Prod. 28/35 Mat. 20/15 Eng 28/40

600013

GEOLOGY AND MINING IN THE TRANQUIL CREEK AREA, VANCOUVER ISLAND

76 70

An essay submitted in partial fulfillment of the requirements of the course in third year Applied Science at the University of British Columbia

Cecil A. Burns

University of British Columbia

November 15 1946

Vancouver, B.C.

November 15, 1946

Dean J.N. Finlayson

Faculty of Applied Science

University of British Columbia

Vancouver, B.C.

Dear Sir:

It is my pleasure to submit the accompanying essay in partial fulfillment of the requirements of the course in third year Applied Science at the University of British Columbia. The topic chosen is Geology and Mining in the Tranquil Creek Area, Vancouver Island.

Yours truly,

Cecil A. Burns

Cecil A. Burns

GEOLOGY AND MINING IN THE TRANQUIL CREEK AREA, VANCOUVER ISLAND

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

.. ..

ABSTRACT

The area, approximately four miles by five miles, in the locale of Tranquil Creek, Vancouver Island, has been divided into three rock divisions by east to west lines. The northern and southern divisions, which are composed of coarse-grained rocks, have intruded the middle one of fine-grained volcanics; but, included in the northern is metamorphosed limestone, in which fossils do not remain. The age of the rocks must be tentative; but, it is suggested that they be associated with the Vancouver group of the Mesozoic Era. The attitude of the rock beds has been determined from the sediments and schistosity. They strike S 40° E and dip 64° NE. Some fracturing is approximately perpendicular to this.

Quartz veins occur in the contact zone of the fine-grained volcanics and coarse-grained intrusives. Mineralization, which in some places include values in gold, has been prospected. Two developments from the prospecting are The Fandora Gold Mine and The Moscena Gold Mine. The former is located in the intruded rock, and has sufficient ore in reserve to make the construction of a mill feasible. The development of this prospect is discussed in detail. The latter is in diorite, and is not as fully developed as is the Fandora.

FOREWORD

The Department of Mines of British Columbia has granted the writer the privilege of using the material in this paper with the proviso that a portion, or the whole, may not be published without the consent of that Department.

GEOLOGY AND MINING IN THE TRANQUIL CREEK AREA, VANCOUVER ISLAND

The following report is based on field work completed during the summer of 1946 when the writer was a field assistant in the provincial geological survey party led by Mr W.J. Lynott, assistant mining engineer with the British Columbia Department of Mines. Mr Lynott and another student field assistant, Mr W.H. Tisdall, arrived in the area May 18, 1946, while the writer joined the group in Tofino, B.C. May 29, and the party in its entirety reached the area at Tranquil Creek, May 30.

TRANSPORTATION

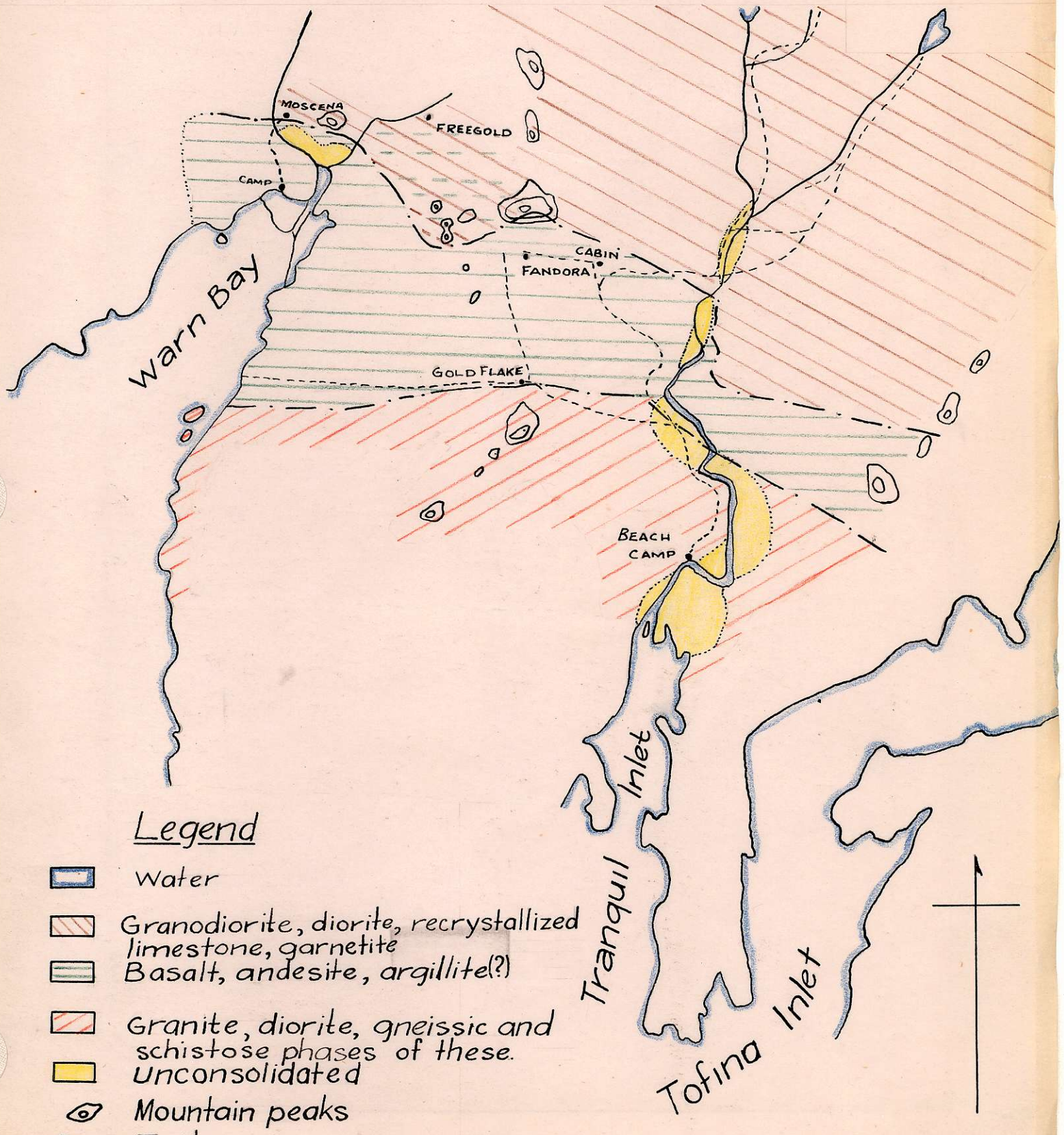
The area is accessible by aeroplane or boat. When one is travelling from Tofino, a cabin-type boat may be chartered from either of two boatmen, Mr W. White or Mr E. Knott. Freight is also transported on scows by these two men. Machinery that is self-propelled and not greater in size or weight than a D 4 caterpillar tractor, may be taken in this way to the area.

AREA

The country geologized is approximately 15 miles northeast of Tofino, Vancouver Island. It consists of an irregular shape as defined by the drainage and mountain divides in the Tranquil Creek and Warn Bay districts, (See map, fig. 1). The south-eastern boundry is at 125° 37' W. 49° 12' N.; the eastern boundary is at the divide of land between Tranquil Creek and Tofino Inlet; and the northern limit is at

FIG. 1

Scale 1in. = 1 mile



49° 16' 30" N. and is covered by the N.E., N., and W. forks of Tranquil Creek. The limits extend from the valley of Tranquil Creek over the divide westward into Warn Bay, where the area is drained by Bulson Creek. The western and northern limits are defined by 125° 44' W. 49° 16' 30" N.

PLOTTING, MAPPING

The regional geology was plotted on a photostat of a topographical map drawn from aerial and ground triangulation photographs. Its scale was ½ in. = 1 mile, and the contour interval was 100 ft. A survey party from the British Columbia Department of Lands took the triangulation photographs during 1942.

WEATHER

The reported weather for the immediate area is not available, and the terrain at the nearest weather station, in Clayoquot, is not similar to that around Tranquil Creek so an erroneous impression is obtained from the reports compiled from the data recorded there. It was noted that the cloudiness and rainfall increased as one travelled the 15 miles from Tofino into the more mountainous countryside of Tranquil Creek. Although a rain gauge was not employed by the party a diary was kept, which indicated the following weather for the first three months spent in the field.

Month	Days Sunshine	Days Sun & Cloud	Days Cloudy	Days Rain
May	6	2	1	4
June	3	4	1	22
July	13	2	4	12

[I] The Clayoquot weather station has reported that for 37 years the

[I] "Climate of British Columbia, Report for 1940", Province of British Columbia, Department of Agriculture.

average annual precipitation has been 107 in of water. The dry months of the summer have an average monthly rainfall in inches of: April, 7.63; May, 5.90; June, 3.75; July, 2.32; August, 3.17; September, 6.37. During the other six months the averages range from 10.22 in. to 16.22 in. Temperature comparisons for the years 1931 to 1938 inclusive, indicate that February has the lowest mean-minimum temperature of 36° F, and August the highest mean-minimum temperature of 52° F.

Snowfalls are most prevalent in the mountains during February and March, when many feet of this form of precipitation occurs. At the end of March at an elevation of 2000 ft the snow is at least 15 ft deep.

The rainfall was found to be extremely heavy, and unless the geologist was traversing upon creeks that were mapped he found it was difficult to obtain accurate positions, because the visability was so reduced as to make resectioning impossible; and pace-and-compass traverses were difficult to execute when away from creeks because of the tortuous ascent normally necessitated by the precipitous slopes. During June, however, it was necessary to traverse in rain.

HISTORY OF PROSPECTING AND MINING

A. Copper

"The Annual Report of the Minister of Mines, British Columbia, 1899," first mentions activity in the Tranquil Creek area when 18 mineral claims, "The American Wonder", were located approximately 2½ miles north of Tranquil Inlet on the easterly side of the creek, where work had been progressing for one year; and some claims were mapped approximately two miles north, on the westerly side. By 1901 the mineral claims, "American Wonder" were crown granted. The owner of these claims, Mr J.M. Ashton of Tacoma, Washington, was interested in the copper content

of deposits along a limestone and granodiorite contact. By 1903 development work had included surveys for 12,800 ft of aerial tramway from the development work, upon the crown granted mineral claims, to the beach, and for branch tramways. No further work was done on this project until 1916 when the trails were relocated. The name had been changed to the "B.C. Wonder", but development work ceased and is not mentioned again on this property.

B. Gold[2]

During 1939 and 1940 prospecting of the area for gold was commenced, which resulted in development work on the following properties:

1. "The Gold Flake Mineral Claims" are located in a contour saddle between Warn Bay and Tranquil Creek, 1½ miles north of Tranquil Inlet. A tunnel was begun at that time following a rusty quartz vein which is five inches thick. It is in pyritized andesite, striking 234° and dipping 50° northwest. No sulphides show in the quartz which has a honeycomb structure, and it weathers black to rusty brown. Work was started on parts of a mill for this property in Clayoquot village, but ceased when mining discontinued, about 1941, when it appeared that insufficient ore tonnage was available.

2. "The Yankee Boy Mineral Claim" is situated one mile north of Tranquil Inlet and within 400 ft of the westerly bank of Tranquil Creek. This property is mentioned in the "Annual Report, Minister of Mines, British Columbia, 1940, and 1941", where analyses of ore shipped to a smelter are listed.

[2] Some dates are approximate because the writer has obtained the information orally when no written record exists.

The ore shipped from this claim was hand-picked by the prospector. When the "working" was inspected by the writer it appeared to be in a lenticular deposit. The prospector assumed that he took all the high-grade value from the claim.

3. "The Mary Mineral Claims"

(a) Initial Exploration

During 1940 or 1941 development work was begun by Mr S. Craig on claims now named the "Mary Mineral Claims". These are 3½ miles north of Tranquil Inlet on the westerly side of the valley. Two adits, one at 1470 ft elevation and the other at 1570 ft elevation, comprised the main development, but some cuts also exposed the Craig vein in the "Mine Creek" at 1700 ft elevation.

The government gave financial aid to a contract given to Mr W. Murray to construct a road from the beach camp (see fig. 1) to a point below the mine camp, approximately 3½ miles by road. Two and one-quarter miles of puncheon and gravel road was constructed by the contractor and Mr Craig before work was terminated on this property in 1942. The claims were allowed to lapse.

(b) Further Development

Some time after the exploration was conducted by Mr Craig, Mr E. Brown became interested in the property and he staked the Mary group of mineral claims. He then extended the property by including the Pandora Group and the Gold Flake Group of Mineral Claims. The regulation that curtailed development of new gold properties during the war

restricted Mr Brown's activities. Nevertheless, some drifting in two new adits, one at 1900 ft and the other at 2100 ft, was done by hand drilling into a dike containing two veins, neither one of which is the "Craig vein". By the winter of 1945 the 2100 ft level was 100 ft into the mountain and the 1900 ft level was 400 ft in. This development was considered sufficient to permit sampling of the mineralized body by mining companies, a preliminary to taking an option.

Mr Brown and his associates obtained ownership of a cabin claim that took in the beach camp, and the B.C. Wonder Group of Crown Grants.

Premier Mining Company (N.P.L.) sampled the workings; and in early February 1946 Mr N.E. McConnel, Managing Director of Privateer Mine Limited, and Mr A.M. Richmond, consulting engineer, visited the camp. A brunton-compass-and-chain survey was made of the development, and the workings were sampled by Mr Richmond. Privateer Mine Limited took an option on the property in order to carry on exploration. The development by Privateer Mine Limited is called Fandora Mine, the details of which will appear under "The Development of a Prospect".

4. "The Maple Leaf Mineral Claims"[3], Moscena Mine Co. Ltd.

The Maple Leaf Mineral Claims, located upon the easterly side of Bulson Creek, have workings on them $\frac{3}{4}$ mile from Warn Bay. During

[3] "The Annual Report, Minister of Mines, British Columbia 1941", also ".....1942".

1941 a shaft was sunk 25 ft and a cut of 10 ft was put into the "shaft vein", At 430 ft elevation on the "E vein" prospect drifting was done for 252 ft. A contract was given Mr W. Murray to construct a road in 1942, also a contract was let for work to be done on a crosscut to the "shaft vein"; but both projects were stopped by regulations that existed during wartime - $2700 was used for the road, and 40 ft of drifting was accomplished on the crosscut.

The writer did detailed geology, on a map scale of 1 in. = 40 ft, of this property, and while doing so sampling was done in the open cuts of the "shaft vein", in the 430 ft level of the "E vein", in the open cuts of the "E vein", and the open cuts of the "H vein". The strikes of the different veins are between 130° and 150°. The dips of the veins range from 63° southwest to vertical on the "shaft" and "E veins", and from ∅79° to ∅84° northeast upon the "H vein". The "shaft vein" has been traced southeasterly to a body of crystalline limestone; but a quartz vein occurs beyond the limestone, a distance of 240 ft, upon the approximate strike of the "shaft vein". This is not, however, necessarily the same vein. The northeast end of surface exploration of the "E vein" also terminates in limestone. The veins, which are in diorite, are cut by northerly-striking andesite dikes of earlier age than the veins and mineralization. The vein ranges from solid non-mineralized quartz to sugary, flaky-white, well-mineralized rock. The minerals are pyrite, chalcopyrite, sphalerite, and some galena.

Quantities of vein material from the dumps, when chipped, disclosed some specimens containing specks of free gold. These specks were

noticed to be in the flaky-white quartz containing galena and sphalerite. No free gold was found in quartz containing only iron sulphides. Mr A.M. Richmond surveyed and sampled the development in November, 1941.

Work was resumed on the Maple Leaf Mineral Claims, now the Moscena Mine Company property, in the spring of 1946. Keyes Construction Company Limited, of Vancouver, obtained a contract to build a road to the mine camp, and to do drifting work on the crosscut to the "shaft vein", and then along it. The road was completed in July, 1946, and the crosscut development commenced in August, 1946.

5."The Free Gold Mining Claims"

The camp, situated at 1200 ft elevation, on a tributary flowing westerly into Bulson Creek is reached by way of a "back-pack" trail. The junction of the tributary and Bulson Creek is ¼ mile from Warn Bay. The claims have two tunnels situated near the camp; but at present only sufficient development is being done on the claims to hold them. When the writer left this vicinity no exploration was being conducted on the property.

REGIONAL GEOLOGY

The area can be divided into three main rock divisions, the lines of division being approximately east-west. The northern part is mainly coarse-grained intrusives composed of a dioritic-textured rock, and a feldspar porphyry that is apparently a version of the former; well crystallized limestone; garnetite; recrystallized fine-grained volcanics, and argillites. The central area consists of fine-grained volcanics that are composed principally of andesite and basalt. A felsite-feldspar-

porphry dike cuts the volcanics near their northern extremity at the Fandora workings. The southern portion is also a coarse-grained intrusive, but by megascopic inspection it is shown to be more acidic than the northern one. It is composed of granodiorite, quartz diorite, diorite, and felsite porphry. In the contact zone of the southern and middle divisions is found gneissic and schistose phases of the coarse- and fine-grained rocks.

PREVIOUS MAPPING IN PROXIMITY

The Bedwell River area, the southern boundary of which is approximately eight miles north of the area described by the writer, was mapped by Dr Sargent of the British Columbia Department of Mines in 1939 and 1940, and the "Vancouver Sheet", map 196-A, which covers the geology of the coast in this vicinity and the geology of southern Vancouver Island, was published by the Geological Survey of Canada, in 1928.

A. Bedwell River

The Bedwell River survey disclosed fine-grained volcanics around the mouth of Bedwell River and that part closest to the writer's area. These were described as belonging to the Vancouver group, and were placed chiefly in the lower Mesozoic. Easterly from these volcanics, to the east of Bedwell Lake, fossils were found in limestone of Permian age, which Sargent described as overlying a stratigraphic complex. These Paleozoic rocks have been associated to a formation described by Gunning in his report of 1930 on the Buttle Lake area. Although he did not name them, he said:[4] "When their age, characteristics,

[4] Gunning, H.C., Buttle Lake Map-area, Vancouver Island, Geological Survey, Canada, Summary Report, 1930, Part A., Pge. 60.

etc., are more fully known, the name Buttle Lake group or formation for all or part of them is suggested. That they should be separated definitely from the overlying Vancouver group, even though possibly conformable with it, is self evident ....".

B. Vancouver Sheet

The coastwise geology depicted on the "Vancouver Sheet" includes a portion of the previously described southern and middle divisions. The southern division is placed in the "Jurassic" (?) and "Cretaceous" ages, and the rock is called granite or diorite and gneissic phases of these. The middle division is placed in the "Triassic (?) Jurassic", and the rock classification may be under a part of the description: "Andesite-basalt tuff; tuffaceous sediments, agglomerate; intrusive porphyrite; crystalline limestone; argillite, sandstone, conglomerate, and schistose derivatives".

C. Correlation of the Bedwell River Report and the Vancouver Sheet

The rocks at the head of Bedwell Sound, which Sargent placed in the Vancouver group, are given the same classification on the "Vancouver Sheet" as are the rocks of the middle section. This has been called of "Triassic (?) Jurassic" age in the above.

CLASSIFICATION OF ROCK GROUPS

A. Northern Division

Small limestone bodies were found in the northern division of the area, but profound metamorphism destroyed any traces of fossils that might have been present, consequently, the age of these rocks cannot be absolutely determined at this time.

The limestone has been metamorphosed by the coarse-grained intrusives and fine-grained felsite porphries found in contact with it.

It is, therefore, older than the intrusives. The limestone occurs in either thin beds or lenticular forms which would suggest that the deposition may have been for a short duration, and in small basins. It was possibly deposited at the same time as the Bedwell River and Buttle Lake deposits. If this is so, the limestone would be of Permian age.

[5]Clapp has said of the Sutton Formation of southern Vancouver Island - that part of the Island south of the Alberni Canal: "It consists of intercalations of crystalline limestone in Vancouver volcanics ..... In part definitely lowermost Jurassic in age; so Vancouver volcanics present accumulated largely under submarine conditions, although some of the vents probably above sea level, are in part of lowermost Jurassic age also. It is possible, however, that Vancouver volcanics includes some Triassic members".

Clapp has also described the formation on p 61 of his report. "Intercalated with the Vancouver volcanics are numerous lenses of crystalline limestone or marble. From one of these lenses, exposed on the south shore of Cowichan Lake three miles west of the Sutton Creek, determinable fossils were collected. The fauna has been determined as lower Jurassic, and the beds in which the fossils occur have been named, from Sutton Creek, the "Sutton Formation". It is probable that the other limestone lenses of southern Vancouver Island are of the same, or nearly the same age, and the Sutton formation is extended provisionally to include all of the intercalated limestones in the Vancouver volcanics of southern Vancouver Island".

[5]Clapp, Charles H., Southern Vancouver Island, Geological Survey, Canada, Memoir 13, 1912.

The lenticular deposits of the writer's northern division if correlated to the similar lenticular forms of the Sutton Formation would extend this horizon marker of lower Jurassic age north of the Alberni Canal. The writer knows of no reason why such a succession of deposits should not occur in this area; but, because of the limitation of information, the age grouping of the rocks can only be tentative.

B. Middle Division

The middle division of fine-grained volcanics and possibly argillites, has been intruded by both the northern and the southern divisions. The intrusives have caused extensive recrystallization in some places. As was previously stated, this middle division was called "Triassic (?) Jurassic" on the Vancouver Sheet.

C. Southern Division

The rocks of the southern division were determined to be mainly granite and diorite, with gneissic and schistose versions of these.

D. The Intrusives

The two intrusives are possibly of the same age and from the same source, although the rocks of the northern division are more basic than those of the southern one. The more siliceous composition of the southern division would tend to indicate that this intrusive is the later if the theory of differential segregation of magmas is applicable in this instance and provided that these intrusives do come from the same parent body.

ATTITUDE OF BEDS

Limestone beds located between the north and northeast forks of Tranquil Creek were the only sediments where reliable attitudes

could be obtained. Here the beds were approximately 60 ft in thickness, still lenticular, and have an average strike of south 37° east, and a dip of 68° northeast. The southern division yielded foliation of gneissic and schistose beds striking south 61° east, and dipping 56° northeast. Fewer observations and a smaller area is depicted by the schistosity so it may be regarded as the least reliable of the attitudes. (Note: Further work is to be done in the southern division and corroboration of the above facts will be accomplished over a larger area.)

This latter attitude agrees reasonably well with that obtained from the limestone; and under conditions of ordinary folding these attitudes would place the intrusion of the southern division before that of the northern, contradicting the assumption that might be derived from the theory of magmatic differentiation. A possible explanation could be that during movement of the magma through rocks of medium iron-magnesium composition, as is the central division, sufficient of this basic rock was included in the magma to render the later intrusive more basic than the earlier. A small area is included in the mapping, and until the tracts around the boundary have been geologized the correlation of relative ages is questionable.

EVIDENCES OF GLACIATION

The valley of Tranquil Creek shows characteristics left by valley and mountain glaciers. Drainage is disrupted on those tributaries draining the western side of the valley between a point three miles north of Tranquil Inlet and the western fork of Tranquil Creek. Here the valley has no well-defined drainage below an elevation of 1000 ft, yet on one tributary at 1000 ft altitude, the bluffs rise for hundreds of feet above the waterway. This is evidence of a valley

glacier truncating the valleys, leaving a "U"-shaped valley below 1000 ft, through which the drainage has not definitely re-established itself. Glacial till, although not extensive, is found in various locations in the valley. At altitudes between 1000 ft and 2000 ft a general tendancy exists for the topography to level off for a few hundred feet before rising as bluffs to the peaks.

Mountain glaciers have manifest themselves with cirque formations. One well-defined cirque on the western side of the Tranquil valley, above and to the south of the Fandora workings, must have been cut by a glacier that was approximately half a mile in width when at its greatest extent. A small lake now forms in the cirque bottom during the recession of the winter snow. Ice has played a part in the erosion and shaping of this area.

THE DEVELOPMENT OF A PROSPECT

Geologization of the area is a direct result of prospecting and the development work mentioned earlier in this paper. The geologists' study of regional geology, mineralization, and mining conditions in the area present the prospector and miner with information pertinent to work that might be planned.

One of the projects in the area, The FandoraMine, affords a suitable example of any lode gold mine exploration and development which may be undertaken in country having rugged, well-timbered topography, typical conditions for any mining anticipated on the west coast of Vancouver Island, and similar to many mainland localities of the Coast Range. The writer will record the development work to date on The Fandora Mine.

.....

ACKNOWLEDGMENT

The writer is indebted to Mr N.E. McConnel, Managing Director of Privateer Mine Limited, (hereinafter called "Privateer"), for the privilege of perusing Richmond's report and the use of assay plans.

.....

It has been pointed out previously that Mr S. Craig began operations on this property soon after the beginning of the war; but, because of financial difficulties, wartime restrictions, and geology that was apparently unfavourable he was obliged to cease work on the two levels he had begun.

When Mr E. Brown inspected the property he recognized that a shear zone possibly existed because spring-like outbreaks occurred on the hillside during dry weather. Further investigation revealed a small gulch running down the mountainside and past the two Craig adits. It was found to contain a body of sheared quartz and country rock. The vein material is contained by a narrow dyke, which in turn has intruded a fine-grained volcanic of andesite and basalt.

When the mineral claims held by Mr Craig lapsed Mr Brown restaked them, and by other transactions he and his associates obtained claims covering the shear-zone locality.

Mr P. Donahue was employed as a prospector, and when work began on tunnelling of the dyke shear he did the hand mining.

Mr McConnel, Managing Director of Privateer Mine Limited (N.P.L.), accompanied Mr A.N. Richmond, a consulting engineer, made an investigation of the property from Feb 5 to Feb 14, 1946 to determine the advisability of taking an option on the development.

A. Description of the Property

The mining property offered in the option included the following claims:

1. Fandora Gold Mining Company Limited,(N.P.L.) - Edmar, Edmar Fractional No. 1, Edmar No. 2, Edmar No. 3, Edmar No. 4, Edmar No. 5, Edmar No. 6, Edmar No. 7.
2. Tofino Gold Mines Limited,(N.P.L.) - Mary, Mary No. 1, Mary No. 2, Mary No. 3, Mary No. 5.
3. Gold Flake Mines Limited, (N.P.L.) - Gold Flake, Gold Flake No. 2, Gold Flake No. 3, Gold Flake No. 4, Gold Flake No. 5, Tranquil Gold No. 3, Tranquil Gold No. 4.

   The body of claims was held only by the location of the original stakes. Mr Richmond recommended that a number of claims should be staked to cover the likely-occurring fractions.

B. Preliminary Report by Consulting Engineer

Richmond concluded from his study of the amount of ore available and its economic potential, that a mine was financially feasible. Three sets of sampling results were available for checking the calculations. These samples had been taken by Mr Brown and Mr Donahue, Mr McConnel and Mr Richmond, and Mr Derome of Premier Mining Company Limited, (N.P.L.). It may be seen from the table below that the results obtained from these samples check very satisfactorily.

1. Development up to Feb 46

   1900 level ..... 400 ft

   2100 level ..... 100 ft

   Lower Craig ..... On footwall stringer

   Upper Craig ..... On hanging wall stringer

   Small cuts

2. Economic Evaluation

   Samples had been taken every 2.5 ft in the 2100 level and the 1900 level. A comparative section for the three sets of samples was obtained between 50 ft and 305 ft in the 1900 level.

Sampler	Richmond McConnel	G. Derome	Brown Donahue
Length of test section	260 ft	255 ft	260 ft
No. samples taken	54	101	186
Av. width H.W. Vein	0.88 ft	0.84 ft	0.76 ft
Uncut assay value, oz. Au.....	1.215	1.480	1.338
Cut assay value, oz. Au.....	1.045	1.125	0.965
.....			
Average width F.W. Vein	0.892 ft	1.010 ft	0.925 ft
Uncut value on 5.44 ft with dyke barren, oz. Au.....	0.385	0.385	0.415
Cut value of above	0.295	0.310	0.285
.....			

The inner end of the 2100 level was sampled and it gave an average of 0.31 oz Au per ton across a vein width of 2.2 ft. Brown's sampling of the outer 40 ft gave 0.3 oz Au across 4.0 ft.

Richmond suggested that mining operations would involve working the two veins and the intervening crushed dyke. He said some of the dyke material could possibly be screened out, and the over-sized quartz could be sorted back into the mill circuit. The mining of the veins and dyke would grade approximately 0.30 oz (cut) or $11.55 per ton with gold at $38.50 per oz in Canadian funds. (This figure has been altered to $10.50 per ton by the change in value of the Canadian dollar in the United States. Any bonus the government may bestow upon gold mine developments has been disregarded.)

.....

Mining Return - on basis of milling not less than 125 tons of ore per day.

Mining, Stoping, timbering, etc. $2.50/ton Tramming, sorting, waste disposal $0.75/ton	.....	$3.25/ton
Milling after 50% waste rejection $4.00/ton	.....	$2.00/ton
Overhead and misc. taxes, etc.	.....	$2.50/ton
Total costs	.....	$7.75/ton
Recovery 95% of $11.55/ton (0.30 oz Au)	.....	$11.00/ton
Recovery 95% of $13.35/ton (0.347 oz Au)	.....	$12.75/ton

Indicated profit per ton $3.25 (cut assays) to $5.00 (uncut)

.....

3. Mill Size

A mill of 125 tons per day has been recommended. According to the Richmond report, 100,000 tons of ore should be available before the construction of a mill is begun. By assuming an average mining width of 5.5 ft the measurement per ton of ore

is 12.5 cu ft, and by employing this unit a total of 67,000 sq ft of probable ore would satisfy the requirements.

Richmond recommended the property on the basis of the above calculations, adding, "The extension of these two drifts is of paramount importance in the period between April 1, and August 1". (This was the period offered in the option for development.)

C. Development

Privateer took the option on the property, which permitted exploration to further determine the economic possibilities of the mineralized body. The agreement allowed for a further monetary settlement when the option terminated if Privateer desired to operate a mine. It would hold the controlling interest of stocks. A percentage of the initial returns from the mine would be allocated to the payment of expenses incurred during development. An operation was undertaken, during the months denoted in the option, which would attempt to tunnel a sufficient area to prove the worth of the mineral claims.

Privateer initiated this project by giving a contract for tunneling of the 1900 level and 2100 level. The contract stipulated that $15.00 per ft would be paid for tunneling, and the mine company would provide all equipment and dynamite. The hiring of men was the responsibility of the contractor. This agreement proved to be a very satisfactory one for both parties. The mining Company was relieved of the responsibility of obtaining workmen. The rate of pay for the miners was high; but to overcome the possibility of individuals drifting away after working a few weeks, the contractor set a daily wage of $8, with a bonus to be received when the contract was completed.

The miners and Mr J. Murray, the foreman overseeing the development for Privateer, were dispatched to build a small camp and stock it with supplies. During April, when the work commenced, snow was still deep at the site of the mine camp at 1500 ft elevation. Transporting the supplies from the beach camp to the mine was done by "back-packing" over a trail consisting of two miles of cross-laid logs, 1½ miles of foot trail, and a steep incline from 500 ft altitude to the camp. The necessity to "back-pack" equipment to the camp resulted in hand-drilling methods of mining being used, because the heavy equipment necessary for mining with machines could not be transported.

The mine camp had been started at the time Mr S. Craig was doing development. A cabin and a wash-house made from split cedar boards remained intact. Further accommodation was necessary for 12 men. The construction undertaken was for the frames, floors, and sides for two sleeping quarters, and a cook-house. A tent and fly was used in each case for the roof. Later, during the summer, another sleeping quarter was erected.

The geological party visited the property during May to do ore sampling, and to locate the levels and camp by metal-chain and bruton-compass surveys. Several times during the summer the vein extensions, opened by mining, were sampled. The assay returns from these samplings are not available to the writer. Privateer has, however, provided the company assay maps, which have been traced and blueprinted by the writer, and are included herein. (Figs. 4 and 5).

D. Geology

Two quartz veins occur in a narrow dyke of feldspar-felsite

porphyry. The dyke has intruded the middle geological division of the area, which at this locale consists of a rock that by megascopic inspection would be called a trap. The intrusion is perpendicular to the attitude of the rocks which was established by bedding and schistosity. It, the intrusion, is about one mile from the coarse-grained rocks to the north and approximately one and one-half miles to the intrusive lying to the south.

The quartz veins are narrow and sheared, and have the pinches and swells which characterize such veins. Frequently some of the country rock between the veins and around them is sheeted also - an average distance between the veins on the 1900 level is 54 in. The two levels have widths of vein ranging from a fraction of an inch of sheeted quartz to that of two feet of crushed and broken material and gouge. The veins are free-walled and clayey gouge sometimes occurs between the vein and the country rock. Oxidation persists throughout the two levels because of the crushed and broken nature of the vein.

Mineralization consists of sparse crystals of pyrite, with galena and sphalerite rarely occurring. Free gold was not distinguished in any material taken from the 1900 level or 2100 level, but one specimen was taken from the dump at the Upper Craig portal that did contain a few specks of free gold.

The dyke shear has previously been described as appearing on the surface as a ravine. At the time the writer inspected the property this gulch had been traced for 1300 ft horizontally and 650 ft vertically. Samples taken from openings upon it have yielded values in all instances.

The mantel covering of the dyke might be conveniently removed by employing the mountain streams for hydraulic washing. At the present time, however, such a practice would not be practical above the mine camp, but could be employed at elevations below 1500 ft without endangering any personnel or existing trails. The plentiful supply of water in the streams flowing down this part of the mountain, and the steep gradient of the slope lend themselves to such an operation.

The surveys conducted by the geological party disclose that the final vertical distance of 1000 ft on the trail to the mine camp is accomplished in a horizontal distance of 1800 ft. The gradient is as much as 51° from the horizontal. The slope from the camp to the levels at 1900 ft and 2100 ft is nearly the same as that below. This is a factor to be considered when planning transportation to the project, or the site for a mill.

E. Timber

Timber is abundant upon the mountainside and will provide an adequate supply for mining purposes and the necessary buildings. The trees are very old and include yellow cedar; hemlock; balsam fir; small numbers of douglas fir; and red cedar which are six feet or eight feet in diameter. Most of the area has been covered by timber leases, some of which may now have lapsed.

F. Water Power

Water power can be developed in the area and the water rights for 500 hp were taken on the north fork of Tranquil Creek. Waterfalls exist over a large extent of this stream, so the steep gradient makes high-head water power possible.

Drifting progressed throughout the summer on the 1900 level

and 2100 level. Then, during the end of July work ceased on the 2100 level and an adit was begun at 1700 ft elevation. Initially the dyke and vein material were more difficult to mine than that in the two upper levels where lagging was necessary to stop the roof from caving; but after tunnelling for 50 ft into the mountainside the sheared material was encountered.

G. Report Published[6]

Privateer published a report during October after the terms of the option had been completed and the company had purchased the controlling interest of the mine property.

It said: "traced for 1600 ft on strike, over a vertical range of 900 ft.

On 2100 ft - 2 ore lengths

(a) One for 105 ft averages 0.46 oz Au per ton over a width of 3 ft.

(b) 100 ft averaging 1.13 oz Au per ton, width 1.26 ft, face continuing.

On 1900 ft - 2 ore bodies

(a) 450 ft average 1.0 oz Au, per ton, width 1.77 ft.

(b) Unlimited length of 160 ft averaging 2.85 oz Au per ton, width 1.07 ft.

On 1700 ft level

(a) 40 ft ore length averaging 2.99 oz Au per ton across 2.15 ft.

[6] "Western Miner", vol.19, No. 10, p 88.

(b) Second ore body encountered, with drifting in progress as this is written.

Company engineers establish the reserves developed to date (Oct 1946) at 55,100 tons, averaging 0.4 oz gold per ton over width of 5.0 ft."

H. Future

Sufficient ore has been opened to pay the costs of exploration and the construction of a mill. It is essential, therefore, to begin building the mill at the earliest opportunity, and the drifting should continue simultaneously.

The site most suitable for a mill is at the base of the mountain below the present mine camp; but, the construction cannot be commenced until a road has been built. This entails improving the existing road and extending it 1½ miles. Although minor repairs are being made to the road, the company is not beginning work with machinery until the spring of 1947.

Deep sea navigation is possible to the head of Tranquil Inlet; but the beach camp is at present accessible only from the Inlet by small boat. This is insufficient for the future, and the writer suggests two alternatives. First, a bulldozer could be used to make the Creek navigable for scows at high tide. The undertaking would be neither difficult nor expensive. Second, the present road could be extended across the Creek by a bridge and continued to the easterly side of the Inlet. Here the shore is accessible at high tide.

Several utilities will be constructed to provide necessities. The lumber for the construction of the mining camp and the timbers for the mine will require a sawmill which will produce approximately 6000

ft of lumber each day. A high-head power plant, supplying 700 hp is also planned, and will be built at the junction of the north and east forks of Tranquil Creek. A power transmission line shall connect it with the mine.

.. ..

BIBLIOGRAPHY

Department of Agriculture, "Climate of British Columbia, Report for 1940", Province of British Columbia.

"The Annual Report, Minister of Mines", British Columbia, 1896.....1942.

Gunning, H.C., "Buttle Lake Map-area, Vancouver Island", Geological Survey, Canada, Summary Report, 1930, Part A.

Sargent, H., "Supplementary Report on Bedwell River Area, Vancouver Island", British Columbia Department of Mines, Bulletin 13, 1941.

Clapp, Charles H., "Southern Vancouver Island", Geological Survey, Canada, Memoir 13, 1912.

Tranquil Creek area, Vancouver Island, B.C.

Aug 1 - neat. Cecil A. Burns.

3 "in" of water = metres

5 - inspected by the writer? - re as assistant to Lynott.

10 + previously - spells it porphory.

13 Why does folding give age of intrusive?

Glaciation - most general statements only.

4 Geologization

Really very little on geology

Good account mining development.

Maps and general presentation good.

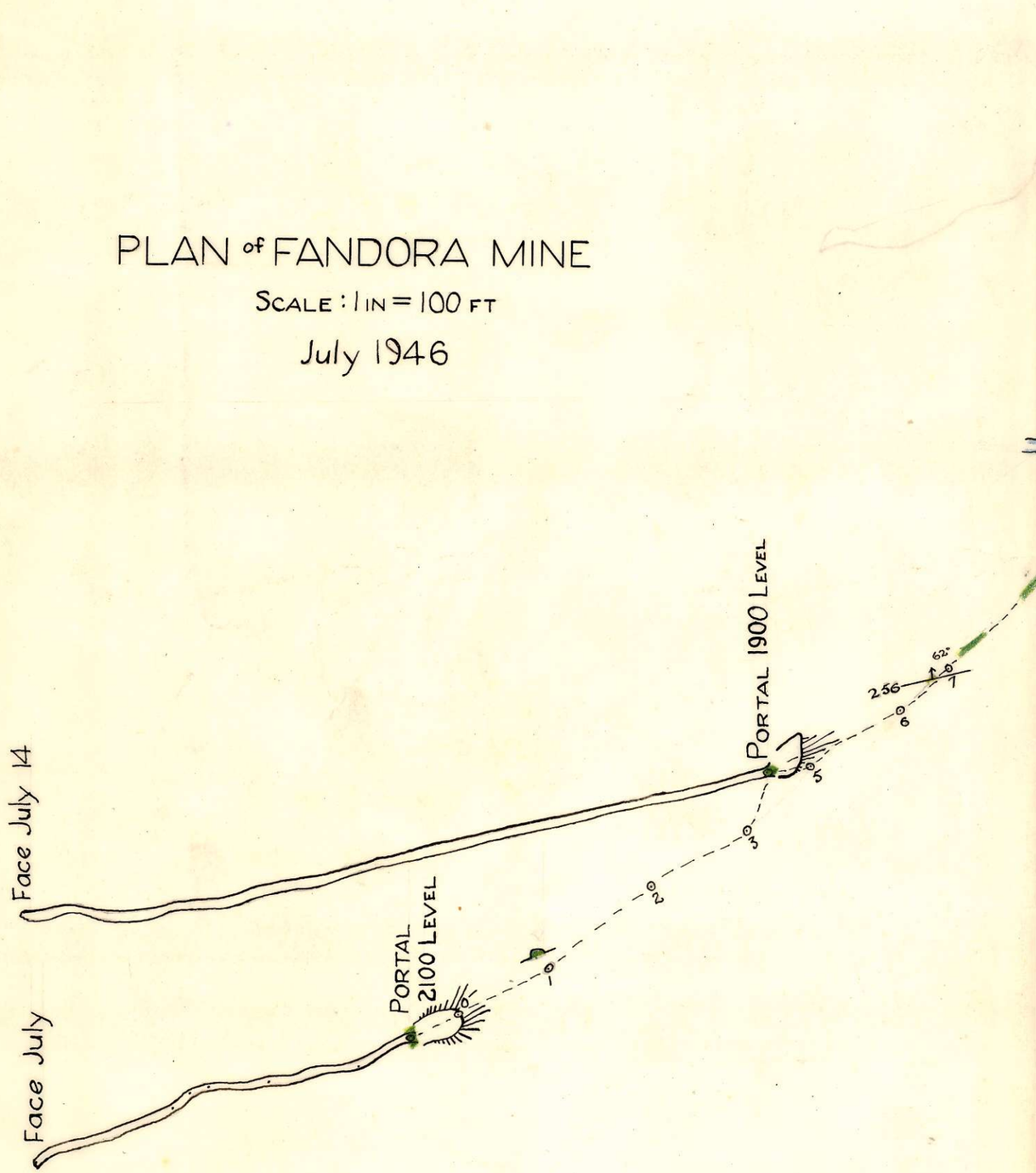
Presentation 28/35 matter 20/25

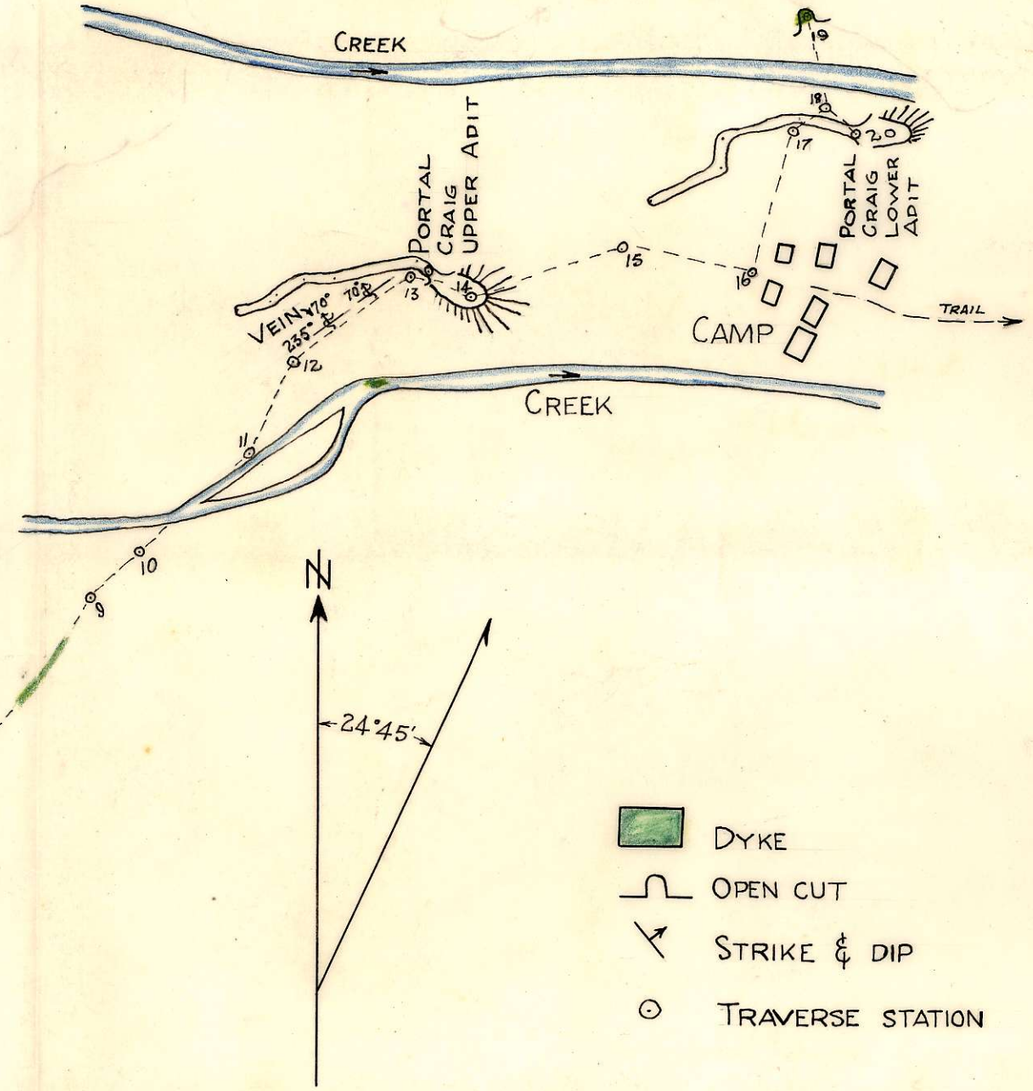
Should have a more clear acknowledgement - probably got most of guidance from Lynott.

PLAN of FANDORA MINE

SCALE : 1 IN = 100 FT

July 1946





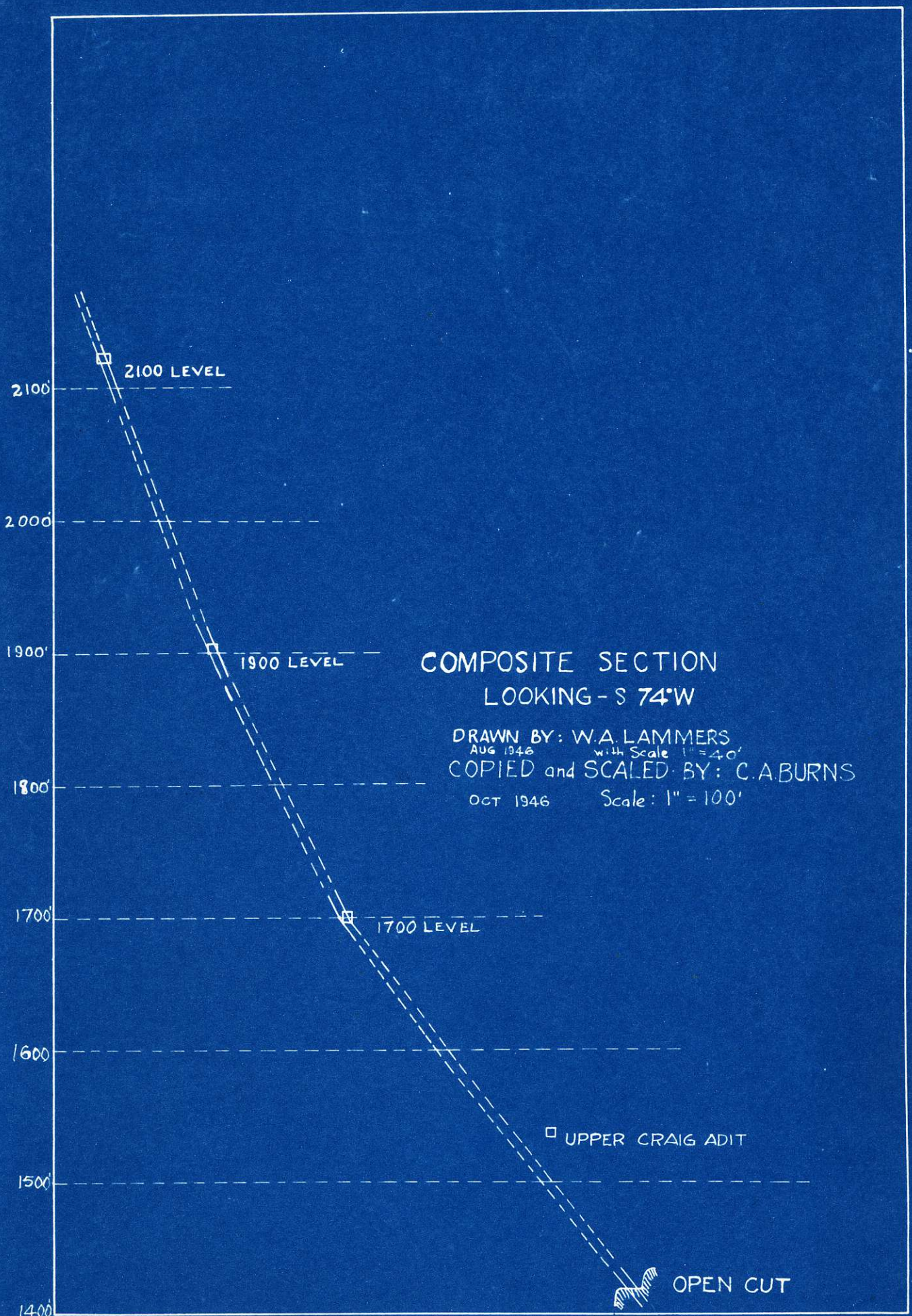
DYKE

OPEN CUT

STRIKE & DIP

TRAVERSE STATION

FIG. 2


2100 LEVEL
2100'
2000'
1900'
1900 LEVEL
1800'
1700'
1700 LEVEL
1600'
UPPER CRAIG ADIT
1500'
OPEN CUT
1400'
COMPOSITE SECTION
LOOKING - S 74°W
DRAWN BY: W.A. LAMMERS
AUG 1946 with Scale 1" = 40'
COPIED and SCALED BY: C.A. BURNS
OCT 1946 Scale: 1" = 100'