

CHIMNEY CORNER COAL FIELD, INVERNESS CO., N. S.

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INTRODUCTION

The purpose of this investigation was to examine and report on the known occurrence of coal at Chimney Corner. The work was done during the latter part of the field season, 1940.

LOCATION

Chimney Corner is situated on the northwest coast of Inverness County, Cape Breton Island. It is twelve miles from the town of Inverness on the shore road to Margaree Harbor. The area mapped was from the shore to the road and extended for approximately three miles along the coast. (See key map.)

HISTORY

According to Richard Brown, mining operations started at Chimney Corner in 1867.⁽¹⁾ It is probably safe to assume that the coal seams were known prior to this date, for Nicholas Denys in 1672 reports in his "Description géographique et historique des Costes de l'Amérique Septentrionale" the existence of a coal mine at Mabou.⁽²⁾ Within the past twenty years there have been various attempts to mine coal at this place. In 1919, the Public Works Department built a breakwater so that the harbor would be suitable for the shipment of coal. At present no work is being carried out at Chimney Corner but the nearby Saint Rose Mine is being operated by Messrs Evans and Dusette.

(1) Browns Coalfields of Cape Breton. P. 104.

(2) loc.cit.p.32. (Note. Brown is apparently in error when he states that Le Chadye is Mabou, for it is evident that Le Chadye is Cheticamp.)

METHOD OF MAPPING

A base line, 4192.15 feet in length and bearing $44^{\circ}45'$ mg., was laid down between the road and the shore, each end of the base line was marked with a cairn of stones. From this base line, stations were laid out by triangulation and plane-table traverses, were run to close on these stations, with this as a control system the area was mapped by plane-table. The scale was 200 feet to the inch with 10 foot contours. The stratigraphic column was measured by foot-rule from an arbitrary base chosen in one of the footwall sandstone members, well below the lowest known Coal Measures. This sandstone bed is 300 feet from the northeast end of the base line on a bearing of 40 mg. The letters "N.R.C. 1940" are cut into the rock on the sea-ward slope. At the southern end of the area on the most prominent knoll, marked Station 52 on the map, about 1000 feet in from the shore, a cairn of loose rocks was built, which will serve as a mark for further extension of the work. Bearings from this point to suitable reference points are as follows:-

Light-house on Margaree Island	$277^{\circ} 15'$ mg.
Marsh Point	$243^{\circ} 50'$ mg.
Headframe of St. Rose Mine	$212^{\circ} 00'$ mg.
Point on base line feet from A towards B	$53^{\circ} 45'$ mg.
Light-house at Cheticamp	$49^{\circ} 00'$ mg.

TOPOGRAPHY

From the mouth of the Margaree Harbor for a distance of approximately six miles, the coast is characterized by an echelon series of straight reaches, separated by hooks which are open to the north (Photograph 1). These

hooks are caused by a series of sandstone beds separated by shales and marls, the sandstones being more resistant than the shales. The long straight portions lie along the strike of the sandstone beds.

Except for several sand beaches, the coast is an almost continuous line of cliffs, varying in height from 30 - 150 feet. In from the edge of the cliffs the land rises gently to the foot of the line of hills which flanks the western side of Cape Breton Island. The slope of the hills is considerably steeper, rising to a height of approximately 600 feet. The limits of the coastal area are approximately determined by the narrow strip of Coal Measures which are found from Margaree Harbor nearly to Marsh Point.

The streams in general are consequent, that is, are following the natural slope of the land and are not in adjustment with the geological structure of the country. There are two valleys in which small subsequent streams are at present flowing and have produced three parallel ridges in the map area. These ridges are strike lines of strong sandstone members. Due to the permeability of the ground, the streams carry little water.

Differential shore erosion is well exemplified along the coast, in addition, the action of the sea breaking down the dip slopes of the sandstone was observed. With reference to Diag. 1 and Photographs 2 and 3, this action was as follows;- A small consequent stream was observed entering the sea near the head of one of the small hooks. The question arose, why did the stream not turn when it encountered the sandstone member and flow along the line of weakness afforded by the narrow barrier of shales? The answer lay in the fact that the sea was breaking into the smooth wall

of the sandstone member, which has been weakened by two sets of joints, one set being vertical and the other, nearly horizontal. During heavy storms, blocks of massive sandstone at the base of the cliff are sucked from their position by the waves, exposing the very much softer underlying shales. Subsequently the unsupported roof of sandstone collapsed until the top of the cliff was reached, thus the stream had a valley cut for it, rather than having to cut a valley for itself. The three stages in this process are shown at A, B and C in Diagram 1. It is possible that the initial loosening of the blocks was effected by frost action, for the underlying shales are very permeable and full of water. Many examples of wave suction are reported by D. W. Johnson⁽³⁾.

GENERAL GEOLOGY

According to W. A. Bell the Carboniferous can be subdivided into the Canso, Riversdale, Cumberland and Pictou Series and in his opinion the Chimney Corner rocks belong to the Riversdale.⁽⁴⁾ An arbitrary point in this series was chosen as a base, the position of this point has already been described. The beds dip into the sea at angles varying from 20° - 50° . The general strike of the rocks is 215° mg. In working along the coast from north to south, a total thickness of $3561' - 3''$ was crossed, this thickness, it must be emphasized, does not represent the total thickness of the Riversdale series but only a portion of it. The details of the beds thus measured are given in Table 1 and are shown in the section. It will be seen that there are 19 strong sandstone members, separated from each other by shales, marls and in some cases, coal.

(3) Johnson, D. W., Shore processes and shoreline development, John Wiley and Sons, New York.

(4) Private communication, 19th September, 1940.

The sandstone members are all characterized by the presence of charred logs, coarse detritus and exhibit cross-bedding (Photograph 4) suggesting torrential conditions at the time of their formation. These rest on shale members which have rill-markings (Photograph 5). The intervening shales and marls indicate periods of slower deposition and stagnant or nearly stagnant water. There were thus cycles or rhythms, varying from rapid accumulations to periods of great quiet, in which the fresh water marls and coals were laid down. In post-Carboniferous times the rocks were thrown into their present tilted position. To the south of the area there is a large fault, beyond which the uptilting has not been so severe. Within the area considered there are no marked faults, but there has been some interformational movement. The following commonly occurring fossils were identified by W. A. Bell in Ottawa; - Neuropteris smithii Lesquereux and Whittleseyia desiderata D. White.

On the underside of some of the sandstone members there are small stalactytic masses of iron pyrites derived presumably from the slow seepage of supergene waters. An assay of these sulphides yielded a trace of gold. (5)

ECONOMIC GEOLOGY

In the Chimney Corner area there are nine coal seams, varying in thickness from 2½" to 60", their positions are shown on the map, the geological section and the stratigraphic column. According to Richard Brown there is still another seam, 42" thick which is not shown on the map or in the sections. (6) If it does exist it should lie 200 feet below the five foot seam. Of these seams the one which appears to merit

(5) Prof. G. F. Murphy, N.S. Tech. Coll., 21 August, 1940.

(6) Brown's Coalfields of Cape Breton, p. 29.

attention is the three foot seam. A channel sample was cut from the outcrop of this seam at the edge of the cliff, it was placed at once in a sack and taken by car to the Nova Scotia Technical College. The following analysis was returned;-

	Percentage	
	As Received	Dry
Moisture	10.9	-
Volatile	33.8	37.9
Fixed Carbon	48.6	54.5
Ash	6.7	7.6
Total	100.0	100.0
Sulphur	3.49	3.91
Calorific B.T.U. per Lb.	10.450	11.730

(7)

A preliminary estimate of the tonnage of this coal seam, between Chimney Corner and the southern boundary of the map area and from the outcrop to where the coal seam passed vertically under the shore line, showed that there is approximately 1,000,000 tons. This is a very rough estimate and should be checked by drilling. The stances for four drill-holes each designed to cut the seam at 500 feet downdip from the crop, are shown on the plan. The stances, as laid out, are for vertical holes. This drilling program would involve a total footage of feet.

(7) Prof. G. F. Murphy, N. S. Tech. Coll., 21 August, 1940.

Stratigraphic Column at Chimney Corner, Inverness Co., N. S.

Table 1

Top of Section

<u>No.</u>		<u>Thickness</u>		<u>Total Thickness above base</u>	
		<u>ft.</u>	<u>ins.</u>	<u>ft.</u>	<u>ins.</u>
19	Sandstone, Grey, fossils, rusty, dip slope on shore has an undulating surface. Dip 25-30 degrees. Jointed.				
	Bluish grey shale. Poorly stratified, fragmental.	13	0	3561	3
18	Grey sandstone. Rusty, some fossils, jointed	385	0	3548	3
	Bluish grey shales. Fragmental. Somewhat sandy at the base. Some slicken-sides.	12	0	3163	3
17	Sandstone, grey, rusty, jointed.	150	0	3151	3
	Coal	0	2	3001	3
	Grey clay	0	4	3001	1
	Grey shale, rusty	0	2	3000	9
	Coal, somewhat brownish	0	9	3000	7
	Grey shaly clay	0	4	2999	10
	Coal	0	7	2999	6
	Greyish brown clayey shale	0	4	2998	11
	Rusty chocolate shale	0	7	2998	7
	Black clayey shale	0	4	2998	0
	Greyish chocolate clayey shale	0	4	2997	8
	Black clayey shale, possibly some splint	0	4	2997	4
	Cream clayey shale with some brown fossils, soft	1	6	2997	0
	Bluish grey fragmental shale, rusty.	3	6	2995	6
	Grey sandy shale. Jointed and fractured, much rust	10	0	2992	0
	Bluish grey fragmental shale, rusty	3	0	2982	0

No.

	<u>Thickness</u>		<u>Total Thickness above base</u>	
	ft.	ins.	ft.	ins.
Rusty clayey shale.	0	2	2979	0
Splint and black shale	0	1	2978	10
Brownish grey clay.	0	1	2978	9
Splint and black shale	0	1	2978	8
Grey clay	0	3	2978	7
Black clayey shale	0	1	2978	4
Grey clay	0	3	2978	3
Black clayey shale, some splint	0	1	2978	0
Grey fragmental clayey shale, some chocolate colored	0	10	2977	11
Black shale and splint	0	5	2977	1
Grey clay	0	1	2976	8
Coal	0	7	2976	7
Clay	0	1	2976	0
Coal	0	4	2975	11
Clay	0	3	2975	7
Coal	0	2	2975	4
Clay	0	1	2975	2
Splint	0	2	2975	1
Clay	0	3	2974	11
Splint	0	1	2974	8
Grey clayey shale, some carbonaceous material and rust	1	3	2974	7
Black shale	0	6	2973	4
Splint	0	1	2972	10
Black shale	0	3	2972	9
Grey shale	0	3	2972	6

<u>No.</u>		<u>Thickness</u>		<u>Total Thickness above base</u>	
		ft.	ins.	ft.	ins.
	Splint with some clay	0	5	2972	3
	Grey and bluish-grey soft fragmental clayey shale, much rust	1	4	2971	10
	Splint	0	2	2970	6
	Grey clayey fragmental shale with tinges of chocolate	1	10	2970	4
	Black shale	0	6	2968	6
	Bluish-grey fragmental clayey shale	1	3	2968	0
	Grey fragmental shale, some rust	3	0	2966	9
	Chocolate fragmental shale	3	0	2963	9
	Grey fragmental shale	2	0	2960	9
	Bluish-black shale, possibly some splint	0	6	2958	9
	Grey clayey shale	1	0	2958	3
16	Sandstone. Grey, jointed, rusty, some fossils, cross-bedded. Base contains sulphides.	90	0	2957	3
	Bluish-grey fragmental shales, rusty	5	0	2867	3
	Black shale, soft, fossiliferous	5	0	2862	3
	Blackish-grey shale with concretions	1	0	2857	3
	Coal with copiapite.	0	11	2856	3
	Grey clayey shale, some rust and copiapite	2	0	2855	4
	Grey sandstone, fine-grained, rusty, some carbonaceous material	0	9	2853	4
	Grey fragmental shale	1	0	2852	7
	Grey sandy shale, rusty, jointed, tinges of pink and yellow on the surface	2	8	2851	7
	Bluish-grey fragmental shale, rusty	2	6	2848	11
	Grey sandy shale with several rusty concretionary beds	3	3	2846	5

<u>No.</u>		<u>Thickness</u>		<u>Total Thickness above base</u>	
		ft.	ins.	ft.	ins.
	Concretion bed	0	2	2843	2
	Grey sandy shales with a few concretions	6	0	2843	0
	Black shale, some fossils and concretions	1	4	2837	0
	Probably grey and possibly black shales	5	0	2835	8
15	Sandstone, grey, rusty, jointed	11	0	2830	8
	Grey sandy shale	2	0	2819	8
	Grey fragmental shale with concretions	4	0	2817	8
	Grey clay with some rust	0	8	2813	8
	Brownish-black shale	0	4	2813	0
	Grey clay with some carbonaceous material	0	3	2812	8
	Splint	0	2	2812	5
	Black clayey shale	0	5	2812	3
	Coal	3	0	2811	10
	Grey clay	0	8	2808	10
	Grey fragmental shale. Drab on the joints, from rust.	5	0	2808	2
	Light grey sandy shale, some concretions	2	6	2803	2
	Grey clayey shale, considerable rust	2	6	2800	8
	Grey shaly sandstone, some concretions	4	6	2798	2
	Chocolate and grey fragmental shale	6	6	2793	8
	Bluish-grey fragmental shale, some chocolate colored material	11	0	2787	2
	Grey with some chocolate fragmental shale. Concretions and rust. Concretions vary from 1"-4".	3	6	2776	2
14	Sandstone. Grey, a small amount of rust, top 4' quite fragmental and soft.	10	0	2772	8
	Grey fragmental shale, some rust	3	2	2762	8

No.

	<u>Thickness</u>		<u>Total Thickness above base</u>	
	ft.	ins.	ft.	ins.
Black clay	0	3	2759	6
Splint	0	1	2759	3
Light grey fine-grained sandstone or sandy shale, some rust	12	0	2759	2
Grey fragmental shale	1	6	2747	2
Greyish-black clayey shale with concretions	1	0	2745	8
Grey fragmental shale, some carbonaceous material	5	6	2744	8
Light grey sandy shale, top tends towards a sandstone, soft	18	0	2739	2
Grey fragmental shale with some concretions	10	0	2721	2
Coal	0	7	2711	2
Clay	0	6	2710	7
Coal	1	2	2710	1
Greyish-black clay	0	7	2708	11
Coal	0	3	2708	4
Clay	0	7	2708	1
Coal	0	11	2707	6
Black clay	0	2	2706	7
Splint	0	1	2706	5
Black clay	0	2	2706	4
Grey clay	1	10	2706	2
Grey fragmental clayey shale, considerable rust	5	6	2704	4
Grey fragmental shale with concretions	4	6	2698	10
Grey clay	2	0	2694	4
Grey fragmental shale with concretions	3	6	2692	4
Grey and black clayey shale	0	3	2688	10

No.		Thickness		Total Thickness above base	
		ft.	ins.	ft.	ins.
	Splint with fossils	0	2	2688	7
	Greyish black clayey shale	0	2	2688	5
	Coal	0	3	2688	3
	Black clay	0	2	2688	0
	Grey clay	0	5	2687	10
	Grey fragmental shale, a few concretions	5	6	2687	5
	Grey sandy shale	1	8	2681	11
	Concretionary bed	2	0	2680	2
	Grey fragmental shale with concretions	3	8	2678	2
	Grey clayey shale	4	0	2674	6
	Black clayey shale, some splint	0	4	2670	6
	Grey clay with some carbonaceous material	0	9	2670	2
	Splint	0	2	2669	5
	Grey clay with black top and bottom	0	2	2669	3
	Coal	0	3	2669	1
	Black clayey shale and splint	0	6	2668	10
	Coal	0	7	2668	4
	Black clay blending into grey fragmental shale with some rust	0	3	2667	9
	Covered	32	0	2667	6
13	Sandstone, rusty, grey, some almost a sandy shale	10	6	2635	6
	Covered, probably grey sandy shales	65	0	2625	0
12	Sandstone, rusty, jointed	13	0	2560	0
	Grey sandy shale	4	0	2547	11
	Grey fragmental shale with concretions	3	0	2543	11
	<i>Bluish shale</i>	3	0	2540	11
	<i>Grey fragmental shale with concretions</i>	3	0	2537	3
	Covered	690	0	2533	9
11	Sandstone. Grey, jointed, cross-bedded, rusty and some black stains, some rusty blebs of concretions	50	0	1843	9

No.

	<u>Thickness</u>		<u>Total Thickness above base</u>	
	ft.	ins.	ft.	ins.
Dark grey clay	0	6	1793	9
Grey clayey shale, some carbonaceous material	6	0	1793	3
Chocolate fragmental shale	7	0	1787	3
Light grey sandstone, fine-grained, jointed, some carbonaceous material	0	8	1780	3
Grey and black fragmental clayey shale	1	0	1779	7
Chocolate fragmental shale	4	0	1776	7
Bluish-grey fragmental shale, large jointed concretions, to 1' diam.	4	0	1774	7
Bluish-grey fragmental shales	1	0	1770	7
Dark grey shale, cleavage well developed	0	5	1769	7
Grey clayey shale with some rust	0	2	1769	2
Dark grey shale, some selenite crystals	0	10	1769	0
Dark grey clayey shale, some rust	0	2	1768	2
Dark grey fragmental shale	3	0	1768	0
Bluish-black shale	0	2	1765	0
Bluish-grey clayey shale	0	4	1764	10
Grey shaly sandstone	1	4	1764	6
Chocolate fragmental shale	2	6	1763	2
Light grey fine-grained sandstone, red stains	1	3	1760	8
Grey and chocolate fragmental shale	3	6	1759	5
Light grey sandstone, some rust and copiapite	2	4	1755	11
Bluish-grey fragmental shale, concretions -2" diam., in middle 6", cleavage is better developed and it stands out	0	3	1753	7
Grey and chocolate sandy shale	1	0	1753	4

No.

	Thickness		Total Thickness above base	
	ft.	ins.	ft.	ins.
Reddish-brown fragmental shale, slicken-sides, some rust	6	0	1752	4
Chocolate and grey fragmental shale	5	0	1746	4
Splint	0	1	1741	4
Black clayey shale	0	3	1741	3
Black clay	0	2	1741	0
Grey clay, rust, carbonaceous material	1	2	1740	10
Bluish-grey fragmental shale, much rust	2	0	1739	8
10 Sandstone, top 5' shaly, jointed, few fossils, surface fractured and rusty, a few red blebs, $\frac{1}{8}$ " diam., color is grey, cream grey and buff, contains several lenses of grey fragmental shale, 1'-3' with copiapite	250	0	1737	8
Black shale, fossiliferous	11	0	1487	8
Grey clay with some rust	1	0	1476	8
Grey and chocolate fragmental shale, a few concretions	5	0	1475	8
Bluish, grey and bluish-grey shale, concretions, fossils and slicken-sides	10	0	1470	8
Dark grey shale, rusty	0	4	1460	8
Grey and black clayey shale	0	9	1460	4
Grey and chocolate fragmental shale, some concretions with carbonate veinlets	7	0	1459	7
Grey sandy shale with rust	4	0	1452	7
Slate grey fragmental shale, concretions	16	0	1448	7
Dark grey shale, very rusty, small concretions at the base, selenite	1	9	1432	7

No.

	<u>Thickness</u>		<u>Total Thickness above base</u>	
	ft.	ins.	ft.	ins.
Grey clay, rust, top 1 ⁰ almost black	1	4	1430	10
Grey sandstone, rusty	0	9	1429	6
Chocolate fragmental shale, concretions	3	0	1428	9
9 Sandstone, grey, rusty, fossils, jointed, cross-bedding, in parts, almost a sandy shale	45	0	1425	8
Dark grey fragmental shale, rusty	7	0	1380	9
Grey clayey shale	0	4	1373	9
Splint	0	1	1373	5
Grey shaly clay	0	1	1373	4
Coal, rusty	0	5	1373	3
Grey shaly clay	0	2	1372	10
Coal, rusty	0	8	1372	8
Grey and black clayey shale	0	10	1372	0
Black and grey shale	0	7	1371	2
Grey shale	0	6	1370	7
Black shale	0	3	1370	1
Grey shale	0	2	1369	10
Black shale	0	1	1369	8
Grey clayey shale, rusty	2	6	1369	7
Grey fragmental shale, concretions	6	0	1367	1
Black shale	2	4	1361	1
Grey clay	0	6	1358	9
Light grey clayey shale, rust	3	0	1358	3
Grey fragmental shale, some concretions	4	0	1355	3
Grey sandy shale	2	0	1351	3
Grey fragmental shale	9	0	1349	3
Blackish shale	2	7	1340	3

No.

<u>Thickness</u>		<u>Total Thickness above base</u>	
ft.	ins.	ft.	ins.

Grey fragmental shale, a few concretions in upper part	1	6	1337	8
Bluish-grey fragmental shale	1	0	1319	8
Grey shaly sandstone	7	0	1316	8
Grey sandy shale, some concretions	11	0	1311	8
Grey fragmental shale	10	0	1300	8
Grey shale, evidence of fossils	8	0	1290	8
Banded black and grey shale, fossils	2	0	1282	8
Coal, much pyrites	0	2½	1280	8
Grey shale, jointed	10	0	1280	6
Bluish-grey fragmental shale, numerous concretions, in middle of bed they are large, up to 1' in diameter	24	0	1270	6
Grey fragmental shale, concretions, jointed	10	0	1256	6
Grey shaly sandstone	0	8	1246	6
Concretion bed	0	2	1245	10
Grey shaly sandstone, jointed, some rust	3	5	1245	8
Grey fragmental shale, some rust	5	0	1242	3
Concretionary bed	0	1	1237	3
Grey fragmental bed	1	2	1237	2
Concretionary bed	0	1	1236	0
Grey sandy shale	1	6	1235	11
Grey fragmental shale, jointed	1	6	1234	5
Grey sandy shale, rusty	0	9	1232	11
Grey fragmental shale, jointed	0	6	1232	2
Grey sandy shale, some concretions	3	0	1231	8
Jointed concretion bed	0	3	1228	8

No.

	<u>Thickness</u>		<u>Total Thickness above base</u>	
	ft.	ins.	ft.	ins.
Grey sandy shale, jointed	2	0	1228	5
Grey fragmental shale, jointed	2	0	1226	5
Grey shaly sandstone, jointed	1	0	1224	5
Concretion bed	0	1	1223	5
Grey fragmental shale, jointed	2	0	1223	4
Grey shaly sandstone	1	2	1221	4
Grey fragmental shale, jointed	12	0	1220	2
Concretion bed	0	1	1208	2
Grey sandy shale	4	6	1208	1
Shaly sandstone, <i>grey</i>	1	0	1203	7
Grey shale, jointed concretions	12	0	1202	7
Grey sandstone	0	5	1190	7
Grey fragmental shale, concretions	0	8	1190	2
Grey shaly sandstone	0	8	1189	6
Grey fragmental shale	3	0	1188	10
Grey sandstone, concretions	3	0	1185	10
Grey fragmental shale	0	8	1182	10
Concretion bed	0	1	1182	2
Grey fragmental shale, jointed	17	0	1182	1
Grey fragmental shale	2	4	1165	1
Sandy shale	0	8	1162	9
Grey fragmental shale	0	8	1162	1
Concretion bed	0	2	1161	5
Grey fragmental sandy shale	6	0	1161	3
Covered	50	0	1155	3
Grey fragmental shale, concretions	11	0	1105	3
Covered, blue calcareous shale and grey fragmental shale in talus	15	0	1094	3

No.

	Thickness		Total Thickness above base	
	ft.	ins.	ft.	ins.
Bluish fragmental shale	3	0	1079	3
Carbonate vein	0	$\frac{1}{4}$	1076	3
Bluish-grey calcareous shale	4	0	1076	2
Carbonate vein	0	$\frac{1}{4}$	1072	2
Bluish calcareous shale	1	0	1072	1
Concretion bed	0	1	107	1
Bluish-black to black laminated limestone, fossiliferous, selenite	20	0	1071	0
Concretion bed	0	1	1051	0
Bluish-grey calcareous shale, fossils, selenite	13	6	1050	11
Bluish-black calcareous shale, fossils (pelecypods), $1/8$ " carbonate vein	3	0	1037	5
Bluish-black calcareous shale, selenite, $1/8$ " carbonate vein	2	6	1034	5
Covered, probably bluish-black calcareous shale	30	0	1031	11
Dark grey fragmental shale	1	0	1001	11
Bluish-black calcareous shales	5	0	1000	11
Covered	38	0	995	11
Bluish calcareous shale, some fossils and concretions	2	0	957	11
Carbonate vein	0	$\frac{1}{4}$	955	11
Bluish-black calcareous shale, fossils and some concretions	1	6	955	10
Carbonate vein	0	$\frac{1}{4}$	954	4
Bluish-black calcareous shale, fossils, selenite	2	8	954	3
Concretion bed	0	1	951	7
Bluish-black calcareous shale, fossils, selenite	8	0	951	6
Greyish-black limestone, fossiliferous	0	2	943	6

No.

	Thickness		Total Thickness above base	
	ft.	ins.	ft.	ins.
Black calcareous shale	0	2	943	4
Bluish-black limestone, some fossils	0	1	943	3
Black calcareous shale, some fossils	0	2	943	2
Coal, with carbonate filling the joints	0	$\frac{1}{2}$	943	0
Grey fragmental shale	0	7	942	11
Blackish-grey clayey shale	0	6	942	4
Black shale, some fossils, sulphides	0	1	941	10
Blackish-grey clayey shale, slicken-sides, selenite	1	0	941	9
Light grey shale, jointed, concretions	29	0	940	9
Black calcareous shale, jointed	3	0	911	9
Bluish-grey fragmental shale	2	6	908	9
Bluish-black calcareous shale, jointed	3	0	906	3
Grey clayey shale	0	3	903	3
Grey fragmental shale, slicken-sides	2	0	903	0
Grey and brownish-grey shale, fragmental	11	0	901	0
Chocolate and dark grey fragmental shale, slicken-sides	3	0	890	0
Grey fragmental shale	1	0	887	0
Grey cream shaly sandstone, rusty, jointed	1	0	886	0
Light grey sandy shale, jointed, some rust	3	6	885	0
Grey fragmental shale, concretions	3	0	881	6
Grey sandy shale	4	0	878	6
6 Sandstone, grey, cross-bedded, fossils, jointed, rusty	50	0	874	6
Grey fragmental shale	5	0	824	6
7 Sandstone, grey, fossils, cross-bedded, jointed, rusty	110	0	819	6
Grey fragmental shale	2	0	709	6
Grey sandstone, rusty, jointed	9	0	707	6

No.

	<u>Thickness</u>		<u>Total Thickness above base</u>	
	ft.	ins.	ft.	ins.
Grey fragmental shale	6	0	698	6
Grey sandstone, rusty, jointed	8	0	692	6
Grey fragmental shale	4	0	684	6
Grey sandstone, rusty, jointed	3	0	680	6
Blackish-grey shale	20	0	677	6
Grey clay	0	9	657	6
Grey sandy shale	1	0	656	9
Grey fragmental shale	3	0	655	9
Chocolate fragmental shale	2	0	652	9
Grey sandy shale	2	0	650	9
6 Sandstone, grey, rusty, cross-bedded, jointed, fossils	120	0	648	9
Dark grey fragmental shale, 2' at base almost black, sougex	9	0	528	9
Concretion bed	0	1	519	9
Dark grey fragmental shale	6	0	519	8
Light grey sandy shale, jointed	4	0	513	8
Concretion bed	0	6	509	8
Grey fragmental shale	2	0	509	2
Grey shale	0	2	507	2
Grey fragmental shale, concretion	0	7	507	0
Grey shale	0	4	506	5
Grey fragmental shale	1	3	506	1
Concretion bed	0	1	504	10
Grey fragmental shale	1	8	504	9
Dark grey fragmental shale, concretions	2	0	503	1
Dark grey fragmental shale, selenite, slightly calcareous	1	0	501	1

No.

	Thickness		Total Thickness above base	
	ft.	ins.	ft.	ins.
Bluish-grey fragmental shale, slicken-sides	2	0	500	1
Black shale, slightly calcareous, selenite	0	3	498	1
Bluish-grey clay, selenite, rust, fossils	1	0	497	10
Grey fragmental shale	0	6	496	10
Splint and shale, rust	0	1	496	4
Black clay	0	6	496	3
Grey clay, fossiliferous	1	0	495	9
Grey and chocolate fragmental shale, rust, concretions	9	0	494	9
Light grey sandy shale	2	6	485	9
Grey fragmental shale, rust, concretions to 1' in diam. in middle of bed	3	6	483	3
Bluish-grey limestone	0	1	479	9
Shale and splint	0	2	479	8
Black clay	0	3	479	6
Grey clay, fossiliferous	0	6	479	3
Grey fragmental shale, & separate 1" concretion beds	6	0	478	9
Bluish-grey limestone	0	1	472	9
Black and bluish-grey shale, fossils	0	4	472	8
Splint and shale	0	2	472	4
Light grey clay, fossils, carbonaceous material	1	0	472	2
Dark grey shale, slightly calcareous, fossils, slicken-sides	0	8	471	2
Concretion bed, calcite stringers, selenite, sulphides	0	1	470	6
Light grey fragmental shale	1	6	470	5
Concretion bed, calcite stringers, sulphides, selenite	0	1	468	11
Light grey fragmental shale, slicken-sides	0	5	468	10

No.

	Thickness		Total Thickness above base	
	ft.	ins.	ft.	ins.
Concretion bed, calcite stringers, sulphides, selenite, slicken-sides	0	1	468	5
Light grey fragmental shale	0	11	468	4
Concretion bed, rusty	0	1	467	5
Light grey fragmental shale, slicken-sides	0	8	467	4
Black shale and splint	0	1	466	8
Black clay, slicken-sides, selenite, carbonaceous material	1	0	466	7
Grey clayey shale, abundant fossils	2	6	465	7
Grey fragmental shale, shaly sandstone and sandstone	4	9	463	1
Dark grey limestone, laminated, top of bed rusty	1	8	458	4
Grey clay	0	1	456	8
Grey sandstone, slightly calcareous	0	3	456	7
Grey and black clay	0	2	456	4
Grey shaly sandstone	0	4	456	2
Soft clayey shale	0	4	455	10
Grey sandy shale	0	6	455	6
Concretion bed	0	4	455	0
Light grey sandy shale	1	1	454	8
Concretion bed	0	2	453	7
Grey fragmental shale	2	0	453	5
Light grey sandy shale, fossils, jointed	2	0	451	5
Grey fragmental shale, concretions	5	3	449	5
Dark grey shaly limestone	0	7	444	2
Grey clay	0	1	443	7
Bluish-grey limestone, jointed	0	2	443	6
Bluish-grey limestone, mud cracks on top of bed, jointed, laminated, was quarried	3	4	443	4

No.

	<u>Thickness</u>		<u>Total Thickness above base</u>	
	ft.	ins.	ft.	ins.
Bluish-grey fragmental limestone	0	3	440	0
Bluish-grey limestone, jointed, and cracks on top	2	2	439	9
Splint	0	1	437	7
Black shale with some splint	0	4	437	6
Grey to bluish-grey clay, weathers light, slicken-sides, rust	1	1	437	2
Black clayey shale, rust	1	5	436	1
Grey and black clay and clayey shale, some fossils	1	0	434	8
Light bluish-grey fragmental shale	4	0	433	8
Greenish-grey clay, fossiliferous	1	6	429	8
Light bluish-grey fragmental shale	3	0	428	2
Greenish-grey clayey shale, slicken-sides, fossiliferous	1	9	425	2
Splint, rusty, selenite	0	1	423	5
Greenish-grey and black clay, fossiliferous	1	0	423	4
Grey fragmental shale, fossils in lower 3', concretions above	7	0	422	4
Bluish-grey to black shale, fossiliferous	2	0	415	4
Splint, selenite, rust, some calcite	0	1	413	4
Black shale, some calcareous material, jointed	1	6	413	3
Light grey to black clay	1	0	411	9
Bluish-grey fragmental shale, concretions, slightly calcareous	9	0	410	9
Greyish-blue fragmental shale, slicken-sides, selenite	2	0	401	9
Concretion bed	0	1	399	9
Fragmental bluish-grey shale	1	0	399	8

No.		Thickness		Total Thickness above base	
		ft.	ins.	ft.	ins.
	Black clayey shale	0	9	398	8
	Grey, bluish-grey, chocolate and almost black fragmental shale, slicken-sides, some concretions	70	0	397	11
5	Sandstone, grey and buff, fossiliferous, cross-bedded, jointed, weathers brown, rust and almost black	90	0	327	11
	Bluish-grey fragmental shale, slicken-sides, lens	4	0	237	11
5	Sandstone, grey, cross-bedded, jointed, fossiliferous, ripple-marked	20	0	233	11
	Bluish grey fragmental shale, lens	6	0	213	11
5	Sandstone, grey, cross-bedded, jointed, fossils	35	0	207	11
	Bluish-grey fragmental shale	3	0	172	11
4	Sandstone, buff to grey, weathers brown, rust and almost black, cross-bedded, jointed, fossiliferous	25	0	169	11
	Bluish-grey fragmental shale	5	6	144	11
3	Sandstone, grey to buff, jointed, fossiliferous, rusty	30	0	139	5
	Bluish-grey fragmental shale, slicken-sides	2	6	109	5
	Sandstone, grey, fossils, jointed, rusty, concretions which weather out leaving a pitted surface	2	0	106	11
	Light grey fragmental shale	2	0	104	11
2	Sandstone, grey, rusty, jointed, fossiliferous	20	0	102	11
	Bluish-grey fragmental shale, lens	3	0	82	11
2	Sandstone, grey, rusty, jointed, fossiliferous	25	0	79	11
	Bluish-grey, chocolate and in places almost black shale, fragmental, some concretions	24	0	54	11

	<u>Thickness</u>		<u>Total Thickness above base</u>	
	ft.	ins.	ft.	ins.
Sandstone, grey, rusty, jointed	2	7	30	11
Grey fragmental shale	0	9	26	4
Grey shale	2	0	27	7
Concretion bed	0	1	25	7
Grey fragmental sandy shale, weathers buff or brown	3	0	25	6
Interbedded sandstone and shale, grey, cross-bedded, ripple-marked	4	0	22	6
Bluish-grey sandy shale, jointed, ripple-marked	7	0	15	6
Grey sandstone, jointed, rusty	3	0	11	6
Light bluish-grey sandy shale	3	8	8	6
Grey sandstone, ripple-marked, rusty	2	10	4	10
Bluish-grey shale	2	0	2	

1 Sandstone, buff to grey, weathers to rust and black, jointed.

Base

Base of section, marked by a cairn of stones on the road above the shore and by the word "BASE" and the initials "N.R.G." carved on the sandstone itself.