market, and be a source of valuable traffic to your Southern lines and Docks, whether the Stone be carried to the present Iron Makers or be used nearer home by parties who may construct Furnaces on your lines. Your position thus appears to be one of considerable advantage! I find the cost of making a Ton of Iron from the ordinary ores found in Derbyshire to be about £3 a ton.

By using a portion of the Northampton Iron Stone this cost may be reduced.

The Northampton Stone costs

at Chesterfield	6/9 <sup>2</sup> a Ton
and at near Masbro'	7/6 "

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Chesterfield	6. 9
Dues (all over the Midland 3/11 <sup>2</sup> ) including 1/ added by sender for Wagon Rent	4. 1
Mine Price	<u>2. 8</u>

Again,

near Masbro'	7. 6
Dues (all over the Midland 3/10 <sup>d</sup> ) including 1/ added by sender for Wagon Rent	4. 10
Mine Price	<u>2. 8</u>

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These are easy prices, but the cost of production is very low, - including Royalty charges about one Shilling a Ton.

According to the tests already made and above referred to, the Iron Stone in Kirton yields a larger per centage of Iron than that in Northamptonshire. It requires  $3\frac{1}{2}$  Tons of the latter Stone to make a Ton of Iron, - whereas practical men calculate 3 tons of Kirton will be ample for the same result, while the working expenses at Kirton will certainly not exceed those of Northampton.

I do not look to the whole supplies for Barnsley (Dawes and Beal) being carried over your line, especially as Mr. Winn is forming a Railroad through his property (as shown on the drawing) a part of which is finished.

Over this line the Stone will be conveyed to the River and by Canal to Dawes and Beal's. The tolls on the Headby Canal are about a shilling a Ton - Mr. Dawes expects to have his stone delivered at his Works, reckoning nothing for Mining profit, at  $5\frac{1}{6}$  a Ton.

Should you, however, extend a Branch line into the Appleby district, most of the traffic will necessarily find its way via Retford.

On viewing the district through which your line runs, I see no place so suitable for the erection of Blast Furnaces as at Retford. This place is nearly equi-distant between Kirton Sheffield and Chesterfield. The Wagons which convey Coals into Lincolnshire can be returned with Iron Stone; and moreover Retford is on the Main Great Northern line, which latter circumstance will invite competition in Coke and Coal supplies.

Reckoning the Stone to cost in carriage from Kirton to Retford  $2\frac{1}{6}$  a ton, including



Wagons, the cost of a Ton of Iron at Retford will be as follows:

Cost of Stone into Wagons . . . . .	2. 6
Carriage . . . . .	2. 6
	<hr/>
	5. 0
	<hr/>

2½ Tons to a Ton of Iron, but } 15. 0  
 say 3 @ 5/.

Lime . . . . .	1. 6
Coke and Coal . . . . .	1. 1. 0
Blasting . . . . .	5. 0
Sundries . . . . .	2. 6
	<hr/>
	£ 2. 5. 0
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This cost very little differs from that of the Cleveland Iron made at Middlesbro'. The cost at Kirton will be much the same as at Retford.

From Retford the ports of Liverpool, Grimsby and London can easily be reached - Also the Sheffield, Manchester and Leeds Markets more readily and at less cost than from either Staffordshire or Middlesbro'.

The probable local demand may be in some measure gathered from the following list of furnaces in the neighborhood of your Railway. Most of these use shale Iron Stone with some from Northampton; the cost of working the shale being from 8/ to 10/ per ton:

Mr Barrow, Staveley . . . . .	2
Mr Fowler, Sheepbridge . . . . .	3
Mr Jackson, Clay Cross . . . . .	3
Mr Dawes, Milton & Elsecar . . . . .	5
	<hr/>
	13

Mess <sup>rs</sup> Newton & Chambers		13
	Thorncliff	2
	Hazlehead	1
Wingerworth Co	Wingerworth	2
M <sup>r</sup> Marshall	Quenethorpe	1
M <sup>r</sup> Rangely	Unstone Iron Works	1
M <sup>r</sup> Appleby	Renrisha, Eckington	2
M <sup>r</sup> Beal	Park Gate	1
do	The Holmes	2
do	Newbold, Chesterfield	1
	Stenton Iron Works, near Derby	2
		<hr/> 28. <hr/>

Calculating each Furnace to produce 100 Tons per week - and 3 tons of Stone to be used in producing a Ton of Iron, the quantity of Iron Ore required per annum will be nearly 700,000 Tons.

I have now given all the information at present available, and have endeavoured to indicate its significance as bearing on the question of traffic. When the Kirtou Stone is further explored, much more light will be thrown on the subject - There are, as I have intimated, vast supplies already proved - and looking also at the mass of Lime Stone ready for market, and the supplies of Coal in course of development on your railway, added to considerations as to advantageous position, on which I have made some remarks, there seem to be adequate reasons why as a matter of good commercial policy this new branch of trade should be promptly