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1. INTRODUCTION

This report covers 1980 exploration by BP Canada on its four coal properties on Vancouver Island (Dash Creek, Alberni, Parksville, Moriarty Lake) and one additional study are (Cowichan).

1.1 Scope of Report

The 1980 exploration programme was undertaken in two phases, mapping in the late spring followed by drilling in the autumn. Logistic and cost data are presented as Section 2 of this report, covering all areas and programme phases. A summary of past geological work, relevant to the areas explored in 1980, constitutes Section 3. The regional geological setting is discussed in Section 4, and exploration results from all five areas explored in 1980 are presented in Sections 5 to 9. Extensive use has been made of published and unpublished geological reports; Section 10 contains the list of literature cited. Volume 2 containing Appendices A and B present field notes and drill logs respectively, whilst Volume 3 contains maps and Volume 4 Geophysical Logs.

1.2 Location and Access

The BP coal properties are situated as follows (refer to Maps 1 and 3 for details):

- | | |
|--------------|---|
| Alberni | - at the south end of the Alberni Valley, in the Insular Mountains of Vancouver Island. |
| Dash Creek - | between the headwaters of the South Fork of the Englishman River and the Nanaimo River, in the Insular Mountains of Vancouver Island. |

- Moriarty Lake - location as for Dash Creek except that it is between the North Fork of the Englishman River and the Nanaimo River.
- Parksville - along the eastern coastal lowland of Vancouver Island, in the vicinity of Parksville and Qualicum.

The Cowichan study area is situated on the south wall of the Cowichan Valley, in the Insular Mountains of Vancouver Island. Access to these areas is by provincial highways 1, 4 and 19 and a network of public and private roads, mostly logging roads.

A more detailed description of the location and access of each property may be found at the beginning of the relevant sections of this report.

1.3 Property Definition

Each of the four BP properties has a similar background. In no case has there been previous known coal exploration, other than cursory prospecting. There have been no coal licences previously granted on any of the properties, and BP currently hold 100% interest on all four properties. Exploration done in 1980 has been under the direct control of BP Canada.

The Cowichan study area covered an area of coal licence application which was dropped from further consideration after mapping, prior to granting of coal licences. This was done due to unfavourable geology.

1.4 Summary of Work Done

Topographic maps at 1:10,000 scale were prepared for the 1980 exploration programme. A total of 50,881 hectares was surveyed for the programme, covering the four properties and the Cowichan study area, as well as substantial surrounding areas.

During the 1980 programme, geological reconnaissance mapping was done over all four properties. A total area of 18,867 hectares was covered at a mapping scale of 1:10,000. Reconnaissance at 1:10,000 and 1:50,000 scales was carried out into adjoining areas for purposes of regional geological control. Approximately 10,000 hectares was covered in this phase of mapping. In the Cowichan study area, reconnaissance mapping at a scale of 1:10,000 covered an area of approximately 4,900 hectares.

On the four properties, thirteen holes totalling 4,451 m were drilled. Of these, two were abandoned due to problems in penetration of overburden. The remaining eleven holes were geophysically logged, with gamma neutron, caliper, density, deviation and resistivity tools. Not all logs were run in all holes; Table 2-8 provides details of log utilisation.

6.0 COWICHAN STUDY AREA

6.1 LOCATION AND ACCESS

The Cowichan study area is situated on the south side of the Cowichan Valley of Vancouver Island, between Holt and Kelvin Creeks, and covers the lower half of the south wall of the valley.

Access to the study area is by paved public roads and several main logging-roads. Branch logging roads also cross the study area but were generally found to be washed-out, or blocked by deadfall and were therefore only of use as walking trails. The abandoned Victoria branch of the Canadian National Railways crosses the southeastern part of the study area. It has been blocked by piles of earth and logs, and in several places the roadbed has washed out, rendering it untrafficable.

The boundaries of the study area are shown on Map 3, "Geology of the Cowichan Study Area".

6.2 PROPERTY STATUS

No coal licences are in effect within the study area.

6.3 PREVIOUS EXPLORATION

Within the confines of the Cowichan study area, there has been no reported coal exploration.

6.4 GEOLOGY

The Cowichan study area is situated along the south flank of the Cowichan Valley, which is an area of complex structure,

TABLE 6-1

COWICHAN STUDY AREA

TABLE OF FORMATIONS

ERA	PERIOD OR STAGE	GROUP AND FORMATION	MAP-UNIT	LITHOLOGY	THICKNESS (m)	
CENOZOIC	PLEISTOCENE AND RECENT		OB	Till, sand, gravel, etc.	0 to 70+	
MESOZOIC	UNCONFORMITY					
	UPPER CRETACEOUS	NANAIMO GROUP				
		PENDER FM.	KPm	Siltstone, mudstone	12+	
		EXTENSION FM.	KEx	Conglomerate, sandstone	190 to 215	
		HASLAM FM.	KH	Siltstone, sandstone, mudstone	550	
		COMOX FM	KCx	Sandstone; minor conglomerate	180	
	NONCONFORMITY					
	JURASSIC	"BASEMENT"		V		
		ISLAND INTRUSIONS		II	Granodiorite	
	PALEO-ZOIC	PENNSYLVANIAN	INTRUSIVE CONTACT			
SICKER GROUP?			S	Meta-sediments and volcanics		

including two west-northwesterly-trending, northeasterly-dipping half-grabens. The thick filling of Upper Cretaceous sedimentary rocks (Nanaimo Group) is largely concealed by extensive Pleistocene sediments. Within the study area, however, tilting and erosion have resulted in the partial exposure of the basal Upper Cretaceous rocks. The table of formations (Table 6-1) shows the various rock-units encountered, and Map 3 shows the geological interpretation of the Cowichan study area.

6.4.1 Stratigraphy

From youngest to oldest, the following units have been recognized in the Cowichan study area:

6.4.1.1 Overburden

The bulk of the study area is covered with overburden sufficiently thick to prevent exposure of bedrock in road cuts (2 m+). Only isolated outcrops are seen to occur, and their recognition is complicated by the presence of glacial erratics of conglomerate, some the size of a truck. A good example is on a farm just north of Deerholme wye. Till, sand and gravel are present in the foothills immediately south of the Canadian National line to Cowichan Lake. At the crossing of the 500-KV power line and the railway, at least 70 m of overburden is present. Further

south, high on the south wall of the Cowichan Valley, the till cover diminishes to a metre or less, and exposures in roadside ditches are more complete. Erosion of logged-off areas (for instance at the head of Glenora Creek) has resulted in the exposure of large patches of bedrock.

6.4.1.2 Catface Intrusions

This unit is believed to be absent in the Cowichan study area.

6.4.1.3 Nanaimo Group

The four oldest formations within the Nanaimo Group are present in outcrop within the study areas. From top down they are the Pender, Extension, Haslam and Comox Formations.

6.4.1.3.1 Pender Formation

At only one point does this unit outcrop in the study area, although its subcrop is inferred to be present along the area's northern margin.

At locality C4200x4, on the Holt Creek logging road, are exposed thinly interbedded dark grey, sandy siltstones and silty mudstones. At least 12 m of section is exposed here.

6.4.1.3.2 Extension Formation

At several localities along the northern rim of the study area, outcrops of conglomerate and sandstone were encountered. These coarse-grained sediments are characterized by poor sorting and thick-bedded to massive nature.

Conglomerates range from granule to small pebble sizes, with locally abundant, commonly ill-sorted matrix of mud to coarse sand. Associated sandstones are medium to coarse-grained or gritty, and locally are arkosic. Carbonate content is variable; in places these rocks range from non- to strongly calcareous. The approximate thickness of the Extension Formation, as calculated from outcrop data, is 190 m at Holt Creek and 215 m along the railway southeast of Deerholme.

6.4.1.3.3 Haslam Formation

This unit is exposed in road-cuts along a broad east-west belt through the study area. Two members were established by Ward (1976 and 1978) on the basis of nearly-complete exposures along the Cowichan River to the north of the study area; within the study area exposures were not as complete and the reconnaissance nature of the

BP project dictated that the Haslam Formation be left undivided.

Typical Haslam lithologies encountered were interbedded sandstone/siltstone, sandstone/siltstone/mudstone, and thick, isolated beds of sandstone. Sandstones of the Haslam are typically very fine to fine-grained, clean or slightly silty, medium grey to greenish-grey, and cherty. Isolated sandstones tend to be cleaner and vary from massive to thin-bedded, with a tendency for bedding to thin upwards. Large (1 m+) elliptical concretions occur in some exposures.

Siltstones tend to be thin-bedded, rubbly, sandy, dark grey to olive drab and show a strong tendency towards spheroidal weathering. Mudstones are a minor component of the outcrops seen thus far; they are commonly dark grey, rubbly and silty. Some siltstones and mudstones were seen to be intensely bioturbated; a few pelecypods were also seen, confirming the marine origin of the Haslam. The thickness of the Haslam at Cowichan River is reported by Ward (1978) to be 550 m; it does not appear to be substantially different within the study area.

6.4.1.3.4 Comox Formation

This unit was the target of the BP study, as it has been shown to contain mineable coal deposits elsewhere on Vancouver Island. Due to the incomplete exposure, no attempt has been made to subdivide the Comox into members such as have been recognized in BP studies elsewhere on the Island.

Within the study area, the Comox Formation consists predominantly of sandstone, with (at least locally) a thin basal conglomeratic phase, perhaps correlative to the Benson Member as seen elsewhere. Comox sandstones here are typically medium to coarse-grained, dark yellow-brown to brown-weathering, thin to medium-bedded, blocky and distinctively arkosic. Small worm burrows, shell fragments, bark chips and intraclastic bands of mud chips are also locally present. Towards the base of the Comox, gritty and pebbly bands occur within the sandstones. On the 500-KV powerline right of way at the western end of the study area (locality C3800x8), medium to coarse-grained, pebbly arkosic sandstone grades down to sandy pebble-conglomerate within a 10 m interval. Nearby are basement exposures;

this conglomerate is probably basal. The thickness of the Comox, calculated from outcrops along the valley wall south of Deerholme, is 180 m.

6.4.1.4 Basement

Two basement units outcrop in the study area; the Island Intrusions and an unknown unit within the Sicker Group.

6.4.1.4.1 Island Intrusions

Exposures of this unit are found along the edge of the Nanaimo Group outcrop, from the 500-KV power line eastwards. It consists of white to golden-weathering, coarse-grained, biotite granodiorite. Locally this rock is chlorite-rich and darker grey-green; possibly this marks the edge of a pluton. Below the pre-Nanaimo Group basement surface, the Island Intrusions are locally deeply weathered, to a friable rusty-orange material, almost a grus. A good example of this is at locality C4298x22.

6.4.1.4.2 Sicker Group?

According to Muller (1980a), the rocks exposed along Holt Creek south and west of the edge of the Island Intrusions outcrop belt are argillite, greywacke, chert and diabase of the Sediment-Sill Unit of the Sicker Group. However, in his

later paper (1980b) he shows them as belonging to the Myra Formation of the Sicker Group, composed of rhyolitic to dacitic breccia, tuff, flows, argillite, siltstone, greywacke and conglomerate. During the BP mapping, these rocks were assigned to the Karmutsen Formation on the basis of their chlorite-rich greenstone lithology in the exposures examined, although it was noted that they are more well-bedded than the typical Karmutsen greenstones. The actual identity of these rocks remains unclear, but it is accepted as probable that they fall somewhere within the Sicker Group.

6.4.2 STRUCTURAL GEOLOGY

The principal structural feature of the study area is a north-northeastward-dipping monocline, with dips increasing westward from 30 to 40 degrees, in the Kelvin Creek area, to nearly 80 degrees, west of Holt Creek. This structure is cut by several north-east-trending, left-lateral faults, with displacements on the order of several hundred metres each. The actual faults themselves have not been observed but the dislocation of outcrop trends and changes in strike direction have indicated their presence.

6.4.3 Coal Development

Earlier geological work (Clapp and Cooke, 1917 pp. 227, 392-3) suggested the occurrence of coal, albeit impure, in beds which now are assigned to the Comox Formation, at Maple Bay and Saanich Inlet, east of the study area. Within the study area, the Comox Formation is at least in part marine (as suggested by the occurrence of shell fossils and worm burrows) and, apart from a few showings of bark chips or coal spars, no carbonaceous or coaly material was found in the field. The lack of favourable environmental indicators suggests that coal is not likely to be present in significant amount with the study area.

6.5 RECOMMENDATIONS

Although the possibility of encountering coal in one or more drillholes could not be discounted exploration was terminated within the study area following completion of reconnaissance mapping, on grounds of steep dips and environmental sensitivity of the area, rendering minimal the prospect of successful mining. Therefore it is recommended that no further coal work be undertaken in the Cowichan study area.

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VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 13

SHEET 1

STATION	UNIT	DESCRIPTION	
C4498x1	KH	Here at washout in logging road, proposed site D. Photographs taken.	
		The following section was observed in the creek, in August, 1979 (old	
		station no. CV-25):	
		TOP OF SECTION:	
		SANDSTONE-fine to very fine-grained, medium grey, non-calcareous, massive	
		low-angle cross-laminated. Attitude: 105/53 NE.	1 m
		SILTSTONE/MUDSTONE, silty/SANDSTONE-very fine-grained, interbedded,	
		sandstone is medium grey, rest is dark grey. Poorly exposed, thickness	
		is estimated. All non-calcareous.	25 m+
		SANDSTONE-very fine-grained, clean, medium grey, buff-weathering, massive	
		and moderately calcareous at base, passing upward to thin-bedded and non-	
		calcareous at top. Some large-scale low-angle cross-lamination;	
		occasional stringers of muddy intraclasts. Rare dark carbonaceous laminae.	
		Attitude: 113/53 NE.	5 m

VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 13

SHEET 3

STATION	UNIT	DESCRIPTION	
		BASE OF SECTION	
C4498x2		Here on logging road, a swampy area to north. No outcrop	
x3	KH	SLP, down road from x2, banks show sandy pebbly till. Here in ditch	
		an outcrop of:	
		SANDSTONE, very fine-grained, grading up to	
		SILTSTONE-sandy - dark grey, grey-weathering, with some rusty patches.	
		Thick-bedded, blocky, slight onion-skin weathering, unit is well-cemented	
		but non-calcareous. Clean, looks lithic. One robust, concentrically-	
		ridged pelecypod fossil, about 2.5 cm long. Attitude: 105/56 N.E.	
x4		SLP, ATP no outcrop. Here culvert and stream.	
x5		SLP, ATP no outcrop. Here another culvert. Stream has low banks, very	
		swampy-looking.	

VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 13

SHEET 4

STATION	UNIT	DESCRIPTION	
C4498x6		SLP no outcrop. Here SANDSTONE-very fine-grained, silty, rubbly, dark greenish-grey, rusty-weathering, concretionary. Thin-bedded, except for one 10 cm bed of fine-grained, slightly lighter, cleaner sandstone with a few intraclasts and silty, muddy laminae. The unit as a whole contains scattered tiny intraclasts or small dark burrows. Non-calcareous. Some beds are more olive-grey and particularly concretionary: they are composed of friable very fine to fine-grained sandstone. This outcrop shows strong jointing, with several closely-spaced sets but no sign of drag. Attitude (bedding) 109/49 NE. Collected one small pelecypod here. Photographed. Joints: major 010/83E, minor 171/82 W.	
x7		SLP rubbly beds partly exposed in bank. Here outcrop on corner shows following section: TOP OF SECTION: SANDSTONE-thick-bedded to massive, fine-grained, clean, medium grey, containing elliptical concretions to over a metre long. Very slightly calcareous. Bedding thins to medium to thin, at top of exposure. Some large-scale trough cross-bedding near top. Basal contact is gradational	6 m+

VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY CowichanGEOLOGIST C. BickfordDATE May 14SHEET 6

STATION	UNIT	DESCRIPTION
C4498x9	KH	Here in bank of road, outcrop of SILTSTONE-dark grey, rusty orange-weathering, rubbly, scattered small dark worm burrows. Thin-bedded, non-calcareous. Attitude: 110/50 NE. From washout to here, scattered outcrops of this unit, including at trail by washout, near its junction with the road. This is probably the thin-bedded unit in creek at the washout.
x7	KH	(revisited) Walking up the road, it is evident that this fine-grained, thick-bedded clean sandstone is both underlain and overlain by the rubbly siltstones, etc. These two lithologies may be repeated in the section, as for example, along the washout creek. These beds may be in the Haslam, perhaps Ward's Cowichan Member.
x10		Here in bank, outcrop of SANDSTONE-very fine to fine-grained, medium to dark grey, chert-lithic. Mainly clean, thick-bedded and blocky, with some argillaceous, thin-bedded and rubbly phases. Patchy hematitic weathering. A few elliptical rusty concretions, 3 cm to 4 cm long. One possible pelecypod mold, quite robust-looking. The thick-bedded phases

VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 14

SHEET 7

STATION	UNIT	DESCRIPTION	
		show vague low-angle or planar lamination. Non-calcareous except for one	
		small patch.	
C4498x11	KCX	Here another washout in road. Section taken in creek here:	
		TOP OF SECTION:	
		SANDSTONE-fine-to medium-grained, arkosic, massive, clean, non-calcareous,	
		brownish-grey, light grey-weathering. Some bedding-plane movement	
		with chalky veining. Rare vague-paralalled lamination. Some rusty	
		patches. Attitude: 054/62 NW. Channeled, erosional base.	7 m+
		SANDSTONE-fine to medium-grained, arkosic, some dark argillaceous	
		laminae; a few thin beds of dark grey carbonaceous mudstone (to 2 cm)	
		with scattered coal spars. Thin to thick-bedded, brown, rusty-weathering,	
		non-calcareous. Abundant chalky veinlets and joint and bedding plane	
		fillings. Jointing: major 152/88 NE, minor (with water). 013/37E.	9 m
		Bedding: 062/59 NW.	(est)

VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 14

SHEET 8

STATION	UNIT	DESCRIPTION	
		<p>FAULT: 5 m wide disturbed zone with small drag folds, sense of displacement down to N. Abundant jointing and shearing, some slickensiding. Central gouge zone is 5 cm wide. Attitude of fault plane is 117/87 N, hence near-vertical normal fault. Throw unknown.</p>	
		<p>SANDSTONE-fine-grained, clean, thick-bedded to massive, becoming thinner-bedded above. Brownish-grey, grey-weathering, parallel, laminated, some bands rich in intraclasts and comminuted shell fragments. Non-calcareous. Some jointing and bedding planes filled with chalky, white, non-calcareous mineralization. Jointing at 170/88 E; bedding at</p>	
		<p>056/54 NW. Base not seen.</p>	6 m+
C4498x12		<p>SLP, STP no outcrop. Probably till all around.</p>	
x13		<p>SLP, ATP no outcrop. Till shows in bank.</p>	

VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 14

SHEET 9

STATION	UNIT	DESCRIPTION
x14	KCX	Here poor exposure of SANDSTONE-medium-grained, arkosic, dark-brown weathering, soft and weathered throughout, medium-bedded, blocky, non-calcareous. Abundant near-vertical and oblique mud-filled burrows, 2 mm to 3 mm diameter. Also come tracks and trails on bedding (less likely: plant stems). Attitude: 099/51 N.
x15	KCX	SLP scattered outcrops of sandstone. Here in bank at road level, SANDSTONE-medium to coarse-grained, dark brown-weathering, like at x14. Here thin bedded, low angle cross-bedded, with carbonized bark chips and shells, both articulated and as fragments. Attitude: 099/59 N.
x16	KCX	Here small outcrop in road, of SANDSTONE-fine to medium-grained, arkosic, like before. A few long, dark med-filled burrows. Here unit is medium-bedded, blocky, attitude 089/49 N.
C4498x17	KH	SILTSTONE/SANDSTONE-very fine-grained, thinly interbedded, churned and burrowed, destroying lamination. Dark greenish-grey, hematitic-weathering, rubbly, non-calcareous. Attitude: 108/40 NE.

VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 14

SHEET 10

STATION	UNIT	DESCRIPTION	
x18	KH	SILTSTONE/SANDSTONE, very fine-grained-as before, exposed in road. Attitude: 123/55 NE.	
x19	KCX	SANDSTONE-very fine to fine-grained, arkosic, brown, thin-bedded, platy to rubbly, non-calcareous, like that at x16. Outcrop in road, cannot get attitude.	
x20	KH?	SANDSTONE-fine-grained, medium-grey, clean, chert-lithic. Thin-bedded hard, non-calcareous, grey-weathering, attitude: 106/51 NE.	
x21	KH	SLP road shows rubble and occasional small outcrops of very fine-grained sandstone and siltstone. Here in bank, SANDSTONE-fine-grained, light brownish-grey, brown-weathering, thin-bedded, rubbly, non-calcareous. Both lithic and arkosic but by no means as arkosic as at x11. Occasional argillaceous laminae. Attitude: 095/53 NE.	

VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 14

SHEET 11

STATION	UNIT	DESCRIPTION	
		Outcrop continues along road for 30 m, show beds lower in section.	
		The sandstones are underlain by:	
		SANDSTONE, fine-grained/(SANDSTONE, very fine-grained/SILTSTONE/MUDSTONE,	
		silty-interlaminated)-thickly interbedded unit, comprising two distinct	
		lithologies. The sandstones are fine-grained, clean, faintly parallel-	
		laminated, remarkably planar-bedded, non-calcareous, well-cemented,	
		medium grey and cherty-looking. They are in beds 15 to 60 cm thick,	
		attitude 100/52 NE. Interbedded with the sandstones are interlaminated,	
		thin-bedded, rubbly-weathering beds, composed of sandstone and siltstone	
		towards the top of the exposed section, and downwards dominantly silt-	
		stone and silty mudstone. These rubbly beds are non-calcareous, with	
		burrows and intraclasts. Total section exposed is approximately 20 m.	
		Overall appearance is turbiditic.	
C4498x22	KCx	Here an outcrop of SANDSTONE-fine-grained, clean, brown-weathering, thin	
		to thick-bedded, softer than before, some low angle crossbedding and	
		dark grey muddy intraclasts. Estimated 5 m thick: attitude: 097/54 NE.	

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TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 14

SHEET 12

STATION	UNIT	DESCRIPTION
x23	KCx	Here glacially polished and rounded outcrop of SANDSTONE, fine-grained, brown-weathering.
x24	KCx	Here another rounded outcrop of SANDSTONE-fine-grained, clean-looking, arkosic, with a few large muddy intraclasts, or possible flattened burrows. Medium brownish-grey, olive-grey weathering, thin to medium bedded, blocky. Attitude: 106/46 NE.
x25	KCx	SLP scattered blocks of sandstone in road, like that of x24. Here road ends. Above is a curiously open slope, with trees but little undergrowth. Could this be a dip slope?
x26	KCx	Here, up slope from x25, outcrop under overturned stump: SANDSTONE-medium to coarse-grained, some very coarse-grained to gritty, with occasional rounded pebbles to 20 mm. Arkosic, brown-weathering, thick-bedded, blocky, non-calcareous. Grits have abundant fine sand matrix. Attitude: 111/47 NE. Almost certainly near base of Comox.

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TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

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SHEET 13

STATION	UNIT	DESCRIPTION
C4600x1		Here end of public road: this countryside is gently rolling and contains no visible outcrops.
x2		Here end of public road. SLP, ATP no outcrop.
x3		Here is located the Shawnigan Division logging office. No outcrop.
C4498x27		Here junction of logging roads. Left leads up to Lois Lake; right leads down to shale pit. No outcrop.
C4298x1		Here junction of logging roads. Left leads uphill to Lois Lake, right ultimately leads to Holt Creek main line. SLP, ATP no outcrop-looks like all till here.
x2		SLP, ATP no outcrop - in logged area.
x3		SLP, ATP still no outcrop.
x4	KH	SLP no outcrop. Here to west of road a drilled and blasted outcrop of SANDSTONE-fine-grained, medium grey, grey-weathering, blocky, medium-

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STATION	UNIT	DESCRIPTION	
		to thick-bedded, non-calcareous, hard and well-cemented, devoid of lamination. 2 m exposed. Attitude 115/31 NE.	
C4298x5		SLP, ATP, banks show sandy till. No outcrop.	
x6		SLP no outcrop. Here poor exposure, in bank and in road, of: SANDSTONE, fine-grained/SILTSTONE-interbedded clean, fine-grained, thin to medium-bedded, dark grey-brown-weathering, non-calcareous blocky sandstone <u>and</u> rubbly, dark grey, hematitic-weathering, non-calcareous siltstone, which is interlaminated with very fine-grained sandstone. Attitude: 092/52 NE (fair).	
x7		SLP, outcrops in road and bank of SILTSTONE/SANDSTONE, very fine-grained rubbly, as before, with more resistant interbeds of light grey-weathering blocky sandstone.	
		Here at road junction, a good outcrop in bank, of: SANDSTONE; very fined-grained, silty/SANDSTONE, fine-grained (90:10)-	

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SHEET 15

STATION	UNIT	DESCRIPTION	
		interbedded, rubbly thin-bedded, silty, very-fined grained, medium to dark grey, rusty-weathering, non-calcareous, concretionary sandstone with vague small dark burrows and tiny plant (?) fragments; and clean, light brownish-grey, buff-weathering medium-bedded, blocky, non-calcareous arkosic fine-to very fine-grained sandstone, which is devoid of lamination but contains a few concretions. Attitude: 099/50 NE. (excellent).	
C4298x8	KH	SLP scattered rubble and outcrops of sandstone and siltstone as before. Here a good exposure of rubbly SANDSTONE, very fine-grained/SILTSTONE/MUDSTONE, silty - interlaminated, with interbeds (to 60 cm) of SANDSTONE, fine-grained. The rubbly beds are dark grey, dominantly silty, with mudstone as laminae and sandstone as cross-laminated lenticles. The sandstone interbeds are clean and somewhat arkosic, with occasional vague thick planar lamination. Attitude: 096/51 NE. (excellent). Compare this outcrop to Δ C4498x21.	

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TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 15

SHEET 16

STATION	UNIT	DESCRIPTION	
x9	KCx?	<p>Here along ditch an excellent exposure of a sandstone and conglomerate-filled channel cut into sandstones. The channel is at least 10 m wide and 1 m deep. The channel contains: CONGLOMERATE, pebble, and SANDSTONE, very coarse-grained, pebbly. Sorting is fair to poor, with abundant flattish clasts of dark grey silty, sand-rippled mudstone. Some thin yet persistent beds of silty, sand-rippled mudstone are found at the bases of conglomerate beds in the channel, and are truncated above by overlying conglomerates; perhaps these mudstones are the source of the mudstone clasts. One gastropod (?) fragment was noted in such a mudstone bed. The conglomerates contain sub-rounded to sub-angular pebbles of dark chert, granodiorite, and greenstone. Cross-bedding and crude internal stratification is evident in the conglomerates. Sandstones in the channel are olive drab. The channel axis bears 020° at 60° NE, suggesting a NNE or SSW paleo current.</p> <p>Underlying and adjacent to the channel is SANDSTONE-fine-grained to gritty, poorly sorted, non-calcareous, olive drab, with abundant muddy intraclasts and narrow leases of conglomerate. Attitude: 122/42 NE (poor).</p>	

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TRAVERSE NOTES

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STATION	UNIT	DESCRIPTION	
C4298x10	KCx	SLP sandstones have become coarser, more arkosic. Here SANDSTONE-very coarse-grained to gritty, with abundant thin dark laminae (maybe of heavy minerals?). Along the road the sandstones occasionally contain pebbles of granodiorite, but here contain occasional muddy intraclasts along bedding planes. Medium scale low-angle cross-laminated and medium to thick bedded, attitude 086/39 NE. Probably near base of Comox.	
x11	JII	Here 2 to 3 m face to granodiorite, sheared at 175/50E: perhaps near a fault.	
x12	JI	Granodiorite	
x13	JI	Granodiorite or granite, more potassium feldspar than at x12, otherwise alike. Here strongly jointed and sheared.	
x14	JI	Granodiorite-here darker than at x12.	
x15	JI	Here on road, practically above x11, outcrop of SANDSTONE-medium-grained,	

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TRAVERSE NOTES

PROPERTY Cowichan

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SHEET 18

STATION	UNIT	DESCRIPTION
		arkosic, moderately sorted, ranging from fine-grained to coarse-grained, massive, with large-scale low-angle cross-lamination. Medium brownish-grey, hard, non-calcareous. Outcrop here strongly jointed; cannot get bedding.
C4298x16	KCx	Here high bank with many large fallen blocks of SANDSTONE-fine-grained, with coarse-grained and pebbly laminae but better sorted than before and clean. Occasional shell-fragment-rich laminae. Still well-jointed; massive to thick-bedded with large-scale low angle cross-lamination. Thickness 3m+. Attitude: 117/40 NE.
x17	JI	Here granodiorite in ditch.
x18	JI	Here at junction of logging roads. SLP, for 30 m, lots of granodiorite rubble, then till. Here stony sandy till; no outcrop.
x19	KCx	Here in ditch, SANDSTONE-medium to coarse-grained (some finer phases), arkosic, moderately to well-sorted, with occasional disseminated angular

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TRAVERSE NOTES

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STATION	UNIT	DESCRIPTION
		grits. Olive-brown, thin to medium-bedded, blocky. Attitude 099/44 NE.
C4298x20	KCx	Here SANDSTONE-arkosic, medium to very coarse-grained, yellow-brown, yellow-buff-weathering; vaguely parallel-laminated, with much biotite scattered throughout. Thick, irregular bedding. Attitude: 129/34 NE.
x21	JI	Granodiorite in ditch, with about 2 m of till above.
x22	JI	SLP granodiorite outcrops and rubble in ditch. Here 3 m bank of deeply weathered granodiorite, almost reduced to a <u>grus</u> . Rusty-orange and friable.
x23	JI	SLP scattered granodiorite outcrops in ditch. Here the same, but fresher.
x24	JI	Here at wye in logging roads. Since last point scattered outcrops of granodiorite; the entire area here appears to be composed of the same.

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TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 15

SHEET 20

STATION	UNIT	DESCRIPTION
C4498x28	KH	<p>Here at "shale"pit, excellent exposures of SILTSTONE-dark grey, rubbly, concretionary, locally orange-weathering, with ripples and lenticles of very fine-grained, medium grey sandstone, and abundant horizontal, medium-sized (0.002 to 0.003 m) worm burrows. This unit is locally intensely bioturbated and churned into a structureless sandy siltstone. Moderately calcareous.</p>
		<p>Sandy laminae occasionally contain intraclasts; the sandstones when thicker (up to 0.04 m) contain abundant dark argillaceous laminae, and show some slump structures and load structures, which with the cross-lamination indicate tops to W. Attitudes: 178/85 W (good).</p>
C4498x29		<p>Here on side of hill a small outcrop of SANDSTONE-fine-grained, clean, thin-bedded, platy to rubbly, buff-weathering, with reddish patches. Medium-scale low-angle cross-laminated. Arkosic. Attitude: 049/57 NE.</p>

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TRAVERSE NOTES

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GEOLOGIST C. Bickford

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SHEET 21

STATION	UNIT	DESCRIPTION
x30		Here in bank on side of road, outcrop of rubbly SILTSTONE-dark grey, concretionary, similar to x28. Attitude (fair): 066/55 NW.
C4298x25		Here in creek bed, above new logging road, SILTSTONE-dark grey, sandy, more massive-looking than that found in the shale pit (C4498x28). Rusty-weathering on bedding planes; attitude 094/66 N. Note that there is no sign of shearing here.
x26		Here in cut, a large conglomerate boulder surrounded by till. Does not appear to be in place.

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TRAVERSE NOTES

PROPERTY CowichanGEOLOGIST C. BickfordDATE May 16SHEET 22

STATION	UNIT	DESCRIPTION
C5098x1	KEX	Here along road, outcrops of CONGLOMERATE and SANDSTONE-conglomerate is matrix-supported and poorly sorted, consisting of granules to 0.20 m cobbles of chert, quartz, and sandstone, in a matrix of fine to coarse-grained sand. Attitude: 094/50 NE.
C4898x6		SLP along road, in banks of till. Here proposed site C, in till. No outcrop.
C4894x1		Since C4898x5, lots of granodiorite along banks. Here road crosses CNR line to Victoria; track is blocked by logs and dirt, evidently this part of line is abandoned.
x2		Here gravel pit. SLP, ATP, no outcrop.
x3		Here a road crossing. Still no outcrop.
C4896x3		Here on railway, end of straight stretch. Still no outcrop.

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TRAVERSE NOTES

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STATION	UNIT	DESCRIPTION
C4896x4		Here beginning of straight track through farm. Still no outcrop.
x5		Here still no outcrop, but to east can see a line of outcrops running up ridge. Probably Comox sandstone.
C4898x7		Here bank shows till.
x8		Here bank shows till.
x9		Here till in bank, still no outcrop in very dense bush.
C4698x1		Here begins long straight stretch; still no outcrop.
x2		Here till in cut. Probably an old road crossing, now overgrown.

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TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 16

SHEET 24

STATION	UNIT	DESCRIPTION
x3	KH?	Here in cut (both sides) exposure of SANDSTONE, fine to medium-grained, clean, hard, light to medium grey, cherty, non-calcareous, thick-bedded to massive Attitude: 126/40 NE. Forms a small cuesta in bush; approx. 10 m thick. A slight greenish tinge and the cherty nature suggests that this is in the Haslam.
C4698x4		Here viewed bluff across swamp, marked on map as x4a.
x4a	KH?	Appears to be on strike with x3.
x5	KEx	Here on corner, in cut, CONGLOMERATE, pebble, thick-bedded to massive, poorly sorted, supported by matrix of fine-to medium-grained sand. Clasts are all rounded and poorly cemented. Cross-bedded. At least 5 m thick. Attitude: 145/30 NE.
x6	KEx	Here 52 m from x5, small outcrop of SANDSTONE-coarse-grained to gritty, with scattered pebbles and one thin lens of dark grey silty mudstone. Pebbles to 0.03 m. Overlies conglomerate of x5. This unit is medium grey, moderately sorted, and non-calcareous. Thick-bedded to massive. Attitude: 130/45 NE. (poor, from mudstone lens).

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TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

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SHEET 25

STATION	UNIT	DESCRIPTION
C4698x7	KEx	SLP, poorly exposed outcrops of sandstone and conglomerate. Here at least 8 m of CONGLOMERATE-like that of x5, although some beds are poorly cemented and friable. Matrix-supported, in silt through coarse-grained sand, itself poorly sorted. Framework is of well-rounded pebbles to 0.10 m. Attitude: 135/39 NE.
C4600x4		Here a private railway crossing. Slabs of sandstone to north in open area and could be float-they do not seem to be in place.
x5		Here a poor exposure of CONGLOMERATE/MUDSTONE-thickly interbedded, illsorted muddy conglomerate (well-rounded pebbles to 0.05 m, most are 0.01 to 0.02 m) and pebbly mudstone. One lens, 0.20 to 0.50 m thick, of illsorted medium to coarse-grained pebbly sandstone, with erosional base. A poor attitude here is 085/30 NW.
x6		Here, on S side of track, poor exposure of pebbly, sandy CONGLOMERATE-better sorted than that at x5. Scattered outcrops for 70 m along tracks.

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TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Bickford

DATE May 17

SHEET 26

STATION	UNIT	DESCRIPTION	
C4600x7	KEx	Here in railway cut a good exposure of the following section:	
		TOP OF SECTION:	
		SANDSTONE-medium-grained, thick-bedded to massive, moderately calcareous	4m+
		moderately sorted, erosional at base. Attitude: 045/9 SE	
		CONGLOMERATE-well-rounded granules to pebbles, supported by a fairly	
		to poorly sorted matrix of silt to coarse sand.	1.8 m+
x8	KEx	Here in railway cut, 2 m+ section of SANDSTONE-arkosic, brown-	
		weathering, thin to thick-bedded, planar-bedded, platy to blocky,	
		moderately to strongly calcareous. Attitude: 085/28 SE.	

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TRAVERSE NOTES

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SHEET 27

STATION	UNIT	DESCRIPTION
C4200x1		Here junction of main line and H200 line, which gives access to Lois Lake region. Here banks show till.
C4000x1		Here junction with H4 line. No outcrop.
C4000x2		Here site A. No outcrop
x3		Here unsigned road off to left. Here bank shows poorly sorted gravels and cobbles.
x4		Here water tank and culvert. Banks since last point show stony till.
C4098x1	JI	Here granodiorite, with well-developed jointing at 004/67E.
x2	JI	Here large outcrop of granodiorite, some shearing at 054/78-85 SE.
x3	JI	SLP, continuous outcrops of granodiorite. Here a good exposure of darker, more mafic-looking, slightly greenish but still coarse-grained rock.

Approaching edge of pluton?

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TRAVERSE NOTES

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STATION	UNIT	DESCRIPTION
C4098x4	TRK	SLP, outcrops of granodiorite. Here well-jointed greenstones, almost certainly of the Karmutsen. Some pyrite and chalcopyrite. Jointing 030/56 SE.
C4200x2		Here fork in road. Sign says: BC Hydro Twrs 5/1 to 5/3 Banks along road show till; no outcrops. Twr 6/1
x3		Here another fork; still in till.
C3802x1		Here at fork in power line access road. Here till, as was all along road from last point.
x2		Here end of north branch of access road. From x1, road follows down ravine, showing up to 30 m of till.
C3800x3		Here at tower 5/3, till with some large blocks of sandstone.

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TRAVERSE NOTES

PROPERTY CowichanGEOLOGIST C. BickfordDATE May 18SHEET 29

STATION	UNIT	DESCRIPTION
x1	KH	Here in small quarry, outcrop of SILTSTONE, sandy/SANDSTONE, very fine-grained, silty (60:40) thinly interbedded and intensely burrowed and churned so that textures are mostly obliterated. Abundant robust-looking pelecypods. Unit rubbly-weathering, dark grey to black, non-calcareous, some spheroidal-weathering. Attitude 093/45N. Thickness 5 m+
C3800x2	KH	Here at tower 6/1, outcrop of SILTSTONE-burrowed, rubbly, argillaceous, dark grey. Attitude: 086/36 NE. SLP, access road shows outcrops of rubbly siltstone and sandstone like that at x1. Here abundant rubble of siltstone and sandstone.
x4	KH	Here below power line a good outcrop of SANDSTONE, very fine-grained/SILTSTONE, sandy - thinly interbedded, churned and burrowed, dark grey; rusty, rubbly, spheroidal-weathering, non-calcareous. Attitude: 085/38 NE. Many low-angle calcite-filled fractures and shears, some minor thrusts, displacement to SW. Shearing at 043/60 NW.
x5		Here fork in road. No outcrop.

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TRAVERSE NOTES

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STATION	UNIT	DESCRIPTION
C3800x6	KCx	Here on new road, outcrop in ditch, of SANDSTONE-medium to very coarse-grained, arkosic, dark brown, brown-weathering, thin to medium-bedded, blocky, parallel-laminated, with alternating finer or coarser laminae. Some medium-scale low-angle cross-bedding, and low-angle cross-lamination. Attitude: 124/78 NE.
x7	JI	Here between towers 6/2 and 6/3, outcrops in ditch, of chlorite-rich greenish grey granodiorite, strongly jointed and crumpled. May be near edge of pluton.
x8	KCxB	Here near tower 6/2 excellent exposure of SANDSTONE-medium to very coarse-grained with stringers of granules and scattered pebbles. Thick-bedded, large-scale low-angle cross-laminated, arkosic, non-calcareous, brown, buff-weathering. Maximum pebble size is 0.03 m (rare); pebbles are rounded. Scattered large carbonised bark chips. One loose boulder shows pelecypod shells. Attitude: 104/71 N.
		This unit grades down to sandy pebble-conglomerate within a 10 m

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TRAVERSE NOTES

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SHEET 31

STATION	UNIT	DESCRIPTION
		stratigraphic interval.
C38009x9	TrK	Volcanics, chlorite-rich, sheared, good iron and copper stains.
x10	TrK	Here on power line access road, outcrops of Karmutsen volcanics. SLP, a few outcrops of fine-grained white feldspathic rock, possible near edge of pluton. Also some probable skarn noted; greenish-white, sheared, calcareous, iron-stained.
C4098x5		Here at fork in road. SLP till.
x6		Here cleared part of road ends. Till only here.
C4000x5		Beyond this point, road cannot be traced in dense bush. Till shows abundant blocks of sandstone.
x6	KEx,	Section exposed in cut on Holt Creek main line:
	KH	TOP OF SECTION: Extension Formation:

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TRAVERSE NOTES

PROPERTY Cowichan

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SHEET 32

STATION	UNIT	DESCRIPTION	
		CONGLOMERATE/SANDSTONE, coarse-grained (80:20)-curde fining-upward	
		sequence, thick-bedded to massive, some channeling. Conglomerate is	
		composed of sub-rounded and sub-spherical pebbles and cobbles (to	
		0.08 m) of chert, quartz, and some mudstone clasts to 0.20 m. Sandstone	
		is massive, arkosic, brownish-buff-weathering. Joints (strong, widely	
		spaced) 038/80 NE. Attitude: 109/58 NE.	10 m+
		COVERED INTERVAL	3 m
		Haslam Formation:	
		MUDSTONE, silty-dark grey, rubbly, tough, thin-bedded, some siltstone	
		phases. Attitude: 119/42 NE.	3 m+
		Base of section.	
C4200x4	^{KPn} Kpn	SILTSTONE, sandy/MUDSTONE, silty (70:30) - thinly interbedded, blocky to	12 m+
		rubbly, some spheroidal weathering. Dark grey. Attitude: 110/45 NE.	
C5098x2		Here no outcrop. Proposed site B.	

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TRAVERSE NOTES

PROPERTY CowichanGEOLOGIST C. BickfordDATE May 19SHEET 33

STATION	UNIT	DESCRIPTION	
C5098x3	KEx	CONGLOMERATE-sandy, fine to coarse-grained sand matrix, contains well- rounded chert, volcanic, and quartz pebbles to 0.4 m. Some interbedded sandstone, coarse to very coarse-grained greenish-grey, moderately sorted, clean, slightly calcareous, massive, hard, cherty. Attitude (poor) 041/26 NW.	
x4	KEx	As above, outcrop in farmer's field, apparently on strike, dip 20° to 30° to NE.	
C5096x1	JI	Granodiorite, chlorite-rich.	
C4000x6A	KEx	CONGLOMERATE-pebbles of chert, volcanics, some of jasper, rounded, matrix of fine sand to grit. Here also some sandstone coarse-grained, pebbly, buff-weathering, with large muddy intraclasts.	
x7	KH	SILTSTONE-dark grey to black, slightly calcareous, rubbly, dark grey- weathering, fossiliferous (unidentifiable fragments), thin to medium- bedded, with elliptical ironstone concretions to 0.20 m. Attitude 102/55 NE.	

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TRAVERSE NOTES

PROPERTY Cowichan

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SHEET 34

STATION	UNIT	DESCRIPTION	
C4000x8		Here in small quarry, exposure of SANDSTONE-very fine-grained, silty, medium grey, light grey and rusty-weathering, concretionary, spheroidal-weathering, non-calcareous. Attitude: 104/58 NE.	
x9		Here in ditch, a long exposure, along strike, of SANDSTONE-very fine-grained, medium to dark grey, thick to thin-bedded (thinning-upward). Some fine-grained phases with muddy intraclasts. Some thin argillaceous or silty lenses or laminae. Tops indicated by load casts at bases of sandstones. The thicker sandstones are spheroidal-weathering and concretionary, while the thinner ones are rubbly. Attitude: 118/70 NE.	
x10		Here in small quarry, SANDSTONE-argillaceous, fine to very fine-grained with minor dark grey sandy siltstone, and abundant corrugated shell fragments. Buff-weathering, attitude: 115/78 N.E. Large-scale spheroidal weathering.	
C4698x8		Here locked fire gate. No outcrop.	

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TRAVERSE NOTES

PROPERTY Cowichan

GEOLOGIST C. Rickford

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SHEET 35

STATION	UNIT	DESCRIPTION	
x9		SLP, no outcrop. Here fork in road.	
x10		SLP, no outcrop. Here bank shows sandy pebbly till.	

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TRAVERSE NOTES

PROPERTY CowichanGEOLOGIST Cathy LangillDATE May 14SHEET 36

STATION	UNIT	DESCRIPTION
C4898x1		Small exposure in ditch on SE side of road marked by flagging tape on small tree at forest's edge, very fine grained sandstone to siltstone bedding attitude: 102/40 NE. Lower bed is .7 m thick and is massive upper bed is 3 m thick, thin bedded and shows concentric weathering. The two beds are of the same lithology, dark grey weathering, fracture surfaces show deep red to black staining fresh surface light grey-brown, with faint laminae of darker material; laminae 1 mm thick. Flake or blade shaped "infraclasts" or organic fragments; 5 cm long. Vertical worm tubes 6 cm diameter, 2 cm depth.
C4998x2		Exposure on SE side of road, marked by flagging tape on small tree. Bedding attitude 99/30 NE. 5 m stratigraphic thickness of fine grained sandstone - massive rounded smooth surface with glacial and/or bulldozer scour marks fresh surface dark grey, weathers to buff colour, 1 pelecypod fossil. .5 m stratigraphic thickness of bedded very fine-grained sandstone is on top of the 5 m of massive sandstone, fresh surface dark grey, weathers to buff colour with fine sand sized specks of white, faint lamination and small scale trough crossbeds (3 cm) no fossils found here.

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TRAVERSE NOTES

PROPERTY CowichanGEOLOGIST Cathy LangillDATE May 14SHEET 37

STATION	UNIT	DESCRIPTION	
C4898x3		Site on SE side of road. Shows stratigraphic succession of massive and	
		bedded sandstones, described here from bottom up:	
		- 4 m thickness of massive, red-brown weathering fine sandstone, attitude	
		of contact bed 88/43 N.	
		- 1 m thickness of bedded (2-4 cm thick) beds very fine-grained sandstone,	
		beds at 110/29 NE.	
		- 7 m covered	
		- 21 m fine to medium sandstone, massive, dark grey, fresh surface, buff	
		coloured weathered surface.	
C4898x4		Fine sandstone, massive, buff weathering, glacially smoothed surface,	
		few fractures, beds probably attitude 93/36 N. Fresh surface is dark	
		grey, brown with specks of white 10 m thickness is massive, but contains	
		two thin (.5 m) layers of well-bedded very fine-grained sandstone,	
		darker grey and laminated. Contain intraclasts or organic fragments 3mm.	



VANCOUVER ISLAND 1980 FIELD MAPPING PROGRAM

TRAVERSE NOTES

PROPERTY CowichanGEOLOGIST Cathy LangillDATE May 14SHEET 38

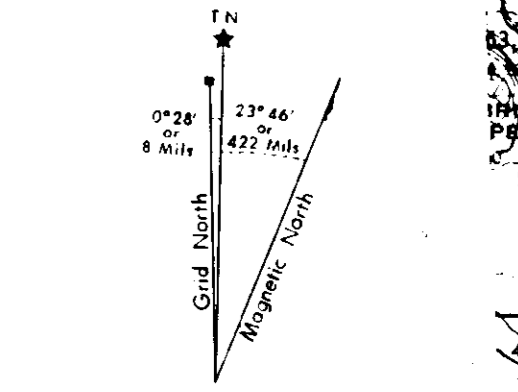
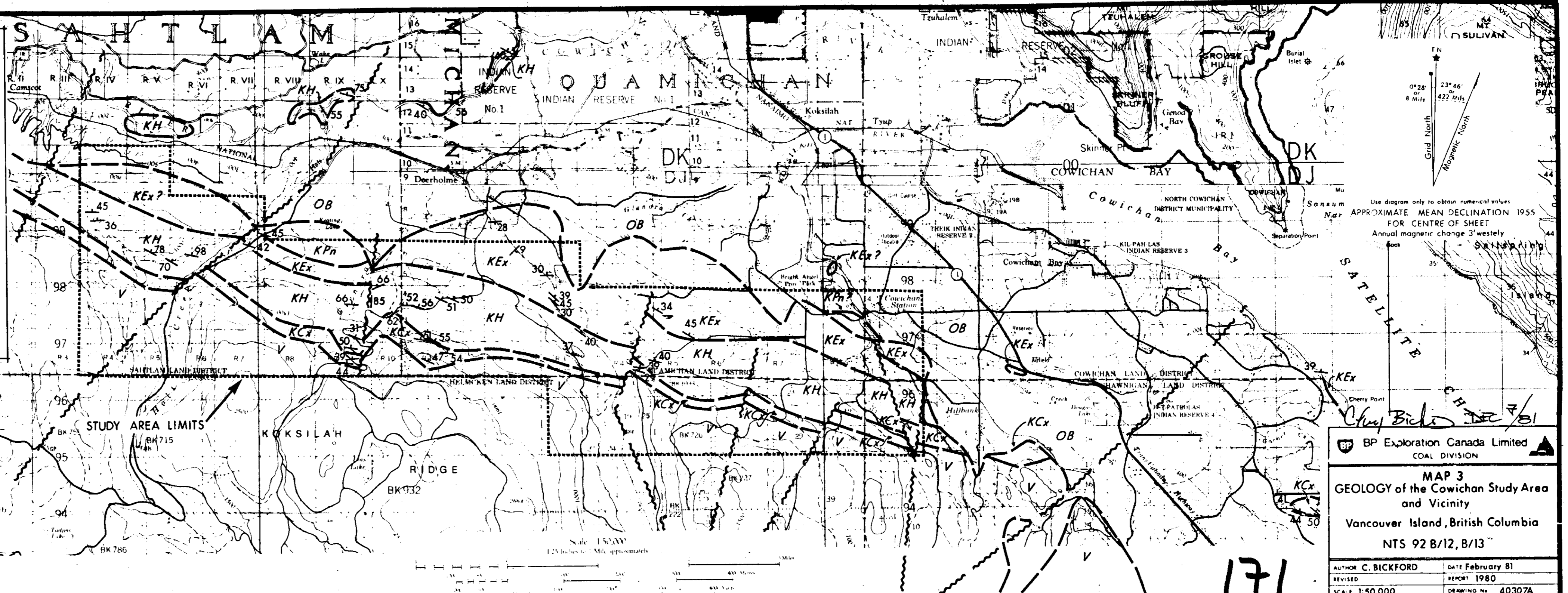
STATION	UNIT	DESCRIPTION	
C4898x5		Weathered granodiorite or tonalite, uniform gold-brown weathered surface.	
		fresh surface shows coarsely crystalline, black, white igneous intrusive	
		texture, 20% biotitic, 3 mm diameter, 50% quartz, clear to grey colour.	
		30% plagioclase feldspar - no K-spar visible.	
C4896x1		Black, white crystalline intrusive rock, same as at C4898x5. Not	
		weathered deeply, fresh cut no foliation or lineation visible.	
C4896x2		Granite-K-spar to plagioclase ratio 3:1, granite 60%, feldspar 20%,	
		biotite 20%. Massive, no foliation or lineation visible.	

LEGEND

-  Fault, approximate/assumed
-  Contact, approximate/assumed
- OB** Overburden (Pleistocene/Recent)
- KPh** Pender Formation
- KEx** Extension Formation
- KH** Haslam Formation
- KCx** Comox Formation
- V** "Basement"

Geology by C. Bickford 1979-80 and compiled from published maps by: Muller (1980a), Kachelmeyer (1978), Clapp & Cooke (1917)

pic



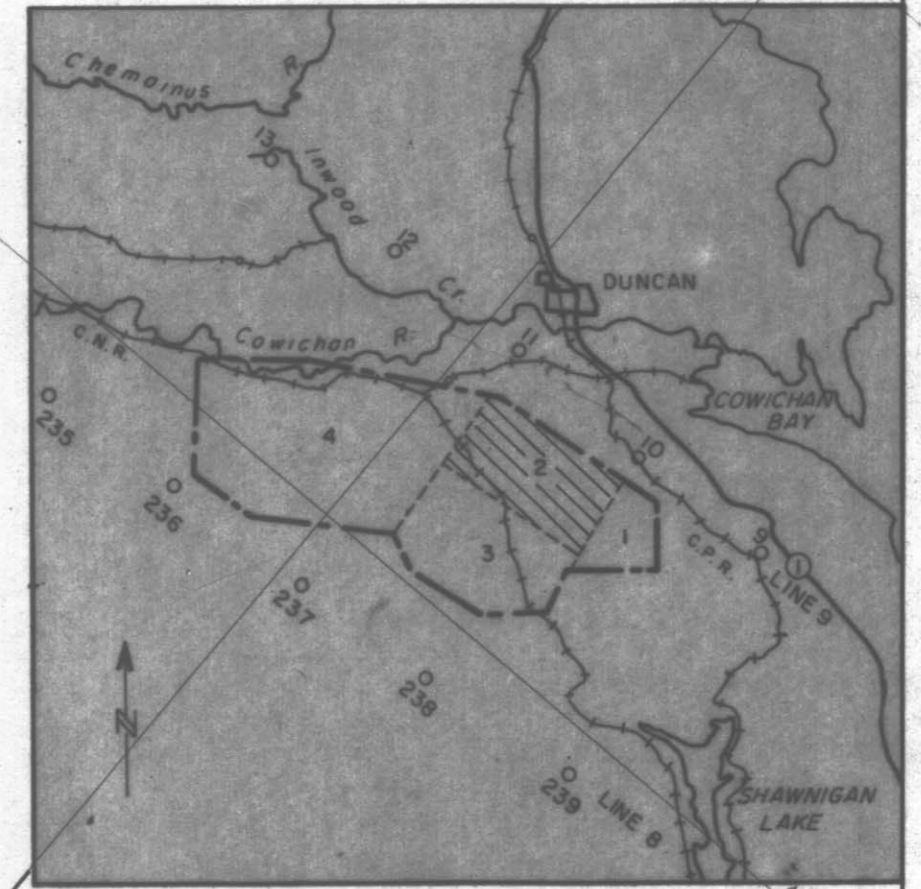
BP BP Exploration Canada Limited
COAL DIVISION

MAP 3
GEOLOGY of the Cowichan Study Area and Vicinity
Vancouver Island, British Columbia
NTS 92 B/12, B/13

AUTHOR C. BICKFORD	DATE February 81
REVISED	REPORT 1980
SCALE 1:50 000	DRAWING No. 40307A

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N-Cowichan 80628A *1

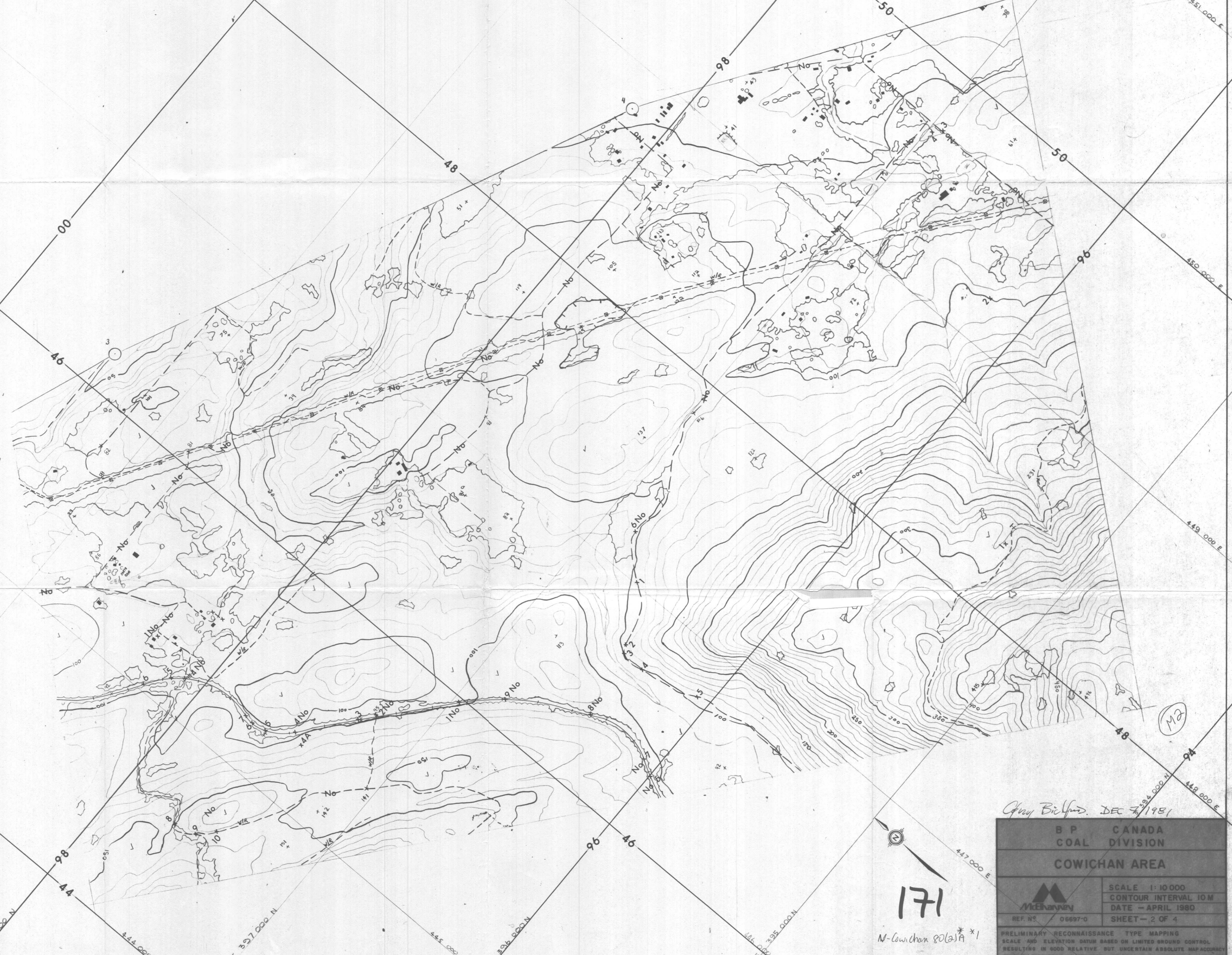


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**FIELD LOCATION MAP
COWICHAN**

MAP 6 sheet no.2

AUTHOR: C. BICKFORD	DATE: February 1981
REVISED:	REPORT: 1980
SCALE: 1:10 000	DRAWING No.:

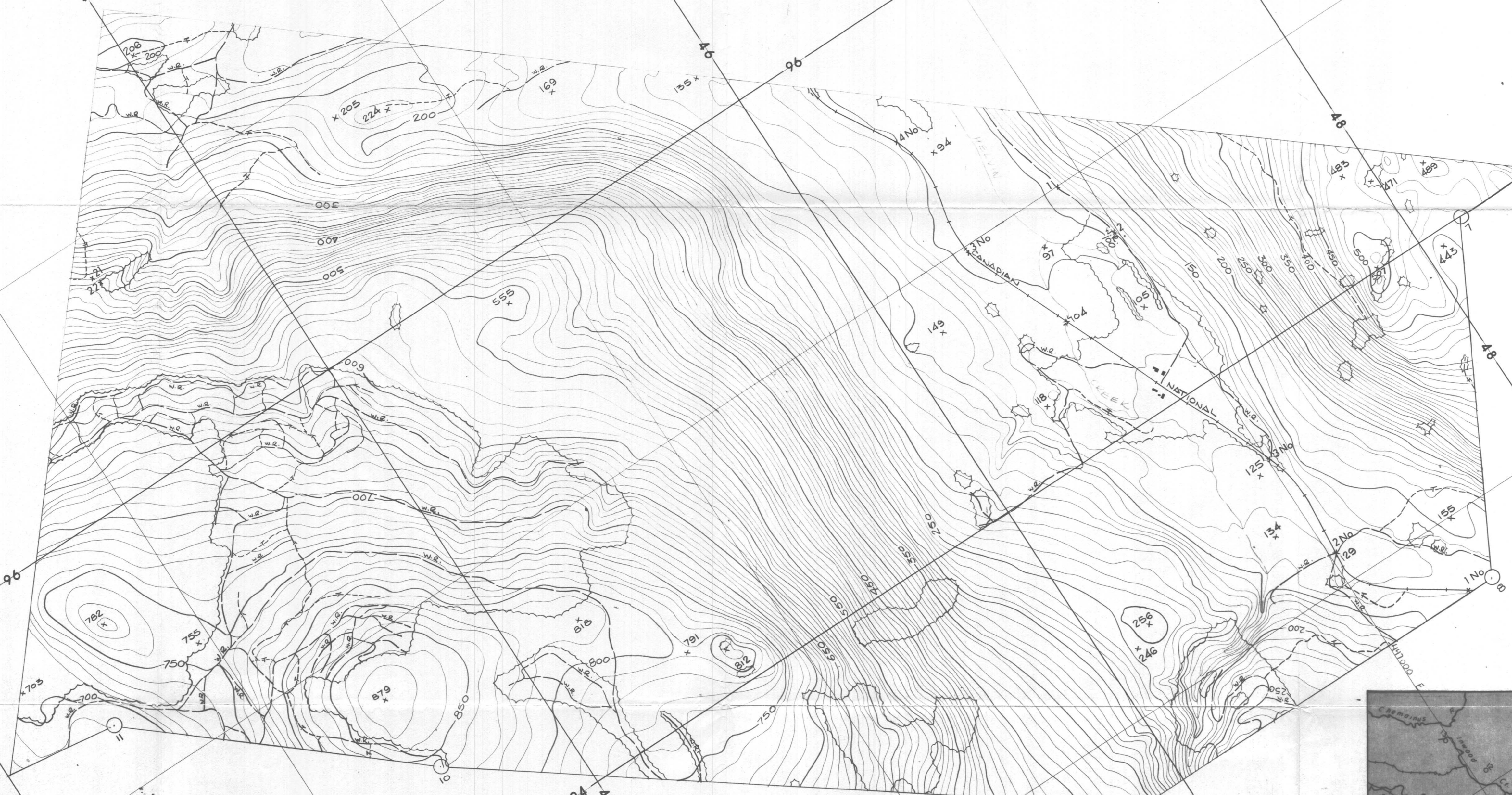


Chris Bickford, DEC 7/1981

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COWICHAN AREA**

	SCALE 1:10 000 CONTOUR INTERVAL 10M DATE - APRIL 1980 SHEET - 2 OF 4
REF. NO. 06687-0	
PRELIMINARY RECONNAISSANCE TYPE MAPPING SCALE AND ELEVATION STATUS BASED ON LIMITED GROUND CONTROL RESULTS IN GOOD RELATIVE BUT UNCERTAIN ABSOLUTE MAP ACCURACY DOWNS TO 1:10 000 SCALE. ELEVATION STATUS IS APPROXIMATE.	

DRAWING No. 40261B



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**FIELD LOCATION MAP
COWICHAN**

MAP 6 sheet no. 3

AUTHOR: C. BICKFORD	DATE: February 1981
REVISED:	REPORT: 1980
SCALE: 1:10 000	DRAWING No.:

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COAL DIVISION
COWICHAN AREA**

McKENNEY

REF. NO. 04697-0

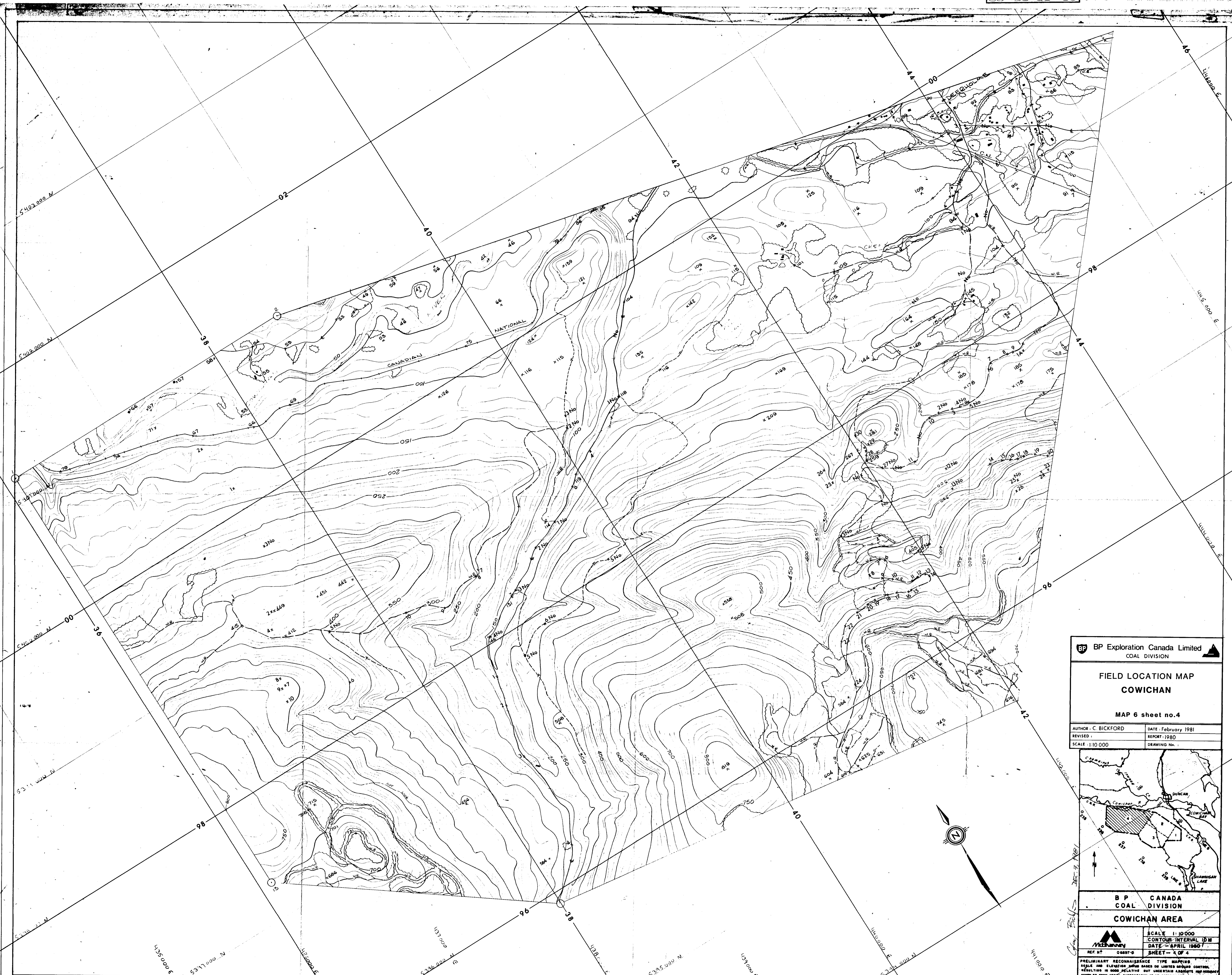
SCALE 1:10 000
CONTOUR INTERVAL 10 M
DATE - APRIL 1980
SHEET - 3 OF 4

PRELIMINARY RECONNAISSANCE TYPE MAPPING
SCALE 300' ELEVATION DATA BASED ON LIMITED GROUND CONTROL
RESULTS IN SOME AREAS BUT UNDETAILED AND ABSOLUTE MAP ACCURACY
COMPILED FROM AERIAL PHOTOGRAPHY AT AN APPROXIMATE SCALE OF 1:50 000
2, 1980-18, 1981

Colby Bell, Dec. 7, 1981

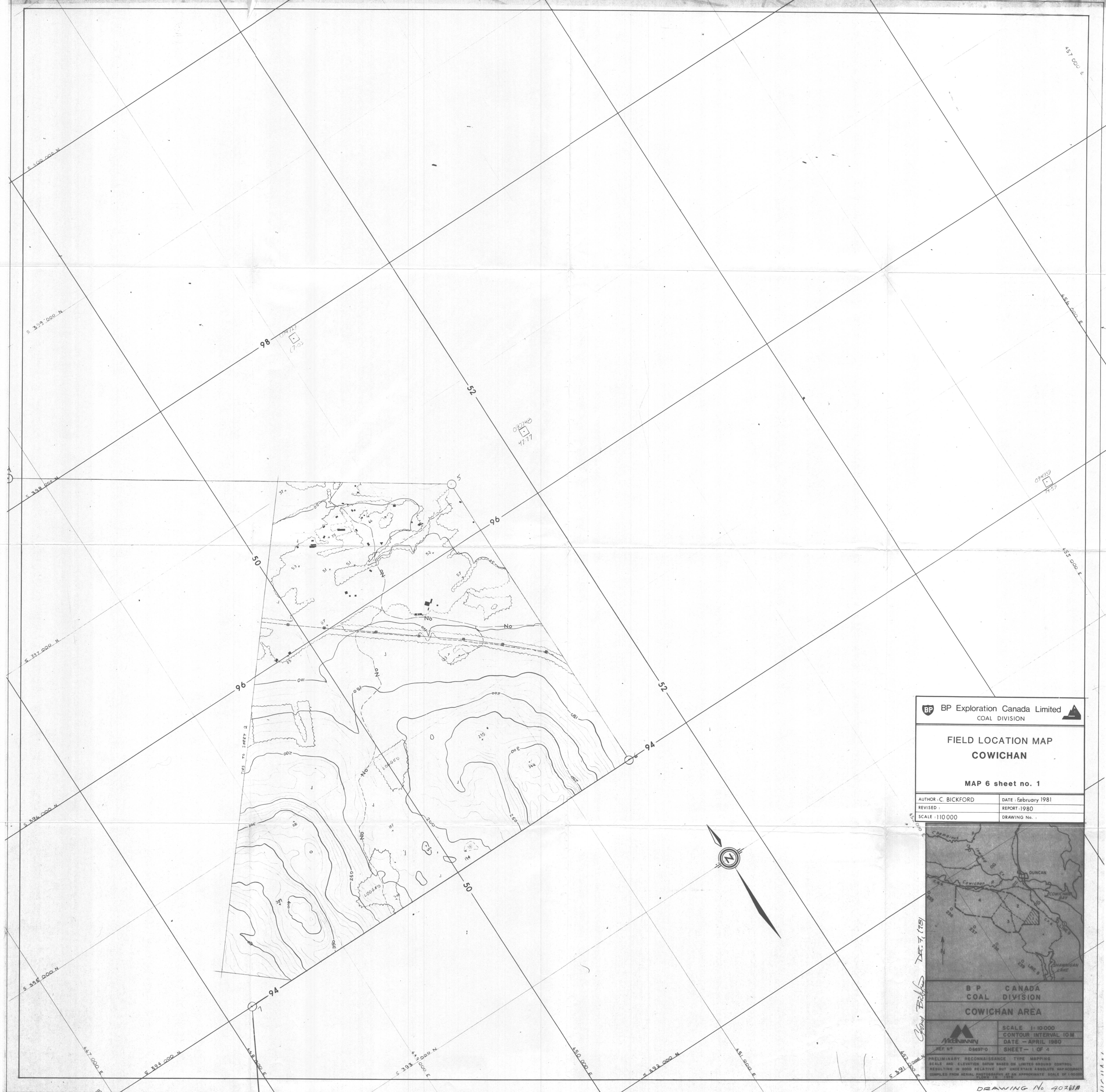
DRAWING No 40261C

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FIELD LOCATION MAP COWICHAN	
MAP 6 sheet no.4	
AUTHOR: C. BICKFORD	DATE: February 1981
REVISED:	REPORT: 1980
SCALE: 1:10 000	DRAWING No.:
B P CANADA COAL DIVISION COWICHAN AREA	
SCALE 1:10 000 CONTOUR INTERVAL 10 M DATE - APRIL 1980 SHEET - 4 OF 4	
PRELIMINARY RECONNAISSANCE TYPE MAPS SCALE AND ELEVATION DATA BASED ON LIMITED SURVEY CONTROL RESULTS IN SOME RESPECTS BUT UNCERTAIN ABSOLUTE HIGH POINTS COMPILED FROM AERIAL PHOTOGRAPHS AT AN APPROXIMATE SCALE OF 1:10000	

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**FIELD LOCATION MAP
COWICHAN**

MAP 6 sheet no. 1

AUTHOR: C. BICKFORD	DATE: February 1981
REVISED:	REPORT: 1980
SCALE: 1:10 000	DRAWING No.:

Chery Bickford Dec. 7, 1981

**B P CANADA
COAL DIVISION
COWICHAN AREA**

SCALE: 1:10 000
CONTOUR INTERVAL: 10 M
DATE: APRIL 1980
SHEET: 1 OF 4

PRELIMINARY RECONNAISSANCE TYPE MAPPING
SCALE AND ELEVATION DATA BASED ON LIMITED GROUND CONTROL
RESULTING IN 5000 RELATIVE BUT UNCERTAIN ABSOLUTE MAP ACCURACY
COMPILED FROM AERIAL PHOTOGRAPHY AT AN APPROXIMATE SCALE OF 1:50 000
DATE: 1979

DRAWING No. 40261A

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W. Cowichan 80 (3) 1A 71