Copy 1
CX-COMOX 20 (1) A.

REPORTS ON A GEOLOGICAL EXAMINATION OF THE CUMBERLAND COALFIELD

BY JOSEPH DANIELS.

1920

MEMORANDUM REGARDING CONTACT LINE FROM BROWN'S RIVER TO THE TSABLE RIVER.

The geologic investigations made during the past few weeks have given considerable data on the position of the line of contact between the coal-bearing series of sedimentaries and the underlying crystalline rock or meta-volcanics from the Brown to the Tsable River. This information has been conveyed to the various maps of the areas.

As a general rule, the meta-volcanic hills stand out in prominent relief above the softer sedimentaries, and outcrops of trap are not so completely obscured by the surface mantle of drift or by timber. The coal-bearing series, however, has been subject to greater erosion and is usually covered by surface material. Except along water courses or in favourably exposed hillsides where the rocks are bared, the determination of the line of contact cannot be exact, but must be based somewhat on the topography of the immediate area under consideration. For these reasons, the contact as shown on the maps is, in many instances, indicative of a zone rather an exact line. The following explanations are given in order that the matter may be followed in detail.

Beginning at Brown's River on the north, the contact is clearly defined in the river bed close to the center line of Section 18 near a small creek which flows from the north. The line extends south westward along the river to a divide near the west line of Section 18 northwest of the summit of anderson Hill. From this divide a stream flows south-easterly to the Puntledge following a topographic depression between Anderson Hill and a ridge west of this stream. No contact is visible immediately adjacent to the water course, but in the ridge to the west, trap is reported by Mr. MacKenzie to outcrop within a relatively short distance.

The meta-volcanic rocks are visible along the creek which supplies water to No. 7 Mine in Section 5 and are again observed at the impounding dam on the Puntledge below Comox Lake. On the basis of these observations and the topography, the line of contact has been shown as extending from Brown's River to the Puntledge along the line of the valley of the creek to which reference has been made.

On the south side of Comox Lake the trap outcrops at the Lake immediately west of the road from Cumberland, approximately 1000 feet from the outlet of Coal Creek. This trap ridge is clearly marked west of Coal Creek valley to the road from Chinatown to the water-supply dam. At the outlet of Hamilton Creek the contact is well defined and follows the valley of Coal Creek to an un-named creek entering Coal Creek halfway to Allen Lake. The trap occurs on this creek within a few hundred feet of its mouth. The next prominent outcrops occur on the south side of Allen Lake just west of the prospect tunnel. Again, the line of contact is well defined from Comox Lake to this point. South of Allen Lake to the Trent the contact is obscured by the surface material so that the exact line cannot be determined with any degree accuracy. At the Trent River, the last observed outcrop of sandstone occurs above the falls near Survey Station 117. A concealed interval upstream of 800 feet elapses before the trap is seem, but it is believed that the actual contact is not far from Station 117 or 118. On the south branch of the Trent the contact is clearly defined about 1700 feet above the junction of the two streams. The line from Allen Lake to the Trent is based on general evidence rather than specific observed data.

On the west fork of Bradley Creek above the coal prospects on the

Perseverence Claim the contact is clearly marked, but in the country intervening between this point and the Trent no investigations were made. The projected line of contact in this area is based on the observations noted and on data from Suttion's Maps which are assumed, for the present, to be indicative of the general trend. The extension of the line of contact easterly to Bradley Lake is based on the observed contact just noted and the occurrence of trap bluffs on the west side of Bradley Lake. These latter have been accurately located in connection with the Tsable River surveys. This irregular swing of the contact does not appear to be normal, and the question suggests itself whether the normal contact line should not extend southeasterly from the Trent directly to Bradley Lake without any great irregularties. If this be the case, then the outcrops on the Perseverence Claim must be regarded as being in a secondary basin. This matter is discussed in the report on the Trent and Bradley area.

The contact from Bradley Lake to the Tsable River and its upper south fork has been determined with a fair degree of accuracy and is essentially correct. The contact in this area have been described in the Tsable River report and need not be repeated.

The contacts of the small basin known as the Hamilton Lake basin have not been defined. Referenve to this has been made in a separate memorandum.

Summarizing the situation, it appears that the line of contact extends from the western portion of Section 18 on Brown's River in a southeaterly direxion to the Puntledge River south of the outlet of the creek flowing from Anderson Hill, then follows the west bank of the Puntledge

to Comox Lake. On the south side of Comox Lake the contact follows the general course of Coal Creek to Allen Lake where it swings slightly to the south intersecting the Trent River above the lower falls 2,000 feet west of the Perseverence Trail. From the Trent, the line extends towards the northwest corner of Section 29 and irregularly swings south and to the west towards the head of the west fork of Bradley Creek. The trend from this point is easterly to Bradley Lake and then southeasterly to the Tsable River.

West of this line of contact no areas of coal-bearing sediments, with the exception of the Hamilton Lake basin, are known to occur. The body of Meta-volcanics is believed to extend to the chain of mountains making up the core of Vancouver Island and here locally known as the Beaufort Range.

"Joseph Daniels".

September 15th, 1920.

REPORT ON BROWN'S RIVER COAL AREA.

LOCATION:

The area described in this report includes Brown's River along Sections 18, 17 and 16 and extends south to the Puntledge River between the impounding dam at the outlet of Comox Lake to the bridge crossing near Bevan. Within this area the dominating topographic feature is Anderson's Hill, a ridge having a general north-west, south-east trend which rises fairly abruptly from the gently sloping surface north of Bevan to an elevation of 1126 feet. West and south-west of Anderson's Hill a depression or divide separates this ridge from the foothills of the Beaufort Range. Within the depression a creek flows south-east to the Puntledge, which flows northerly from Comox Lake to a point near its junction with this creek and then continues in a north-easterly direction. Brown's River, west of the summit of Anderson's Hill flows north-easterly and then swings to a general easterly course from the center of Section 18.

GEOLOGY.

Line of Meta-volcanic Contact.

The line of contact between the meta-volcanics and the overlying rocks follows the general depression already described. The observed contact on Brown's River is found near the center of Section 18 near a creek which flows from the north. The meta-volcanics make up the bed of Brown's River from this point to the falls near the south-west corner of Section 18. Trap is reported by Mr. McKenzie to outcrop on the slopes west of the creek in the depression. In the southern portion of the area trap outcrops along the creek which supplies water for Bevan, and is again observed at the site of the impounding dam. The line of contact, then, folows Brown's River south-westerly toward the depression and then follows a south-easterly course to Comox Lake.

The line, as shown on the map, is based on the topographic evidence as well as the known points of outcrop.

Sedimentaries:

The coal-bearing rocks are not clearly exposed along the Puntledge River in the portion of the area under discussion. Sandstones are exposed along the north bank above the diversion dam, and shaly sandstones appear near the bridge crossing. A coal seam can be seen in the river north of the fan shaft at No.7 Mine and the remains of an old prospect hole can be seen near by. No outcrops can be seen along the creek flowing into the Puntledge from the west side of Anderson's Hill.

The principal outcrops are along Brown's River where the rocks are continuously exposed from the center of Section 16 to the contact with the meta-volcanics. In the vicinity of Borehole 10 the river section is largely sandy shale up to a point approximately 1100 feet west, where the rock is massive sandstone. The overlying shales show marine fossils and are believed to represent the "lower shales", or barren measures, overlying the productive formation. The line of division, based on the occurrence of these fossils and the character of the shales, is in this vicinity. The river section from this point to the contact is largely made up of sandstone, both massive and shaly. Comparatively few beds of shale are present, and these are usually in association with the coal seams. The sandstone beds are responsible for the cliffs through which the river travels.

The strike of the measures is prevailingly north-west, varying from N 10° W to N 55° W. The dips are all eastward, but are variable in amount from 3° to 20°. Two small faults, with down-throw to the east were observed.

Two small, unimportant coal seams outcrop near the line between Sections 16 and 17. On the south bank of the river, 800 feet south east of

Borehole 118, a coal bed having a strike N 10° W and dip of 3° - 5° occurs. The section here is as follows:

Sandstone cliff.
Shale, sandy ..... 0' 6".
Coal, hard ..... 0' 9"
Coal ..... 1' 4"
Total ..... 2' 1"
Clay ..... 0' 1"
Shale, Black.

The bottom portion of the seam is not clearly exposed. The bed is exposed in the river for approximately 100 feet before it disappears and the bottom shale is visible at the bend of the river, nearly south of the borehole.

The section immediately west of Borehole 118 is sandstone under which a coal seam having the following section outcrops:

Sandstone.
Shale, black, hard ..... 0' 5½"
Coal, hard ..... 0' 8"
Shale, soft ..... 0' 6"
Shale, sandy ..... 1' 1"
Coal and bone ..... 0' 3"
Shale, sandy ..... 0' 4"
Coal, hard ..... 0' 8"
Total .... 3' 6"

Shale, sandy.
Sandstone.

The strike is N 55° W and dip 9° to the north-east.

The next outcrop of coal seen on the river is 800 feet east of the west line of Section 17. This seam is continuously exposed in the river and in the cliffs on the north side for a distance of 1500 feet. The measured section at the lowest point is as follows:

Sandstone.
Shale, sandy, grey.
Shale, sandy, with coal streaks..... 6' 0"
Coal ..... 0' 2"
Shale ..... 0' 2"
Coal ..... 0' 8"
Shale ..... 0' 7"
Coal ..... 0' 9"
Shale ..... 0' 4"
Coal ..... 1' 4"
Total ..... 4' 0"
Shale ..... 1' 4"

The strike is N 45° W and the dip 3°. The prospect tunnel on the north bank of the river on the line between Sections 17 and 18 yields the following section:

Shale, black.		
Coal	0'	4"
Shale	0'	1"
Coal	0'	9"
Shale	0'	7"
Coal	1'	0"
Shale	0'	4"
Coal	1'	2"
Total	4'	3"

The strike here is N 40° W and the dip is the same as before, 3°. The low dip and the grade of the river bed are responsible for the continuous exposure of this seam. South-west of the prospect opening at a distance of approximately 600 feet, this seam appears at the top of the north bank of the river, about 60 feet above the bed. The cliff here shows the following approximate section, beginning at the top with the seam just described:

Coal	4'	0"
Sandstone, massive ....20'		0"
Coal and shale bed	4'	0"
Sandstone shaly & massive18'		0"
Shale, with streaks of coal	2'	0"
Sandstone	2'	0"
Shale grey	3'	0"
Shale, sandy	3'	0"

The shale bed with occasional streaks of coal lying in, is not a true seam at this point. It is noted at the bend of the river, south of the position just described and again immediately north, at an outcrop approximately 1100 feet west of the prospect tunnel. The strike is N 10° W and the dips are 10° and 14° at the two exposure.

At a point 1000 feet east of the center of Section 18, a peculiar outcrop of shale and coal occurs in the south bank of the river. The bed is

bent or folded over and is overlain by sandstone but underlain by an apparent tongue of igneous rock, apparently porphyritic dacite. The bed is impure and consists of a mixture of coal, shale, and sand, and its folding appears to be due to the intrusion of the crystalline rock beneath, probably a tongue from the main mass of Anderson's Hill.

A thin bed of coal appears at the point where the river channel begins to take a south-westerly course. The strike is variable from N 5° E to N 5° W and the dip varies from 11° - 15°. The section is as follows:

Sandstone.
Shale and bone ..... 0' 3"
Coal, hard ..... 1' 5"
Total ..... 1' 8"
Sandstone ..... 0' 6"
Sandstone, shaly.

Overlying this seam is a small bed of coal 6 inches thick which appears to be in a roll. Its strike is N 20° W and its dip 11° to the east.

Further upstream another small band of coal and some shales outcrop. These are followed by a coal seam which has been reported to be 2' 6" thick, but which was inaccessible for measurement. Only 12 inches of clean coal was seen in the bed, which appeared to be largely shale and bone. The strike of the bed is N 40° - 45° W and it dips 15° to the east.

At a distance of 200 feet upstream from this coal seam the meta-volcanic rocks appear in the bed of the river. A small creek flows into the river from the north, in trap. The river bed is in trap all the way to the end of the section studied, at the falls near the south-west corner of Section 18. In the cliffs on the east side of the river sedimentaries could be observed at some points, but the river bed is in trap and undoubtedly marks the line of contact. Near the end of the traverse, two coal seams are visible on the east bank. These have been opened by prospect tunnels, only the lower of which could be entered. The section of this seam is as follows:

Shale, nodular.

Coal, firm	1'	2"
Coal and shale, dirty	0'	10"
Coal, hard	0'	10"
Coal, soft	0'	7"
Shale	0'	6"
Coal, hard	0'	2"
Shale	1'	5"
Coal, hard	0'	8"
Total	6'	2"

Shale, black.

The strike appears to be N 10° E and the dip very low to the east.

The coal at the upper tunnel is approximately 7' 0" thick, made up of several bands of coal and shale with a roof of sandstone. This material had caved into the opening making it impossible to get a detailed section of the seam.

In the highest cliffs east of the river and south of the prospect tunnels, sheets of a greyish-white rock were observed. Broken masses in the river, believed to have come from these cliffs, are dacite.

Dacite.

In addition to the meta-volcanics and the sedimentaries, a third type of rock is found in this area. This rock resembles a granite but differs in certain essential characters. Field study indicates that it is dacite or dacite prophyry. Anderson's Hill appears to be largely made up of this rock but the exact limits of the body of dacite and its distribution with respect to the adjacent sedimentaries is not known. It outcrops boldly in the cliffs above the head of Brown's River and clearly along the summit of Anderson's Hill. Small exposures are seen on the west side of Anderson's Hill and float rock on the east slope. Boreholes 137 and 138 encountered the rock at the surface and Borehole 135 records 2' 8" of "granite", the local name for the dacite, lying between the benches of the lower coal seam at a depth of 138' 4" below the surface, and elevation of 322.67 feet. The rock underlying the altered coal seam on Brown's River appears to be dacite, although differing somewhat in type from that seen at the other localities.

The borehole records for Holes 137 and 138 show the dacite resting on top of the coal-bearing rocks. The general field relationships suggest that the greater portion of the mass of dacite rests upon the sedimentaries and that it has invaded or intruded the coal-bearing series in at least two known places. The body of dacite probably represents a surface flow or sheet from which tongues or stringers have worked their way between the beds of the underlying sedimentaries, but whether the main mass was poured out on an original erosion surface as a true surface flow or whether it is the remains of a laccolith or sill from which the overlying sediments have been eroded cannot be determined from the meagre data at hand. The dacite, is, however, the most recent rock in the area and is probably Tertiary in age.

The principal effect of the outflow of the dacite on the coal-bearing

rocks may be considered from two angles:- first, as limiting the area of workable or accessible coal; second, the influence of the intrusive material on the quality of the coal. If the dacite of Anderson's Hill largely represents a surface flow, the underlying area should be largely the same structurally as it was before the extrusion of the crystalline rock, and the dacite simply represents a cover or capping which must be pierced if operations are to be conducted from the surface within its area. Tongues or stringers into the beds may alter the structure, just as in the case of the outcrop on Brown's River. The metamorphic effect on the quality or rank of the coal is generally to decrease the amount of volatile matter and to relatively increase the fixed carbon content within the immediate area of influence.

So far as can be determined from the brief examination of the area, the coal-bearing formation is believed to extend under Anderson's Hill from the Puntledge to the Brown without serious break or disturbance, but this belief can only be proved by drilling because the exact structure and relationship of the dacite to the sedimentaries are masked. No attempt has been made to outline the limits of the dacite body on the map of this area. A tentative boundary, following the 650 feet contour from the vicinity of Boreholes 137 and 138 north-westerly, then gradually rising to intersect and follow the 900 feet contour beyond the summit of Anderson's Hill toward Brown's River, is suggested.

Coal Seams:

The area north and north-west of Number 7 Mine, immediately beyond the mine workings, has been prospected by a number of drill holes. The lower seam in the mine is known to be shaly and bony, particularly in the west level workings, and to be rather thin. The indentification of this seam in the

borehole records is fairly complete, but the coal is variable in thickness and in quality. Few of the records indicate coal of commercial importance and the general results are very unfavorable. It does not appear that workable coal exists over the area included within these boreholes.

Along Brown's River three boreholes have been sunk. These show the same section revealed by the river traverse but do not indicate that the seams in depth improve in thickness over the measurements made along the river. The prospect tunnels do not show commercial seams. North of Brown's River a number of scattered holes have been drilled in the area toward Dove Creek. These records also yield discouraging information.

The general conclusion regarding the Brown's River area is that it is not an area in which seams of coal of present commercial worth may be found. An area in the vicinity of the summit of Anderson's Hill has not been prospected, but it is questionable whether this area will yield good coal.

SUMMARY:

The contact between the meta-volcanics and the younger rocks resting on it follows a south-westerly course in the upper reaches of Brown's River then extends south-easterly along a depression, which separates Anderson's Hill from the foothills of the Beaufort Range, to the Puntledge River and Comox Lake.

West of the line of contact, Anderson's Hill, a ridge formed by a geologically recent outflow of dacite, occupies a large portion of the area between the Puntledge and the Brown. No sedimentary rocks are exposed in the upper elevations of Anderson's Hill, but drill holes in the southern portion reach the coal series after passing through a capping or cover of the dacite. Puntledge River gives but little exposure of sedimentaries, but the Brown yields practically a complete section from

the shales overlying the productive formation to the underlying trap. This section is similar in general relationships to the sections along the Trent, Bradley Creek, and Sable River, but there appears to be a greater preponderance of massive sandstone. Several seams of coal are exposed, but these are made up of relatively thin bands of coal separated by shale layers.

North of the workings in Number 7 Mine in the flatter country east of Anderson's Hill, a number of boreholes have shown the presence of sedimentaries away from the dacite mass. The borehole record indicates an irregular trap surface and a warped structure of the coal series, although the general north-westerly strike and north-easterly dip prevail over the field as a whole.

The exact structural relationships between the meta-volcanics, dacite, and sedimentaries have not been determined, but it is believed that the dacite forms a mantle of limited superficial area over the sediments resting on the meta-volcanics floor. No clue as to the point of origin of the dacites was available.

The field evidence, supported by that from the borehole records over the area prospected, indicates that the Brown's River field is very unpromising as a source of commercial coal. No thick seams are found; the coal beds contain too great a proportion of shale and bony material to make them of present value; and the area appears to have the same structural irregularities which characterize the west side workings in Number 7 Mine.

"Joseph Daniels".

September 17th, 1920.

MEMORANDUM REGARDING HAMILTON LAKE COAL AREA.

The Hamilton Lake coal area lies southwest of Cumberland in the range of hills of meta-volcanics which extend from the Trent River on the south to Comox Lake on the north and which have Coal Creek as their general eastern boundary. The elevations are moderately high over the area, ranging from 1800 to 2000 feet in the vicinity of Hamilton and Stevens Lakes, as a maximum to approximately 1500 feet in the vicinity of the Trent River. The boundaries and extent were not determined in the course of the examination, but the area appears to form a relatively small, isolated basin, having a major axis extending south-east from Hamilton Lake towards the Trent and a shorter axis at right angles to this line.

The drainage of the area is not fully known. The chain of lakes and creeks which furnish the Cumberland water supply extend from Stevens Lake on the western side of the basin to Hamilton Lake and Hamilton Creek on the north. In the southern portion, at least two creeks, not named flow southerly to the Trent. Another un-named creek heads near the center of the area and flows north-easterly to Coal Creek which it joins at a point approximately half way between Hamilton Creek and Allen Lake.

The principal route of access to the area is by trail from China-town at Cumberland to the dams at Hamilton creek. This trail roughly follows the creek to a point half way between dams One and Two, then it swings away from the creek and intersects Hamilton Lake on the north side, near dam Three. The extension of this trail follows around Hamilton Lake and parelleas the upper portion of Hamilton Creek to Stevens Lake where it ends.

Traverses were made along this trail and along Hamilton Creek to

Shale, massive and nodular, sandy	12'	0"
Shale, black, foliated	0'	3"
Coal, hard	2'	0"
Shale, hard	0'	2"
Coal, hard	1'	0"
Total	3'	5"

Shale, sandy, black.

The section of the upper seam was measured in a short prospect opening. The intermediate seam has been opened by a prospect in the lower4' 6" of the exposed bed. The bottom bed was measured in the bank, which is caved; for this reason it is not certain whether the entire section was visible. The general strike is north-south and the dip is low 4^{0} to 6^{0} to the east.

Just below the dam is an old prospect opening, presumably on the lower seam, butthis is caved and inaccessible for observation. The contact between the coal series and the meta-volcanics is visible in the creek bottom and in the exposed rock along the dam-site within a few feet of the coal outcrops.

Along the creek which empties from Stevens Lake into Hamilton Lake, sandstones, shales and fine grained conglomerate was visible for 1500 to 2000 feet from the outlet. The strike averages N 40^{0} -50^{0} W and the dip, where observed, was 20^{0} to the north-east. The trap contact then follows the creek to the upper lake. In the lower portion of the creek, the sedimentaries appear to extend for a short distance to the north-west but they are soon cut off by the crystalline rock. In general the contact is along the creek.

Immediately south of Stevens Lake no further outcrops of sedimentaries are visible but occasional float sandstone was seen near the western line of Lot 25. From this point the south-easterly traverse was entirely in trap

Stevens Lake. From Stevens Lake a traverse was made south-easterly to the creeks which flew into the Trent. Another traverse was made from the Perseverence Trail and the branch of Coal Creek south of Allen Lake westerly to the creek already described as flowing into Coal Creek north of Allen Lake. This creek was followed to its outlet. In these traverses all of the rock encountered, with the exception of two areas, was meta-volcanics or "trap". No connection was found with the coal-bearing series to the eastward, proving the belief that the basin is isolated and detached from the main coal areas.

In detail, the following observations were made. The bed of Hamilton Creek from its junction with Coal Creek to the south dam at the outlet of Hamilton Lake is in trap with the exception of a small outcrop of sandstone and shale noted on the south side of the creek at a point 2000 feet below the outlet of No. 3 Dam. This outcrop extends approximately 200 feet along the bank of the creek but is cut off by the trap on the east and west sides. The observed strike was N 65° W and the dip 14° to the north-east.

At the outlet of Hamilton Lake, south of the dam, is a low cliff made up of sandstone, shale and coal. The section from the top down is as follows:

Massive whitish sandstone.		
Black, sandy, foliated shale ..... 5' 0"		
Coal and shale, dirty	0'	5"
Coal, hard	0'	7"
Shale, soft	0'	5"
Coal, hard	2'	6"
Total	3'	11"
Black, sandy, foliated shale ..... 6' 0"		
Coal and shale, dirty.....	0'	8"
Coal, clean	0'	8"
Shale, brown	0'	8"
Coal, hard	2'	0"
Shale and bone	1'	0"
Coal	1'	6"
Total.....	6'	6"

until the easterly of the two small creeks flowing toward the Trent was reached. In this creek, black shales and float coal were observed. Easterly from this creek to the Perseverence Trail outcrops are obscured by the surface material and few exposures were seen. These, however, were trap.

The traverse down the creek which flows into Coal Creek between Allen Lake and Hamilton Creek was entirely in the volcanics. The headwaters of this creek were not examined, however, and there is a possibility that the stream may cut into the western margin of the basin. This should be investigated.

From the foregoing, it can be seen that the only definite information available about this basin is the data from the outcrops near Hamilton Lake. On the assumption that there is a continuous belt of sedimentaries from this locality to the shale outcrops on the creek near the Trent, the maximum length of the basin cannot be estimated as greater than 1½ miles. The width is even more difficult to estimate, bit it probably does not average more than one-half mile. On these assumptions, the area of the basin is approximately 500 acres.

This basin appears to justify sufficient preliminary investigation to determine its limits. To this end a series of survey lines should be carried across it to serve as bases from which prospecting can be carried on. As a suggestion, a line extending the Trent River survey to the tributary creeks referred to in this report, then following these creeks to their beds, and from here tying into the Hamilton Lake survey, would form one link. Another line from Coal Creek up the creek emptying into it north of Allen Lake, then swinging to the eastward to tie in with the Perseverence Trail survey would cross the eastern margin of the belt and form another link. The boundaries of the contact should then be determined and the basin itself prospected in

a manner governed by the information obtained. The preliminary prospecting, after the lines have been surveyed, should not take very long to complete. This program is recommended in order that accurate information may be available as a basis for further action.

"Joseph Daniels",

September 15th, 1920.

MEMORANDUM REGARDING AREA SOUTH OF CUMBERLAND TO ALLEN LAKE.

In the area south of Cumberland between the Sutton Road on the west and Coal Creek on the east extending to the Lewis Trail and Allen Lake detailed study of the geology was not made, but a few observations were noted and these are submitted for record.

West of Sutton's Road, low hills of sandstone rise above a swamp and the valley of a small stream which flows northerly toward Cumberland. Sandstone is exposed near the summit of the Lewis Trail and at the intersections of the trail and the small creeks which flow into Allen Lake. A prospect tunnel on the south side of Allen Lake has been driven on the lowest seam in the basin directly overlying the trap. The strike of the seam here is N 50° W and the dip is 15° - 20° to the north-east. The section of the outcrop is as follows:

Shale, foliated, black ..... 5' 0"		
Coal and shale	0'	6"
Shale	0'	1"
Coal, hard	1'	10"
Shale, hard	1'	7"
Coal, hard	1'	0"
Shale, soft	0'	2"
Coal, hard	1'	6"
Total	6'	8"
Shale.		

The opening has been driven in the lower 6 feet of the coal for 150 feet. A few feet of underlying measures are seen on the creek above the tunnel, but these soon disappear under the cover of surface material. Trap appears on the hillside west of the creek and extends to the south margin of the lake where it forms steep bluffs.

At the outlet of Allen Lake sandstone and shale appear on the north bank of Coal Creek. The strikes here are N 35° - 50° W and the dips from 10° to 20°. These outcrops extend for 800 feet along the creek and

disappear. The hill south of Coal Creek is trap. On the traverse down Coal Creek at the falls, massive sandstone outcrops. The strike here is N 40° W. At the point marked "Old Mine" a slope appears to have been driven into a seam which outcrops on the bank. The section cannot be measured, but the coal is at least 3 feet thick. The bearing of the slope is N 40° E which gives an assumed strike of N 50° W. One hundred feet downstream from the old slope, the meta-volcanics outcrop in the creek bottom and are exposed all the way to Hamilton Creek, the contact line following the course of Coal Creek. At the highest cliffs, the bank exposes a section nearly 100 feet high, made up of approximately 25 feet of sandstone on top and a series of shales and coal seams below to the trap contact. The strike here is N 35° W. At least eight irregular coal seams can be counted in the section. Further down stream, sandstones and shales occur and there is some evidence of a roll or a fault here. The strike here is N 30° W and the dip variable from 20° to 25°. A prospect slope sunk on coal further downstream has a bearing N 60° - 65° E and a dip of 30°. This indicates a strike of N 25° - 30° W. The section here is:

Shale.
Shale and coal ..... 0' 6"
Coal, hard ..... 3' 0"
Shale.

Number 2 Slope, the old mine near Coal Creek at Chinatown was opened on one of the seams exposed in the Coal Creek section. Number 3 tunnel developed an overlying seam, but there is no data regarding these workings.

In the block or area extending south of number 6 shaft very little data is available about the occurrence of coal and the structure except that already noted along the Coal Creek traverse and the information from the

records of two boreholes, numbers 139 and 19, immediately south of the shaft. The lower seams shown in these holes are thin and broken by shale partings. This evidence, together with that of the mine workings, is highly unfavorable, but it should not be accepted as final and determinative for the large area which remains unproved. It would appear desirable to explore this territory to secure accurate data on which to base a definite conclusion regarding the commercial possibilities of the area. Until this is done, all opinions are matters of conjecture rather than scientific evidence.

"Joseph Daniels".

September 16th, 1920.

REPORT ON THE TRENT RIVER AND BRADLEY CREEK AREA.

LOCATION.

The area described in this report includes that portion of the Comox Basin north and west of the Tsable River field from the vicinity of Bradley Lake to the Trent River. Bradley Creek flows out of Bradley Lake north-westerly across the Perseverence Claim, then bends to the north-east and ultimately joins the Trent. A fork of the Bradley flows north-easterly across Section 20 and joins the main stream about 3,600 feet below Bradley Lake. The Trent River flows in a general north-easterly direction across the strike of the sedimentary series of rocks. It is joined at the Perseverence Trail crossing by a south branch. Within the territory embraced by this drainage area the crystalline rocks and the overlying productive group of sedimentaries are exposed.

GEOLOGY.

Line of Contact.

The contact between the meta-volcanics and the coal-bearing series was observed at but four localities within the area. At Bradley Lake cliffs of trap are exposed near the north end on both the east and west sides. Near the south-west corner of Section 20 at the head of the west fork of Bradley Creek, the meta-Volcanics are exposed above the short prospect tunnel. No attempt was made to trace the contact north from this point because of the limited time available for field studies. The next observed outcrops of trap are on the south fork of the Trent 2000 feet above its junction with the main stream, and on the main strea, 3000 feet west of the junction near Survey Station 124. Near Allen Lake, the meta-volcanics are exposed in the cliff on the south side of the lake within a few hundred feet of the prospect tunnel. The Line of contact is thus established with a fair degree of accuracy from Allen Lake to the south fork of the Trent, and from Bradley Lake to the head

of the west fork of Bradley Creek. Within the limits of the Perseverence Claim, the line of contact has been reproduced from office data supplied by Sutton's maps, but this contact must be regarded as tentative and approximate only.

There is some reason to believe that the Perseverence Claim locality may be a separate small field or basin and that the main line of contact may lie to the eastward of the line marked. The basis of this hypothesis is the data from Boreholes 3 and 4 which lie east of the Perseverence Claim. In Borehole 3, the trap is reported as lying 818' 9" below the surface at elevation 95.25 feet; in Borehole 4 the trap was encountered 176' 4" below the surface at elevation 784.7 feet. The rapid rise in the topography of the trap surface is significant and suggests the possibility of the meta-volcanics lying close to the surface along the north line of Section 20. No outcrops are visible along Bradley Creek in the southern portion of Section 29 or the northern portion of Section 20 to the junction of the two branches where a small exposure of sandstone is observed in the creek bed. In this concealed area it is possible that the trap may extend across toward Borehole 4 within a relatively short distance below the surface, forming the margin of a basin which extends to the south-west. This is suggested as a tentative theory. Careful field study of district in detail will indicate the exact situation.

On the basis of the field observations, the contact line is indicated as having a fairly uniform south-easterly trend from Allen Lake to Section 29, then swinging southerly to the head of the west branch of Bradley Creek, and easterly to Bradley Lake.

Sedimentaries:

The "lower productive formation" is best exposed on the Trent River and its branch. The Bradley Creek section is incomplete because of intervals

in which outcrops are concealed. The group of shales, overlying the lower productive formation is well shown on the Trent and to a lesser degree on the Bradley.

As in the other portions of the Comox Basin, the lower productive formation, in which are found the coal seams, consists essentially of sandstones and shaly sandstones with some small beds of shales, argillaceous and sandy, all lying directly on the floor of meta-volcanics. The "lower shales", locally referred to as "marine shales", overly these and are barren of coal seams. The geological map shows the distribution of the individual beds and indicates the strikes and dips. The strikes are uniformly to the north-west and the dips are to the north-east at moderate angles. The maximum dip observed was 50° at the coal outcrop near the junction of the forks on the Trent, but this appears to be unusual as the dips of the overlying and underlying beds never exceed 20°. The average dip is 10°.

Bradley Creek Section.

The exposed section on the Perseverence Claim is best seen on the west fork of Bradley Creek in the southern part of Section 20. The meta- volcanics are exposed near the head of the creek and immediately overlying is a seam of coal which has been opened by a short prospect tunnel bearing S 20° E. The section at this point is as follows:-

Shale, sandy, black		
Shale and coal dirty ..... 3' 0".		
Coal	0'	8"
Shale and coal streaks	0'	4"
Coal, hard	0'	11"
Shale, hard	0'	6"
Coal, hard	1'	0"
Shale, hard	0'	9"
Coal, hard	1'	0"
Total	5'	2"

Shale, Black ..... 1' 0" .
Sandstone.

The strike of this seam is north-south and dip 15° - 20° to the east.

The next important seam noted lies at the foot of a fall in the creek and is partially obscured. The measured section is:

Sandstone	15'	0"
Sandstone, shaly, and shale	6'	0"
Shale parting, black		
Coal	0'	3"
Shale	0'	3"
Coal	1'	6"
Shale	0'	2"
Coal ..... (at least)	0'	8"
Total	2'	10"

Sandstone.

The strike is N 5° W. Dip 10°, north-east.

Near the old Sutton cabin, the last seam noted outcrops above some shales.

Sandstone.
Shale.

Coal	1'	6"
Shale, hard	0'	6"
Coal hard.....	0'	7"
Total	2'	7"

Shale, Black
Shale, sandy.

The dip of this coal is variable, ranging from 5° to 20° along the exposed section. The strike is N 10° W.

Proceeding downstream, the measures are concealed practically all the way to the bend in the creek in Section 29. From this point to the crossing of the Perseverence Trail, three unimportant small seams are exposed in a belt of sandstone and conglomerates. Below the trail crossing, on the west bank of the creek is a prospect opening. The section is as follows:-

Sandstone, shaly,
Shale parting, black.

Coal, hard	1'	9"
Shale, hard	0'	2"

Coal	1'	8"
Total	3'	7"

Shale.

Sandstones extend along the creek for a distance, then follows a concealed interval, and sandstones recurring to the vicinity of some falls where the beds become prevailingly shaly. Although not accurately determined, because of no survey lines along the creek, the line marking the division between the productive measures and the overlying barren shales is in the vicinity of these falls.

Trent River Section.

The Trent River section was surveyed for a considerable distance above the observed contact in order to make certain that no areas of sedimentaries occurred west of the known line. The most easterly exposure of meta-volcanics is found in the bed of the main stream 3000 feet west of its junction with the south fork. Below this is a concealed area, covered with trap boulders, for 800 feet. Succeeding the concealed area, sandstone outcrops and forms the bed of the river to the falls. The lowest seam of the productive formation is not seen in this section, but it is believed to lie in the concealed area between the trap and the sandstone.

In the stretch of the river between the falls and the Perseverence Trail crossing, sandstone is the predominating rock, with some small interlying beds of sandy shale. But two important seams of coal are visible. The lower of these, stratigraphically, is seen in the cliff along the river approximately 1350 feet above the trail crossing. The section is as follows:

Sandstone.
Shale, sandy ..... 8' 0".

Coal	1'	7"
Shale	0'	5"
Coal	0'	5"
Total.....	2'	1"

Shale, Black
Shale, sandy.

The strike of this seam is N 45° W and the dip from 15° to 20° to the north-east. The bed can be seen in the cliffs on each side of the river rising toward the west.

Just above the junction of the two branches of the Trent a thick seam stands out in the small triangle of rock between the two streams. The section is somewhat concealed but is essentially as follows:-

Shale.		
	Coal	1' 0"
	Shale, black	0' 6"
	Coal, hard	1' 6"
	Total	3' 0"
Shale	2' 6"	
	Coal	0' 8"
Shale	2' 6"	
	Coal	1' 0"
Shale.		

The strike is N 50° - 60° W and the dip is high, 50°, to the north-east, This bed is exposed on its strike above this point in the river bottom.

The south fork section from the meta-volcanics to the seam described above is essentially the same as that of the main stream.
The trap, exposed at a point 2000 feet from the junction, is succeeded by a concealed interval for 400 feet, followed by a regular sandstones and associated beds of shale and coal. Between the 2' 1" seam and the 3' 0" seam at the junction, a small seam of coal 8" to 10" thick outcrops in a sandstone bed overlying the 2' 1" seam.

Below the junction, three small seams outcrop in the river section. These seams are all small, ranging from 12" to 16" in thickness. Then strikes and dips are regular. At a point approximately 1000 feet south-west of the crossing of Suttons' Road is the division between the sandstone of the productive group and the overlying shales. The shales are well marked in the river and extend from this point below Sutton's Road where the traverse

of the river ended. The shales are also visible for a short distance, along Sutton's Road north-west of the river.

No outcrops of rock are visible along the Perseverence Trail until the Lewis Trail is reached. Here sandstones are observed. Along Coal Creek, west of the trail, a prospect tunnel was opened in a seam lying below sandstone. The strike here is N 10° - 15° W and the dip 10° -15° to the north-east. Only 12" of coal was visible, but the seam is believed to be much thicker. At Allen Lake a tunnel has been driven for 150 feet along a seam whose section is as follows:-

Shale, hard, black	5'	0"
Coal and shale	0'	6"
Shale	0'	1"
Coal, hard	1'	10"
Shale, hard	1'	7"
Coal, hard	1'	0"
Shale, soft	0'	2"
Coal, hard.....	1'	6"
Total.....	6'	8"

Shale.

The tunnel has been driven in the lower 6 feet of coal. The strike of the coal is N 50° W and the dip is 15° - 20°. This seam appears to be the bottom or lower seam of the Comox Basin.

Correlation:

Correlation of individual seams over the area between the Trent River and Bradley Creek is practically impossible. Only general relations dips of the beds as a whole can be determined from the available data.

SUMMARY:

The line of contact between the coal measures and the underlying meta-volcanics is well defined at four localities, namely, at Allen Lake, on both branches of the Trent River, at the head of the west fork of Bradley Creek, and at Bradley Lake. The line appears to have a regular south-easterly

trend from Allen Lake to the northern portion of Section 20, but from here it is irregular to Bradley Lake. This irregularity may be due to the occurrence of a small field in Section 20 which is separate from the main basin further east.

Bradley Creek does not give a continuous series of exposures of the coal-bearing rocks. The lower seam of the productive formation has been opened by a prospect tunnel at the head of the west fork, and several smaller seams outcrop on the branch and on the main creek, but there is considerable area over which the measures are concealed. Borehole 4 shows a few feet of sedimentaries, which can be correlated with the outcrops in the northern part of Section 29. The trap here lies 176' 4" below the surface. Borehole 3 shows the general series similar to the outcrops on the creek north and east of the Perseverence Trail crossing, but only general relationships can be deduced. The line of division between the lower productibe formation and the overlying barren shale formation is believed to occur near the falls on the creek.

The Trent River reveals a fairly continuous section from the meta-volcanics to the barren shales. The lowest seam of the basin appears to be concealed in the river bottom, but the overlying seams are well exposed. The strikes are uniformly to the north-west and the dips regular to the north-east, the average range of dip ranging from 10° to 20° with the exception of one high dip at the junction of the branches of the Trent. Practically no faulting was observed in the section.

The structure of the area appears to be regular from Allen Lake south-easterly to the vicinity of Section 29. In the block, known as the Perseverence Claim, the general north-wasterly strike and north-easterly

dip prevails, but the continuity of the beds is not definitely established.

Practically no prospecting has been done in this area, and portions of it have not yet been accurately surveyed. In the absence of sufficient data, very little light can be thrown on detailed structure or correlation.

"Joseph Daniels".

September 18th, 1920.

Copy 3
Cumberland Coalfield
- 1920 -

MEMORANDUM REGARDING CONTACT LINE FROM BROWN'S RIVER TO THE TSABLE RIVER.

The geologic investigations made during the past few weeks have given considerable data on the position of the line of contact between the coal-bearing series of sedimentaries and the underlying crystalline rock or meta-volcanics from the Brown to the Tsable River. This information has been conveyed to the various maps of the areas.

As a general rule, the meta-volcanic hills stand out in prominent relief above the softer sedimentaries, and outcrops of trap are not so completely obscured by the surface mantle of drift or by timber. The coal-bearing series, however, has been subject to greater erosion and is usually covered by surface material. Except along water courses or in favourably exposed hillsides where the rocks are bared, the determination of the line of contact cannot be exact, but must be based somewhat on the topography of the immediate area under consideration. For these reasons, the contact as shown on the maps is, in many instances, indicative of a zone rather an exact line. The following explanations are given in order that the matter may be followed in detail.

Beginning at Brown's River on the north, the contact is clearly defined in the river bed close to the center line of Section 18 near a small creek which flows from the north. The line extends south westward along the river to a divide near the west line of Section 18 northwest of the summit of anderson Hill. From this divide a stream flows south-easterly to the Puntledge following a topographic depression between Anderson Hill and a ridge west of this stream. No contact is visible immediately adjacent to the water course, but in the ridge to the west, trap is reported by Mr. MacKenzie to outcrop within a relatively short distance.

The meta-volcanic rocks are visible along the creek which supplies water to No. 7 Mine in Section 5 and are again observed at the impounding dam on the Puntledge below Comox Lake. On the basis of these observations and the topography, the line of contact has been shown as extending from Brown's River to the Puntledge along the line of the valley of the creek to which reference has been made.

On the south side of Comox Lake the trap outcrops at the Lake immediately west of the road from Cumberland, approximately 1000 feet from the outlet of Coal Creek. This trap ridge is clearly marked west of Coal Creek valley to the road from Chinatown to the water-supply dam. At the outlet of Hamilton Creek the contact is well defined and follows the valley of Coal Creek to an un-named creek entering Coal Creek halfway to Allen Lake. The trap occurs on this creek within a few hundred feet of its mouth. The next prominent outcrops occur on the south side of Allen Lake just west of the prospect tunnel. Again, the line of contact is well defined from Comox Lake to this point. South of Allen Lake to the Trent the contact is obscured by the surface material so that the exact line cannot be determined with any degree accuracy. At the Trent River, the last observed outcrop of sandstone occurs above the falls near Survey Station 117. A concealed interval upstream of 800 feet elapses before the trap is seen, but it is believed that the actual contact is not far from Station 117 or 118. On the south branch of the Trent the contact is clearly defined about 1700 feet above the junction of the two streams. The line from Allen Lake to the Trent is based on general evidence rather than specific observed data.

On the west fork of Bradley Creek above the coal prospects on the

Perseverence Claim the contact is clearly marked, but in the country intervening between this point and the Trent no investigations were made. The projected line of contact in this area is based on the observations noted and on data from Suttion's Maps which are assumed, for the present, to be indicative of the general trend. The extension of the line of contact easterly to Bradley Lake is based on the observed contact just noted and the occurrence of trap bluffs on the west side of Bradley Lake. These latter have been accurately located in connection with the Tsable River surveys. This irregular swing of the contact does not appear to be normal, and the question suggests itself whether the normal contact line should not extend southeasterly from the Trent directly to Bradley Lake without any great irregularties. If this be the case, then the outcrops on the Perseverence Claim must be regarded as being in a secondary basin. This matter is discussed in the report on the Trent and Bradley area.

The contact from Bradley Lake to the Tsable River and its upper south fork has been determined with a fair degree of accuracy and is essentially correct. The contact in this area have been described in the Tsable River report and need not be repeated.

The contacts of the small basin known as the Hamilton Lake basin have not been defined. Reference to this has been made in a separate memorandum.

Summarizing the situation, it appears that the line of contact extends from the western portion of Section 18 on Brown's River in a southeasterly direction to the Puntledge River south of the outlet of the creek flowing from Anderson Hill, then follows the west bank of the Puntledge

to Comox Lake. On the south side of Comox Lake the contact follows the general course of Coal Creek to Allen Lake where it swings slightly to the south intersecting the Trent River above the lower falls 2,000 feet west of the Perseverance Trail. From the Trent, the line extends towards the northwest corner of Section 29 and irregularly swings south and to the west towards the head of the west fork of Bradley Creek. The trend from this point is easterly to Bradley Lake and then southeasterly to the Tsable River.

West of this line of contact no areas of coal-bearing sediments, with the exception of the Hamilton Lake basin, are known to occur. The body of Meta-volcanics is believed to extend to the chain of mountains making up the core of Vancouver Island and here locally known as the Beaufort Range.

"Joseph Daniels".

September 15th, 1920.

REPORT ON BROWN'S RIVER COAL AREA

LOCATION:

The area described in this report includes Brown's River along Sections 18, 17 and 16 and extends south to the Puntledge River between the impounding dam at the outlet of Comox Lake to the bridge crossing near Bevan. Within this area the dominating topographic feature is Anderson's Hill, a ridge having a general north-west, south-east trend which rises fairly abruptly from the gently sloping surface north of Bevan to an elevation of 1126 feet. West and south-west of Anderson's Hill a depression or divide separates this ridge from the foothills of the Beaufort Range. Within the depression a creek flows south-east to the Puntledge, which flows northerly from Comox Lake to a point near its junction with this creek and then continues in a north-easterly direction. Brown's River, west of the summit of Anderson's Hill flows north-easterly and then swings to a general easterly course from the center of Section 18.

GEOLOGY

Line of Meta-volcanic Contact.

The line of contact between the meta-volcanics and the overlying rocks follows the general depression already described. The observed contact on Brown's River is found near the center of Section 18 near a creek which flows from the north. The meta-volcanics make up the bed of Brown's River from this point to the falls near the south-west corner of Section 18. Trap is reported by Mr. McKenzie to outcrop on the slopes west of the creek in the depression. In the southern portion of the area trap outcrops along the creek which supplies water for Bevan, and is again observed at the site of the impounding dam. The line of contact, then, folows Brown's River south-westerly toward the depression and then follows a south-easterly course to Comox Lake.

The line, as shown on the map, is based on the topographic evidence as well as the known points of outcrop.

Sedimentaries:

The coal-bearing rocks are not clearly exposed along the Puntledge River in the portion of the area under discussion. Sandstones are exposed along the north bank above the diversion dam, and shaly sandstones appear near the bridge crossing. A coal seam can be seen in the river north of the fan shaft at No.7 Mine and the remains of an old prospect hole can be seen near by. No outcrops can be seen along the creek flowing into the Puntledge from the west side of Anderson's Hill.

The principal outcrops are along Brown's River where the rocks are continuously exposed from the center of Section 16 to the contact with the meta-volcanics. In the vicinity of Borehole 10 the river section is largely sandy shale up to a point approximately 1100 feet west, where the rock is massive sandstone. The overlying shales show marine fossils and are believed to represent the "lower shales", or barren measures, overlying the productive formation. The line of division, based on the occurrence of these fossils and the character of the shales, is in this vicinity. The river section from this point to the contact is largely made up of sandstone, both massive and shaly. Comparatively few beds of shale are present, and these are usually in association with the coal seams. The sandstone beds are responsible for the cliffs through which the river travels.

The strike of the measures is prevailingly north-west, varying from N 10° W to N 55° W. The dips are all eastward, but are variable in amount from 3° to 20°. Two small faults, with down-throw to the east were observed.

Two small, unimportant coal seams outcrop near the line between Sections 16 and 17. On the south bank of the river, 800 feet south east of

Borehole 118, a coal bed having a strike N 10° W and dip of 3° - 5° occurs. The section here is as follows:

Sandstone cliff.		
Shale, sandy	0'	6"
Coal, hard	0'	9"
Coal	1'	4"
Total	2'	1"
Clay	0'	1"
Shale, Black.		

The bottom portion of the seam is not clearly exposed. The bed is exposed in the river for approximately 100 feet before it disappears and the bottom shale is visible at the bend of the river, nearly south of the borehole.

The section immediately west of Borehole 118 is sandstone under which a coal seam having the following section outcrops:

Sandstone.		
Shale, black, hard	0'	8½"
Coal, hard	0'	8"
Shale, soft	0'	6"
Shale, sandy	1'	1"
Coal and bone	0'	3"
Shale, sandy	0'	4"
Coal, hard	0'	8"
Total	3'	6"
Shale, sandy.		
Sandstone.		

The strike is N 55° W and dip 9° to the north-east.

The next outcrop of coal seen on the river is 800 feet east of the west line of Section 17. This seam is continuously exposed in the river and in the cliffs on the north side for a distance of 1500 feet. The measured section at the lowest point is as follows:

Sandstone.		
Shale, sandy, grey.		
Shale, sandy, with coal streaks	5'	0"
Coal	0'	2"
Shale	0'	2"
Coal	0'	8"
Shale	0'	7"
Coal	0'	9"
Shale	0'	4"
Coal	1'	4"
Total	4'	0"
Shale	1'	4"

The strike is N 45° W and the dip 3°. The prospect tunnel on the north bank of the river on the line between Sections 17 and 18 yields the following section:

Shale, black.		
Coal	0'	4"
Shale	0'	1"
Coal	0'	9"
Shale	0'	7"
Coal	1'	0"
Shale	0'	4"
Coal	1'	8"
Total	4'	3"

The strike here is N 40° W and the dip is the same as before, 3°. The low dip and the grade of the river bed are responsible for the continuous exposure of this seam. South-west of the prospect opening at a distance of approximately 600 feet, this seam appears at the top of the north bank of the river, about 60 feet above the bed. The cliff here shows the following approximate section, beginning at the top with the seam just described:

Coal	4'	0"
Sandstone, massive	20'	0"
Coal and shale bed	4'	0"
Sandstone shaly & [illegible]	18'	0"
Shale, with streaks of coal	2'	0"
Sandstone	2'	0"
Shale grey	3'	0"
Shale, sandy	5'	0"

The shale bed with occasional streaks of coal lying in, is not a true seam at this point. It is noted at the bend of the river, south of the position just described and again immediately north, at an outcrop approximately 1100 feet west of the prospect tunnel. The strike is N 10° W and the dips are 10° and 14° at the two exposure.

At a point 1000 feet east of the center of Section 18, a peculiar outcrop of shale and coal occurs in the south bank of the river. The bed is

bent or folded over and is overlain by sandstone but underlain by an apparent tongue of igneous rock, apparently porphyritic dacite. The bed is impure and consists of a mixture of coal, shale, and sand, and its folding appears to be due to the intrusion of the crystalline rock beneath, probably a tongue from the main mass of Anderson's Hill.

A thin bed of coal appears at the point where the river channel begins to take a south-westerly course. The strike is variable from N 5° E to N 5° W and the dip varies from 11° - 15°. The section is as follows:

Sandstone.		
Shale and bone	0'	3"
Coal, hard	1'	5"
Total	1'	8"
Sandstone	0'	6"
Sandstone, shaly.		

Overlying this seam is a small bed of coal 6 inches thick which appears to be in a roll. Its strike is N 20° W and its dip 11° to the east.

Further upstream another small band of coal and some shales outcrop. These are followed by a coal seam which has been reported to be 2' 6" thick, but which was inaccessible for measurement. Only 12 inches of clean coal was seen in the bed, which appeared to be largely shale and bone. The strike of the bed is N 40° - 45° W and it dips 15° to the east.

At a distance of 200 feet upstream from this coal seam the meta-volcanic rocks appear in the bed of the river. A small creek flows into the river from the north, in trap. The river bed is in trap all the way to the end of the section studied, at the falls near the south-west corner of Section 18. In the cliffs on the east side of the river sedimentaries could be observed at some points, but the river bed is in trap and undoubtedly marks the line of contact. Near the end of the traverse, two coal seams are visible on the east bank. These have been opened by prospect tunnels, only the lower of which could be entered. The section of this seam is as follows:

Shale, nodular.		
Coal, firm	1'	2"
Coal and shale, dirty	0'	10"
Coal, hard	0'	10"
Coal, soft	0'	7"
Shale	0'	5"
Coal, hard	0'	2"
Shale	1'	5"
Coal, hard	0'	8"
Total	6'	2"
Shale, black.		

The strike appears to be N 10° E and the dip very low to the east.

The coal at the upper tunnel is approximately 7' 0" thick, made up of several bands of coal and shale with a roof of sandstone. This material had caved into the opening making it impossible to get a detailed section of the seam.

In the highest cliffs east of the river and south of the prospect tunnels, sheets of a greyish-white rock were observed. Broken masses in the river, believed to have come from these cliffs, are dacite.

Dacite.

In addition to the meta-volcanics and the sedimentaries, a third type of rock is found in this area. This rock resembles a granite but differs in certain essential characters. Field study indicates that it is dacite or dacite prophyry. Anderson's Hill appears to be largely made up of this rock but the exact limits of the body of dacite and its distribution with respect to the adjacent sedimentaries is not known. It outcrops boldly in the cliffs above the head of Brown's River and clearly along the summit of Anderson's Hill. Small exposures are seen on the west side of Anderson's Hill and float rock on the east slope. Boreholes 137 and 138 encountered the rock at the surface and Borehole 135 records 2' 8" of "granite", the local name for the dacite, lying between the benches of the lower coal seam at a depth of 139' 4" below the surface, and elevation of 522.67 feet. The rock underlying the altered coal seam on Brown's River appears to be dacite, although differing somewhat in type from that seen at the other localities.

The borehole records for Holes 137 and 138 show the dacite resting on top of the coal-bearing rocks. The general field relationships suggest that the greater portion of the mass of dacite rests upon the sedimentaries and that it has invaded or intruded the coal-bearing series in at least two known places. The body of dacite probably represents a surface flow or sheet from which tongues or stringers have worked their way between the beds of the underlying sedimentaries, but whether the main mass was poured out on an original erosion surface as a true surface flow or whether it is the remains of a laccolith or sill from which the overlying sediments have been eroded cannot be determined from the meagre data at hand. The dacite, is, however, the most recent rock in the area and is probably Tertiary in age.

The principal effect of the outflow of the dacite on the coal-bearing

rocks may be considered from two angles;- first, as limiting the area of workable or accessible coal; second, the influence of the intrusive material on the quality of the coal. If the dacite of Anderson's Hill largely represents a surface flow, the underlying area should be largely the same structurally as it was before the extrusion of the crystalline rock, and the dacite simply represents a cover or capping which must be pierced if operations are to be conducted from the surface within its area. Tongues or stringers into the beds may alter the structure, just as in the case of the outcrop on Brown's River. The metamorphic effect on the quality or rank of the coal is generally to decrease the amount of volatile matter and to relatively increase the fixed carbon content within the immediate area of influence.

So far as can be determined from the brief examination of the area, the coal-bearing formation is believed to extend under Anderson's Hill from the Puntledge to the Brown without serious break or disturbance, but this belief can only be proved by drilling because the exact structure and relationship of the dacite to the sedimentaries are masked. No attempt has been made to outline the limits of the dacite body on the map of this area. A tentative boundary, following the 650 feet contour from the vicinity of Boreholes 137 and 138 north-westerly, then gradually rising to intersect and follow the 900 feet contour beyond the summit of Anderson's Hill toward Brown's River, is suggested.

Coal Seams:

The area north and north-west of Number 7 Mine, immediately beyond the mine workings, has been prospected by a number of drill holes. The lower seam in the mine is known to be shaly and bony, particularly in the west level workings, and to be rather thin. The indentification of this seam in the

borehole records is fairly complete, but the coal is variable in thickness and in quality. Few of the records indicate coal of commercial importance and the general results are very unfavorable. It does not appear that workable coal exists over the area included within these boreholes.

Along Brown's River three boreholes have been sunk. These show the same section revealed by the river traverse but do not indicate that the seams in depth improve in thickness over the measurements made along the river. The prospect tunnels do not show commercial seams. North of Brown's River a number of scattered holes have been drilled in the area toward Dove Creek. These records also yield discouraging information.

The general conclusion regarding the Brown's River area is that it is not an area in which seams of coal of present commercial worth may be found. An area in the vicinity of the summit of Anderson's Hill has not been prospected, but it is questionable whether this area will yield good coal.

SUMMARY:

The contact between the meta-volcanics and the younger rocks resting on it follows a south-westerly course in the upper reaches of Brown's River then extends south-easterly along a depression, which separates Anderson's Hill from the foothills of the Beaufort Range, to the Puntledge River and Comox Lake.

West of the line of contact, Anderson's Hill, a ridge formed by a geologically recent outflow of dacite, occupies a large portion of the area between the Puntledge and the Brown. No sedimentary rocks are exposed in the upper elevations of Anderson's Hill, but drill holes in the southern portion reach the coal series after passing through a capping or cover of the dacite. Puntledge River gives but little exposure of sedimentaries, but the Brown yields practically a complete section from

the shales overlying the productive formation to the underlying trap. This section is similar in general relationships to the sections along the Trent, Bradley Creek, and Sable River, but there appears to be a greater preponderance of massive sandstone. Several seams of coal are exposed, but these are made up of relatively thin bands of coal separated by shale layers.

North of the workings in Number 7 Mine in the flatter country east of Anderson's Hill, a number of boreholes have shown the presence of sedimentaries away from the dacite mass. The borehole record indicates an irregular trap surface and a warped structure of the coal series, although the general north-westerly strike and north-easterly dip prevail over the field as a whole.

The exact structural relationships between the meta-volcanics, dacite, and sedimentaries have not been determined, but it is believed that the dacite forms a mantle of limited superficial area over the sediments resting on the meta-volcanics floor. No clue as to the point or origin of the dacites was available.

The field evidence, supported by that from the borehole records over the area prospected, indicates that the Brown's River field is very unpromising as a source of commercial coal. No thick seams are found; the coal beds contain too great a proportion of shale and bony material to make them of present value; and the area appears to have the same structural irregularities which characterize the west side workings in Number 7 Mine.

"Joseph Daniels".

September 17th, 1920.

MEMORANDUM REGARDING HAMILTON LAKE COAL AREA.

The Hamilton Lake coal area lies southwest of Cumberland in the range of hills of meta-volcanics which extend from the Trent River on the south to Comox Lake on the north and which have Coal Creek as their general eastern boundary. The elevations are moderately high over the area, ranging from 1800 to 2000 feet in the vicinity of Hamilton and Stevens Lakes, as a maximum to approximately 1500 feet in the vicinity of the Trent River. The boundaries and extent were not determined in the course of the examination, but the area appears to form a relatively small, isolated basin, having a major axis extending south-east from Hamilton Lake towards the Trent and a shorter axis at right angles to this line.

The drainage of the area is not fully known. The chain of lakes and creeks which furnish the Cumberland water supply extend from Stevens Lake on the western side of the basin to Hamilton Lake and Hamilton Creek on the north. In the southern portion, at least two creeks, not named flow southerly to the Trent. Another un-named creek heads near the center of the area and flows north-easterly to Coal Creek which it joins at a point approximately half way between Hamilton Creek and Allen Lake.

The principal route of access to the area is by trail from China-town at Cumberland to the dams at Hamilton creek. This trail roughly follows the creek to a point half way between dams One and Two, then it swings away from the creek and intersects Hamilton Lake on the north side, near dam Three. The extension of this trail follows around Hamilton Lake and parelleks the upper portion of Hamilton Creek to Stevens Lake where it ends.

Traverses were made along this trail and along Hamilton Creek to

Stevens Lake. From Stevens Lake a traverse was made south-easterly to the creeks which flow into the Trent. Another traverse was made from the Perseverance Trail and the branch of Coal Creek south of Allen Lake westerly to the creek already described as flowing into Coal Creek north of Allen Lake. This creek was followed to its outlet. In these traverses all of the rock encountered, with the exception of two areas, was meta-volcanics or "trap". No connection was found with the coal-bearing series to the eastward, proving the belief that the basin is isolated and detached from the main coal areas.

In detail, the following observations were made. The bed of Hamilton Creek from its junction with Coal Creek to the south dam at the outlet of Hamilton Lake is in trap with the exception of a small outcrop of sandstone and shale noted on the south side of the creek at a point 2000 feet below the outlet of No. 3 Dam. This outcrop extends approximately 200 feet along the bank of the creek but is cut off by the trap on the east and west sides. The observed strike was N 65° W and the dip 14° to the north-east.

At the outlet of Hamilton Lake, south of the dam, is a low cliff made up of sandstone, shale and coal. The section from the top down is as follows:

Massive whitish sandstone.

Black, sandy, foliated shale ..... 5' 0"		
Coal and shale, dirty	0'	5"
Coal, hard	0'	7"
Shale, soft	0'	5"
Coal, hard	2'	6"
Total	3'	11"

Black, sandy, foliated shale ..... 6' 0"		
Coal and shale, dirty.....	0'	8"
Coal, clean	0'	8"
Shale, brown	0'	8"
Coal, hard	2'	0"
Shale and bone	1'	0"
Coal	1'	6"
Total.....	6'	6"

Shale, massive and nodular, sandy	12'	0"
Shale, black, foliated	0'	3"
Coal, hard	2'	0"
Shale, hard	0'	2"
Coal, hard	1'	0"
Total	3'	5"

Shale, sandy, black.

The section of the upper seam was measured in a short prospect opening. The intermediate seam has been opened by a prospect in the lower4' 6" of the exposed bed. The bottom bed was measured in the bank, which is caved; for this reason it is not certain whether the entire section was visible. The general strike is north-south and the dip is low 4^0 to 6^0 to the east.

Just below the dam is an old prospect opening, presumably on the lower seam, butthis is caved and inaccessible for observation. The contact between the coal series and the meta-volcanics is visible in the creek bottom and in the exposed rock along the dam-site within a few feet of the coal outcrops.

Along the creek which empties from Stevens Lake into Hamilton Lake, sandstones, shales and fine grained conglomerate was visible for 1500 to 2000 feet from the outlet. The strike averages N 40^0 -50^0 W and the dip, where observed, was 20^0 to the north-east. The trap contact then follows the creek to the upper lake. In the lower portion of the creek, the sedimentaries appear to extend for a short distance to the north-west but they are soon cut off by the crystalline rock. In general the contact is along the creek.

Immediately south of Stevens Lake no further outcrops of sedimentaries are visible but occasional float sandstone was seen near the western line of Lot 25. From this point the south-easterly traverse was entirely in trap

until the easterly of the two small creeks flowing toward the Trent was reached. In this creek, black shales and float coal were observed. Easterly from this creek to the Perseverence Trail outcrops are obscured by the surface material and few exposures were seen. These, however, were trap.

The traverse down the creek which flows into Coal Creek between Allen Lake and Hamilton Creek was entirely in the volcanics. The headwaters of this creek were not examined, however, and there is a possibility that the stream may cut into the western margin of the basin. This should be investigated.

From the foregoing, it can be seen that the only definite information available about this basin is the data from the outcrops near Hamilton Lake. On the assumption that there is a continuous belt of sedimentaries from this locality to the shale outcrops on the creek near the Trent, the maximum length of the basin cannot be estimated as greater than 1½ miles. The width is even more difficult to estimate, bit it probably does not average more than one-half mile. On these assumptions, the area of the basin is approximately 500 acres.

This basin appears to justify sufficient preliminary investigation to determine its limits. To this end a series of survey lines should be carried across it to serve as bases from which prospecting can be carried on. As a suggestion, a line extending the Trent River survey to the tributary creeks referred to in this report, then following these creeks to their beds, and from here tying into the Hamilton Lake survey, would form one link. Another line from Coal Creek up the creek emptying into it north of Allen Lake, then swinging to the eastward to tie in with the Perseverence Trail survey would cross the eastern margin of the belt and form another link. The boundaries of the contact should then be determined and the basin itself prospected in

a manner governed by the information obtained. The preliminary prospecting, after the lines have been surveyed, should not take very long to complete. This program is recommended in order that accurate information may be available as a basis for further action.

"Joseph Daniels",

September 15th, 1920.

MEMORANDUM REGARDING AREA SOUTH OF CUMBERLAND TO ALLEN LAKE.

In the area south of Cumberland between the Sutton Road on the west and Coal Creek on the east extending to the Lewis Trail and Allen Lake detailed study of the geology was not made, but a few observations were noted and these are submitted for record.

West of Sutton's Road, low hills of sandstone rise above a swamp and the valley of a small stream which flows northerly toward Cumberland. Sandstone is exposed near the summit of the Lewis Trail and at the intersections of the trail and the small creeks which flow into Allen Lake. A prospect tunnel on the south side of Allen Lake has been driven on the lowest seam in the basin directly overlying the trap. The strike of the seam here is N 50° W and the dip is 15° - 20° to the north-east. The section of the outcrop is as follows:

Shale, foliated, black	5'	0"
Coal and shale	0'	6"
Shale	0'	1"
Coal, hard	1'	10"
Shale, hard	1'	7"
Coal, hard	1'	0"
Shale, soft	0'	2"
Coal, hard	1'	8"
Total	6'	0"

Shale.

The opening has been driven in the lower 6 feet of the coal for 150 feet. A few feet of underlying measures are seen on the creek above the tunnel, but these soon disappear under the cover of surface material. Trap appears on the hillside west of the creek and extends to the south margin of the lake where it forms steep bluffs.

At the outlet of Allen Lake sandstone and shale appear on the north bank of Coal Creek. The strikes here are N 35° - 50° W and the dips from 10° to 20°. These outcrops extend for 300 feet along the creek and

disappear. The hill South of Coal Creek is [illegible] traverse down Coal Creek at the falls, [illegible]. The strike here is N 40° W. At the point marked "Old [illegible]" [illegible] appears to have been driven into a seam which outcrops on the [illegible]. [illegible] cannot be measured, but the coal is at least [illegible] feet thick. The bearing of the slope is N 40° E which gives an [illegible] strike of N [illegible] [illegible] feet downstream from the old slope, [illegible] outcrop in the creek bottom and are exposed all the way to [illegible] Creek, the contact line following the course of Coal Creek. [illegible] the creek exposes a section nearly 150 feet high, [illegible] feet of sandstone on top and a series of [illegible] coal [illegible] below [illegible] the [illegible] section. The strike here is N [illegible] [illegible] coal seams can be counted in [illegible] sandstones and shales occur and there is [illegible] The strike here is N [illegible] and [illegible] from [illegible] to [illegible]. A [illegible] slope sunk on coal [illegible] a dip of [illegible]. This indicates a strike of [illegible]. The section [illegible]

Shale.
[illegible]
[illegible]
Shale.

Number 2 Slope, the old mine [illegible] was opened on one of the seams exposed in the [illegible] section. [illegible] tunnel developed an [illegible] seam, but there is no data regarding these workings.

In the block of [illegible] north of Number 1 shaft very little data is available about the [illegible] of [illegible] and the structure except that already noted along the Coal Creek [illegible] and the information from the

records of two boreholes, numbers 139 and 19, immediately south of these shafts. The lower seams shown in these holes are thin and broken by shale partings. This evidence, together with that of the mine workings, is highly unfavorable, but it should not be accepted as final and determinative for the large area which remains unproved. It would appear desirable to explore this territory to secure accurate data on which to base a definite conclusion regarding the commercial possibilities of the area. Until this is done, all opinions are matters of conjecture rather than scientific evidence.

"Joseph Daniels".

September 16th, 1920.

REPORT ON THE TRENT RIVER AND BRADLEY CREEK AREA.

LOCATION.

The area described in this report includes that portion of the Comox Basin north and west of the Tsable River field from the vicinity of Bradley Lake to the Trent River. Bradley Creek flows out of Bradley Lake north-westerly across the Perseverence Claim, then bends to the north-east and ultimately joins the Trent. A fork of the Bradley flows north-easterly across Section 20 and joins the main stream about 3,600 feet below Bradley Lake. The Trent River flows in a general north-easterly direction across the strike of the sedimentary series of rocks. It is joined at the Perseverence Trail crossing by a south branch. Within the territory embraced by this drainage area the crystalline rocks and the overlying productive group of sedimentaries are exposed.

GEOLOGY.

Line of Contact.

The contact between the meta-volcanics and the coal-bearing series was observed at but four localities within the area. At Bradley Lake cliffs of trap are exposed near the north end on both the east and west sides. Near the south-west corner of Section 20 at the head of the west fork of Bradley Creek, the meta-Volcanics are exposed above the short prospect tunnel. No attempt was made to trace the contact north from this point because of the limited time available for field studies. The next observed outcrops of trap are on the south fork of the Trent 2000 feet above its junction with the main stream, and on the main strea, 3000 feet west of the junction near Survey Station 124. Near Allen Lake, the meta-volcanics are exposed in the cliff on the south side of the lake within a few hundred feet of the prospect tunnel. The Line of contact is thus established with a fair degree of accuracy from Allen Lake to the south fork of the Trent, and from Bradley Lake to the head

of the west fork of Bradley Creek. Within the limits of the Perseverance Claim, the line of contact has been reproduced from office data supplied by Sutton's maps, but this contact must be regarded as tentative and approximate only.

There is some reason to believe that the Perseverance Claim locality may be a separate small field or basin and that the main line of contact may lie to the eastward of the line marked. The basis of this hypothesis is the data from Boreholes 3 and 4 which lie east of the Perseverance Claim. In Borehole 3, the trap is reported as lying 218' 9" below the surface at elevation 95.25 feet; in Borehole 4 the trap was encountered 176' 4" below the surface at elevation 784.7 feet. The rapid rise in the topography of the trap surface is significant and suggests the possibility of the meta-volcanics lying close to the surface along the north line of Section 29. No outcrops are visible along Bradley Creek in the southern portion of Section 29 or the northern portion of Section 20 to the junction of the two branches where a small exposure of sandstone is observed in the creek bed. In this concealed area it is possible that the trap may extend across toward Borehole 4 within a relatively short distance below the surface, forming the margin of a basin which extends to the south-west. This is suggested as a tentative theory. Careful field study of district in detail will indicate the exact situation.

On the basis of the field observations, the contact line is indicated as having a fairly uniform south-easterly trend from Allen Lake to Section 29, then swinging southerly to the head of the west branch of Bradley Creek, and easterly to Bradley Lake.

Sedimentaries:

The "lower productive formations" is best exposed on the Trent River and its branch. The Bradley Creek section is incomplete because of intervals

in which outcrops are concealed. The group of shales, overlying the lower productive formation is well shown on the Trent and to a lesser degree on the Bradley.

As in the other portions of the Comox Basin, the lower productive formation, in which are found the coal seams, consists essentially of sandstones and shaly sandstones with some small beds of shales, argillaceous and sandy, all lying directly on the floor of meta-volcanics. The "lower shales", locally referred to as "marine shales", overly these and are barren of coal seams. The geological map shows the distribution of the individual beds and indicates the strikes and dips. The strikes are uniformly to the north-west and the dips are to the north-east at moderate angles. The maximum dip observed was 20° at the coal outcrop near the junction of the forks on the Trent, but this appears to be unusual as the dips of the overlying and underlying beds never exceed [illegible]°. The average dip is [illegible]°.

<u>Bradley Creek Section</u>

The exposed section on the [illegible] on the east fork of Bradley Creek [illegible] are exposed [illegible] the head of the creek [illegible] coal which has been opened by a short [illegible] tunnel [illegible]. The section at this point is as follows:-

Shale, sandy, [illegible]	
Shale and coal [illegible]	[illegible]
Coal	[illegible]
Shale and coal streaks	[illegible]
Coal, hard	[illegible]
Shale, hard	[illegible]
Coal, hard	[illegible]
Shale, hard	[illegible]
Coal, hard	[illegible]
Total	[illegible]

Shale, [illegible] .... 1' [illegible]
Sandstone.

The strike of this seam is northeast and dip [illegible]° - [illegible]° to the east.

The next important seam [illegible] the foot of a fall in the creek, and is partially [illegible]. [illegible]:

Sandstone [illegible]
[illegible], shale, [illegible]
Shale [illegible]
Coal [illegible]
Shale [illegible]
Coal [illegible]
Shale [illegible]
Coal [illegible]
[illegible]
Sandstone.

The strike is N [illegible]° W, dip [illegible].

Near the old [illegible], the [illegible] shales:

Sandstone,
Shale,
Coal [illegible]
Shale, [illegible]
Coal [illegible]
[illegible]

Shale, Black
Shale, sandy.

The dip of this coal is variable, ranging from [illegible] along the exposed section. The strike is N [illegible] W.

Proceeding downstream, the measures are [illegible] all the way to the bend in the creek in Section [illegible]. From this point to the crossing of the Perseverance Trail, three unimportant coal seams are exposed in a belt of sandstone and conglomerates. Below the trail crossing, on the west bank of the creek is a prospect opening. The section is as follows:-

Sandstone, [illegible]
Shale [illegible]
Coal, hard .... 1' [illegible]"
Shale, [illegible] .... [illegible]' [illegible]"

Coal .... [illegible]
Total .... [illegible]

Shale.

Sandstones extend along the creek for a distance, then following a concealed interval, and [illegible] recurring in the vicinity of the falls where the beds become prevailingly sandy. Although not accurately determined, because of no survey lines along the creek, the line marking the division between the productive measures and the overlying barren shales is in the vicinity of [illegible] Falls.

Trout River Section.

The Trout River section was surveyed for a considerable distance above the [illegible] in order to make certain that no areas of sedimentaries occurred west of the [illegible] line. The most easterly exposure of non-volcanics is found in the bed of the main stream [illegible] feet west of its junction with the south fork. Below this is a concealed area, covered with trap boulders, for [illegible] feet. Succeeding the concealed area, sandstone outcrops and forms the bed of the river to the falls. The lowest part of the productive formation is not seen in this section, but it is believed to lie in the concealed area between the trap and the sandstone.

In the stretch of the river between the falls and the Perseverance Trail crossing, sandstone is the predominating rock, with some small interlying beds of sandy shale. But two important seams of coal are visible. The lower of these, stratigraphically, is seen in the cliff along the river approximately 1320 feet above the trail crossing. The section is as follows:

Sandstone.		
Shale, sandy	[illegible]	
Coal		1' [illegible]
Shale		0' [illegible]
Coal		0' [illegible]
Shale, black. Total		[illegible]
Shale, sandy.		

The strike of this seam is N 45° W and the dip from 15° to 20° to the north-east. The bed can be seen in the cliffs on each side of the river rising toward the west.

Just above the junction of the two branches of the stream a thick seam stands out in the small triangle of rock between the two streams. The section is somewhat obscured but is essentially as follows:

Shales
- Coal .... 1' 6"
- Shale, black .... [illegible]
- Coal, hard .... [illegible]
- Total .... [illegible]

Shale .... 2' 6"
- Coal .... [illegible]

Shale .... 2' 6"
- Coal .... [illegible] 0"

Shale.

The strike is N 30° - 40° W and the dip is high, [illegible], to the northeast. This bed is exposed on its strike above this point in the river bottom.

The south fork [illegible] from the [illegible] above is essentially the same as that of [illegible] stream. The [illegible] exposed at a point [illegible] feet from the junction is [illegible] by a [illegible] interval for 400 feet, followed by a [illegible] and associated beds of shale and [illegible]. [illegible] 5' 6" [illegible] of the junction, a small seam of coal [illegible] 10" thick [illegible] by a sandstone bed overlying the 5' [illegible].

Below the junction, three small seams outcrop in the [illegible]. These seams are all small, ranging from 10" to 16" in thickness. Their strikes and dips are regular. At a point approximately [illegible] feet [illegible] of the crossing of [illegible] Road is the contact between the sandstone of the productive group and the overlying shales. The shales are well exposed in the river and extend from this point below [illegible] where the [illegible]

of the river ended. The shales are also visible for a short distance, along Sutton's Road north-west of the river.

No outcrops of rock are visible along the Perseverance Trail until the Lewis Trail is reached. Here sandstones are observed. Along Coal Creek, west of the trail, a prospect tunnel was opened in a seam lying below sandstone. The strike here is N 10° - 15° W and the dip 10° - 15° to the northwest. Only 12" of coal was visible, but the seam is believed to be much thicker. At Allen Lake a tunnel has been driven for 100 feet along a seam whose section is as follows:-

Shale, hard, black	5'	0"
Coal and shale	0'	6"
Shale	0'	1"
Coal, hard	1'	10"
Shale, hard	1'	7"
Coal, hard	1'	8"
Shale, soft	0'	2"
Coal, hard	1'	6"
Total	6'	8"

Shale.

The tunnel has been driven in the lower 6 feet of coal. The strike of the coal is N 20° W and the dip is 15° - 20°. This seam appears to be the bottom or lower seam of the Comox Basin.

Correlation:

Correlation of individual seams over the area between the Trent River and Bradley Creek is practically impossible. Only general relationships of the beds as a whole can be determined from the available data.

SUMMARY:

The line of contact between the coal measures and the underlying meta-volcanics is well defined at four localities, namely, at Allen Lake, on both branches of the Trent River, at the head of the west fork of Bradley Creek, and at Bradley Lake. The line appears to have a regular south-easterly

trend from Allan Lake to the northern [illegible], but from there it is irregular to Bradley Lake. This irregularity may be due to the occurrence of a small field in Section [illegible] which is separate from the main basin farther east.

Bradley Creek does not give a continuous section of [illegible] coal-bearing rocks. The lower part of the productive formation [illegible] opened by a prospect tunnel at the head of the west fork, and several smaller seams outcrop on the branch and on the main creek, but there is considerable area over which the measures are concealed. Borehole [illegible] shows a few feet of carbonaceous [illegible] in the northern part of Section [illegible]. The [illegible] below the surface. Borehole [illegible] shows the general section [illegible] outcrops on the creek north and east of the Perseverance [illegible], but only general relationships can be inferred. The line of division between the lower productive formation and the overlying barren shale formation is believed to occur near the falls on the creek.

The Trent River reveals a fairly continuous section from the upper volcanics to the barren shales. The lowest seam of the main [illegible] appears to be concealed in the river bottom, but the overlying seams are well exposed. The strikes are uniformly to the north-west and the dips are regular to the north-east, the average range of dip [illegible] from [illegible] to [illegible]° with the exception of one high dip at the junction of the branches of the Trent. Practically no faulting was observed in the section.

The structure of the area appears to be regular from Allan Lake [illegible] easterly to the vicinity of Section [illegible]. In the block [illegible] the Perseverance Claim, the general north-westerly strike and north-easterly

dip probable, but the continuity of the beds is not definitely established.

Practically no prospecting has been done in this area, and portions of it have not yet been accurately surveyed. In the absence of sufficient data, very little light can be thrown on detailed structure or correlation.

"Joseph Daniels".

September 15th, 1920.

orm A143 1000-10-17

CANADIAN COLLIERIES (DUNSMUIR) LIMITED

ACCOUNT

DATE February 29th. 1920

Tsa-hle River Developement

LOCATION Comox

SUB-DIVISION Nelson District SHEET NO.

ITEM NUMBER	ITEMS	LEDGER ACCOUNT	A AMOUNT PAID PER LEDGER RECORD	B NOW UNDER CONTRACT AND UNPAID	C ESTIMATE OF COST TO COMPLETE WORK NOT UNDER CONTRACT	D ESTIMATE OF TOTAL COST WHEN COMPLETED
1	Engineering Expense		$ 4,717.22			
2	Opening Prospect Shafts		5,229.08			
3	Buildings		2,805.00			
4	Diamond Drilling		24,822.08			
5	Road Making		18,894.59			
			$56,467.97			