GEOLOGICAL and METALLURGICAL ASSESSMENT REPORT on the LANG BAY (DUCK LAKE) KAOLINITE DEPOSIT

Longitude 124°24'29"/Latitude 49°48'48"
NTS: 92F/16W (92F.088)
Vancouver M.D.

Prepared for

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GEOLOGIST

August 15, 2006

Fieldwork completed between January 2, 2006 and June 10, 2006

BRITISH COLUMBIA

Ministry of Energy & Mines
Energy & Minerals Division
Geological Survey Branch

BRITISH COLUMBIA GEOLOGICAL SURVEY

ASSESSMENT REPORT
TITLE PAGE AND SUMMARY

TITLE OF REPORT [type of survey(s)] GEOLOGICAL AND METALLURGICAL — TOTAL COST $16,287

AUTHOR(S) J. T. SHEARER SIGNATURE(S) [signature]

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PROPERTY NAME DUCK LAKE / LANG BAY PROJECT

CLAIM NAME(S) (on which work was done) Duck lake 514350, 514352, 514363, 514264, 514349 514353-355, 514357, 514362

COMMODITIES SOUGHT KAOLIN

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN 092F 137

MINING DIVISION VANCOUVER M D. NTS 92F/16W (92F.088)

LATITUDE 49 ° 48 ' 48 " LONGITUDE 124 ° 24 ' 29 " (at centre of work)

OWNER(S)
1) J. Shearer / Electra Gold Ltd. 2)

MAILING ADDRESS
Unit 5 - 2330 TYNER ST.,
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OPERATOR(S) [who paid for the work]
1) SAME AS ABOVE 2)

MAILING ADDRESS
SAME AS Above.

PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude):
The Claims cover an Upper Cretaceous sedimentary basin containing shale, sandstone + coal overlying Kaolinized granodiorite. Core was assembled + Relogged and metallurgical testing was completed

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS 1999 - Shearer
1987 - Assess Rpt #16734 Currie 1988. also #16734

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ILLUSTRATIONS and TABLES

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SUMMARY

1) The Lang Bay (Duck Lake) Property consists of the cell mineral claims.
2) The claims are located 3 km north of Highway 101 at Myrtle Point. Access is via the Duck Lake Forest Service Road or along the powerline from Zilinski Road.
3) The claims cover the western and eastern margins of an Upper Cretaceous sedimentary basin containing shale, sandstone and minor coal.
4) Work on the sedimentary basin originally (1940's to 1960's) focussed on germanium in the ash of the coal beds exposed in Lang Creek. Subsequently the kaolinite potential was realized in 1986.
5) A previous owner entered into a joint-venture agreement with Brenda Mines Ltd., a Noranda Group company, in September 1987. An extensive exploration program was initiated in September 1987, which continued until February 1989. Work completed during that time consisted of 6,700 metres of seismic refraction survey, 10,500 metres of magnetometer survey, 11,000 metres of Dipole-Dipole resistivity survey, 4 Schlumberger electrical soundings and 2,100 metres of reverse circulation and diamond drilling.
6) In February 1992 Fletcher Challenge Canada carried out a trial at Elk Falls paper mill near Campbell River. The trial produced 60 tonnes of newsprint containing up to 5% load of kaolin from the eastern margin of the Duck Lake area. This test was apparently favourable.
7) Overburden consisting of bouldery gravels, sand, till and clay-rich glaciofulvial units, is highly variable in thickness.
8) In 1999, a program was completed of 4 diamond drill holes (198.88m) and 4.3 km of seismic refraction geophysics.
9) Current work as documented in this report focussed on metallurgical processing of filler products.
10) Placing the resulting filler products with industrial end users is recommended to obtain feedback on optimizing product specifications.

Respectfully submitted,

J.T. (Jo) Shearer, M.Sc., P.Geo.
Geologist
August 15, 2006

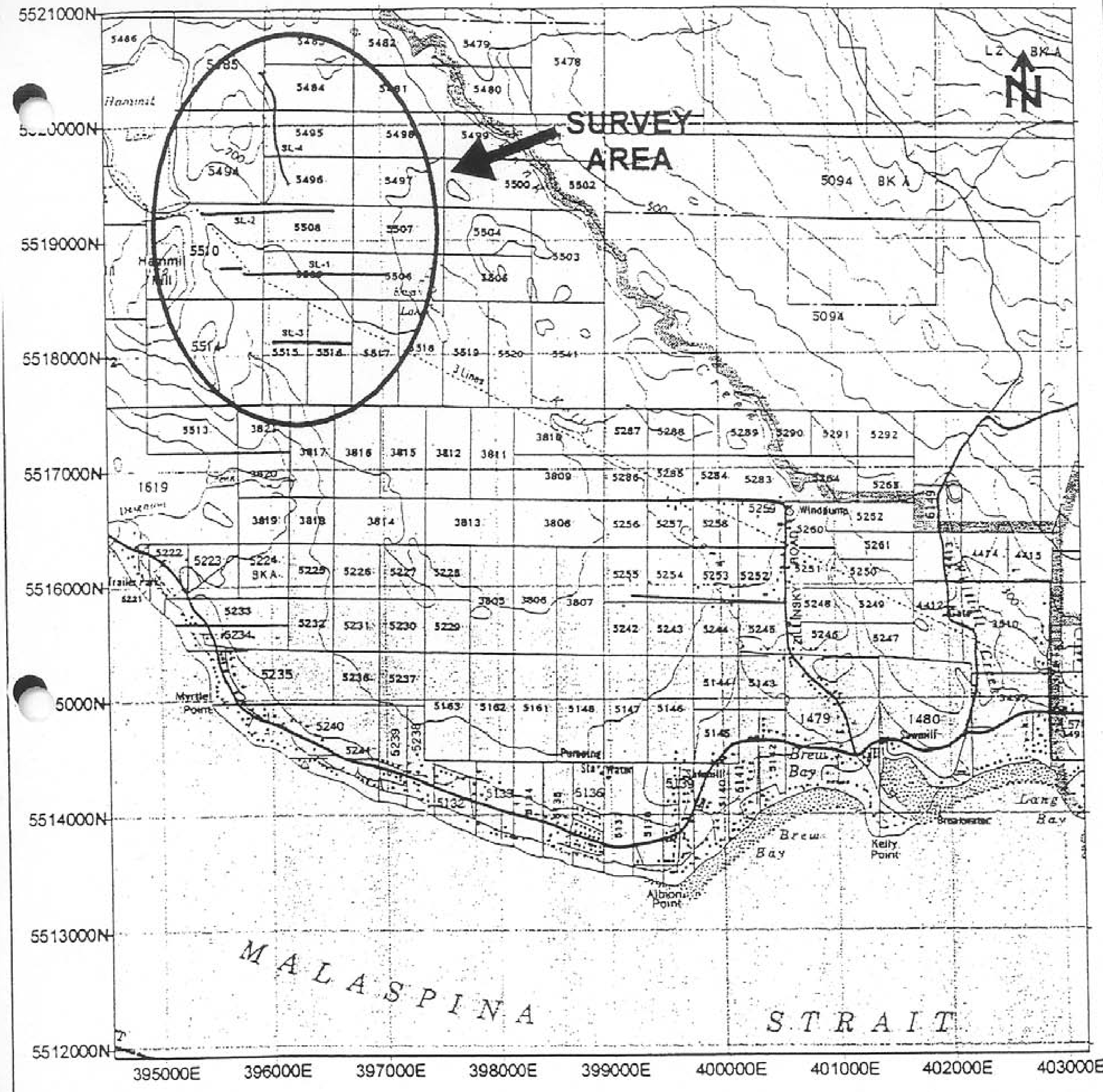
INTRODUCTION

In 1999, the Duck Lake Mineral Claims were staked covering the western margin of the Cretaceous Sedimentary Basin near Powell River, British Columbia. Subsequently, the eastern portion was acquired in 2001. These claims cover a basin, which contains a large inferred resource of kaolin. Additionally, the property is known to contain highly anomalous values of germanium and gallium in some of the more carbonaceous horizons of the deposit.

Basement granitoid rocks, which in places are extensively altered to kaolin, are overlain by shales containing kaolin clays. Work in 1999 consisted of 4 diamond drillholes and 4.3 km of seismic refraction surveys. In the late 1980's and early 1990's an effort was made to evaluate the eastern margin of the basin. In February 1992 Fletcher Challenge Canada carried out a trial at Elk Falls paper mill near Campbell River. The trial produced 60 tonnes of newsprint containing up to 5% load of kaolin from the eastern margin of the Duck Lake area. This test was apparently favourable.

A calcining test was carried out on a sample of Lang Bay kaolin by Nord Kaolin Company of Jeffersonville, Georgia. The sample was first beneficiated by Magnetic separation and ozone bleaching and this improved the brightness to that of a standard performance filler. The sample was then calcined and brightness values equivalent to those of imported calcined grades were achieved. This is significant because calcined kaolin produces a superior performance and sells for up to four times the price of filler grade. The calcined grade requires heating by natural gas, which only recently has been made available for industrial users in the Powell River area.

The current 2006 program consisted of setting up an organized core logging facility, moving the previously drilled core and reverse circulation samples indoors, and completing a research and development program to define possible kaolin products by Process Research Associates.



NOTE:

This map is a segment of the NTS map sheet 92 F/16, "HASLAM LAKE".

LANG BAY SHALE/SANDSTONE PROSPECT, POWELL RIVER AREA, B.C.		
SEISMIC REFRACTION SURVEY		
LOCATION PLAN		
DATE: SEPTEMBER 1999	SCALE 1:50,000	FIG. 1

LOCATION and ACCESS

The Duck Lake Claims are northeast of Myrtle Point near the town of Powell River. Highway 101 follows the coast from Saltery Bay to Powell River and passes 2 km south of the southern border of the Duck Lake claim group. A good paved secondary road (Zilinski Road) connecting to Highway 101 between Lang Creek and Kelly Creek extends north end then west where a tote road along the power line in useable condition, gives access to the area where the drilling was undertaken. The drill area is also accessible by driving north along the Duck Lake Forest Service Road to the power line area.

The claim group lies 15 km southeast of the town of Powell River, British Columbia and centred on Kelly Creek. General physiographic boundaries are Malaspina Strait between Lang Bay and Myrtle Point to the south, Myrtle Creek and Hammil Lake to the west and northwest, Lang Creek to the north and Whitall Creek to the east. The approximate co-ordinates are 49°48'N and 124°25'W. The NTS map reference for the area is 92F/16W.

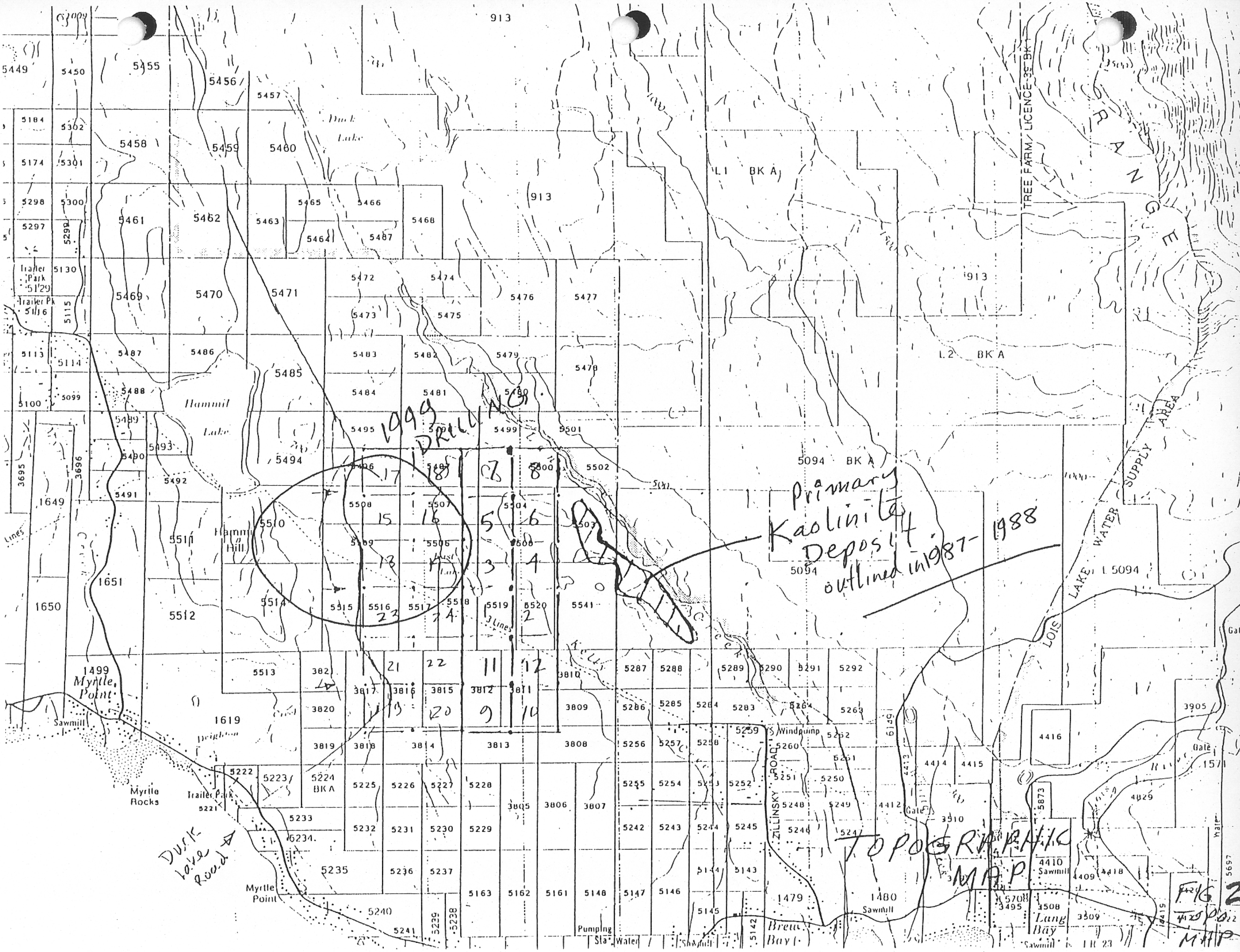
The moderately undulating terrain has a maximum elevation of approximately one hundred and eighty metres above sea level near the northeast corner of the property. The ground slopes gently to the southeast. Kelly Creek has cut its valley about 10 metres below the general level of the surrounding area.

The area is covered with a mixed second growth forest consisting mainly of fir, hemlock, cedar and alder. The area was first logged around 1920.

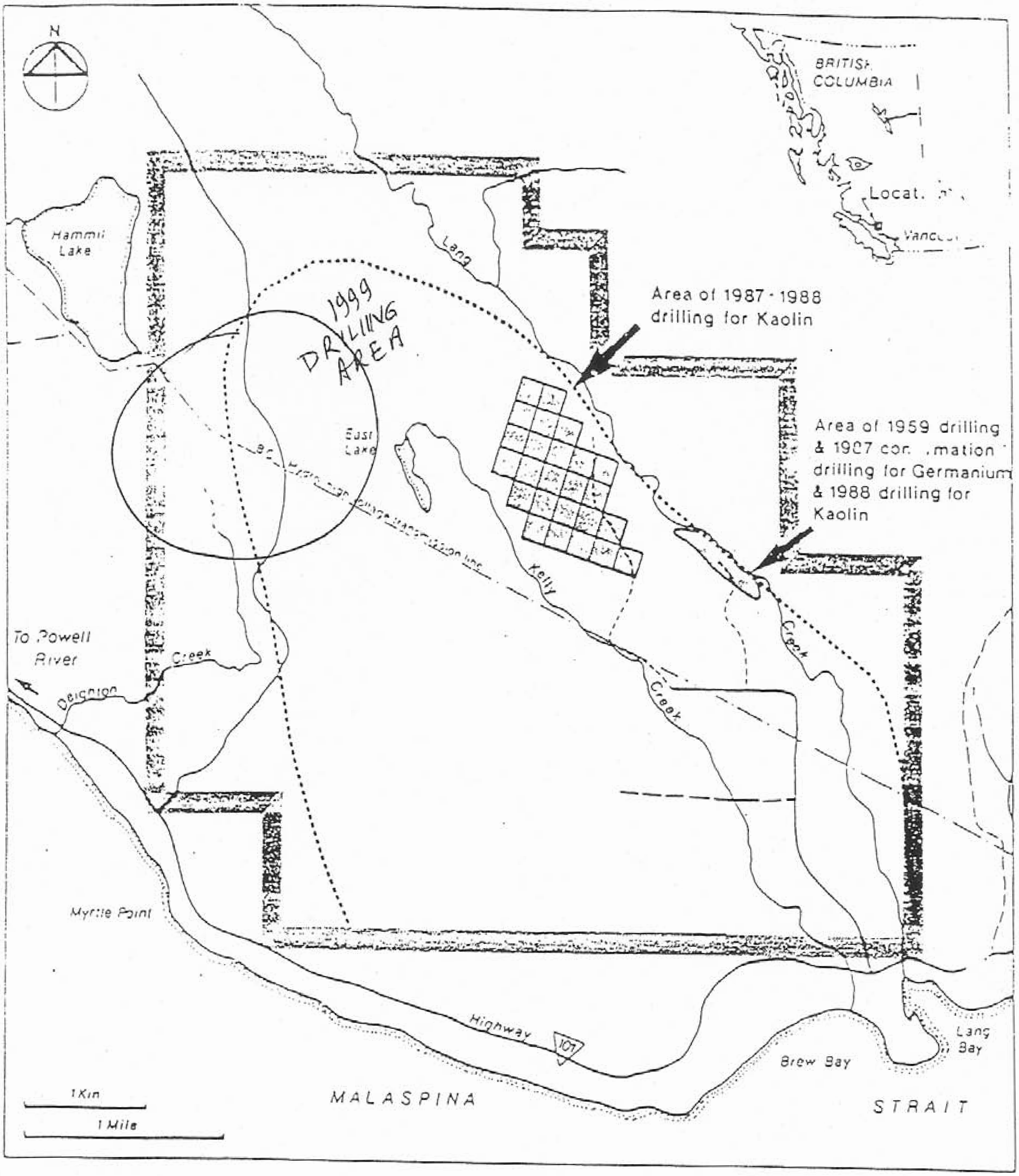
The water supply is plentiful due to the many streams and creeks on the property, the main ones being centrally located, Lang Creek and Kelly Creek, both flowing southeasterly and to the west, Deighton Creek flowing southerly into Malaspina Strait.

The climate is mild with an annual rainfall from 40 to 50 inches (100 – 125mm) and minimal snowfall in the winter.

Dissecting the property in a northwest to southeast line is a high voltage power line to the town of Powell River and the pulp mill.



1999 DRILLING
Primary Kaolinite Deposit outlined in 1987-1988
TOPOGRAPHIC MAP
FIG 2 TOPO MAP
Duck Lake Road
Duck Lake
Hammil Lake
Hammil Hill
Lost Lake
Myrtle Point
Myrtle Rocks
Sawmill
Trailer Park
Pumping Sta
Windpump
ZILINSKY ROAD
Brew Bay
Lang Bay
Gate
TREE FARM / LICENCE 39 BK
RANGE
LOIS LAKE WATER SUPPLY AREA
L1 BK A
L2 BK A
5094 BK A
913



KEY

Claim boundary

Paved highway

Inferred boundary of Sedimentary Basin

LOCATION MAP
LANG BAY KAOLIN PROSPECT

Fig 2

CLAIM STATUS

The Duck Lake Property consists of the 16 claims totalling 103 cells of 2,148.01 ha as tabulated in Table I and shown on Figure 3.

TABLE I

List of Claims

Claim Name	Tenure #	Cells	Area (ha)	Registered Owner	Issue Date	Current Good To Date *
	514363	5	104.260	J. T. Shearer	June 11/05	Sept. 11, 2007
	515264	5	104.275	Electra Gold Ltd	June 11/05	Sept. 11, 2007
	515267	2	41.700	Electra Gold Ltd	June 11/05	Sept. 11, 2007
	514359	5	104.240	J. T. Shearer	June 11/05	Sept. 11, 2007
	515265	8	166.840	J. T. Shearer	June 25/05	Sept. 11, 2007
Duck Lake Southwest	514362	10	208.590	J. T. Shearer	June 11/05	June 11, 2007
Duck Lake South	514365	12	250.37	J. T. Shearer	June 11/05	June 11, 2007
Duck Lake S.	514357	20	417.150	J. T. Shearer	June 11/05	June 11, 2007
	514379	1	20.850	J. T. Shearer	June 11/05	Sept. 11, 2007
Duck Lake	514349	1	20.850	J. T. Shearer	June 11/05	June 11, 2007
Lang Bay Pick up	517151	2	41.700	J. T. Shearer	July 12/05	July 12, 2007
	514350	3	62.550	J. T. Shearer	June 11/05	Sept. 11, 2007
	514355	12	250.160	J. T. Shearer	June 11/05	Sept. 11, 2007
	514352	4	83.395	J. T. Shearer	June 11/05	Sept. 11, 2007
	514353	4	83.400	J. T. Shearer	June 11/05	Sept. 11, 2007
Duck Lake Southwest	514354	9	187.680	J. T. Shearer	June 11/05	Sept. 11, 2007
16 Claims		103 cells	2,148.01 ha			

* with application of assessment work documented in this report.

Under the present status of mineral claims in British Columbia, the consideration of industrial minerals requires careful designation of the product end use. An industrial mineral is a rock or naturally occurring substance that can be mined and processed for its unique qualities and used for industrial purposes (as defined in the *Mineral Tenure Act*). It does not include "Quarry Resources". Quarry Resources includes earth, soil, marl, peat, sand and gravel, and rock, rip-rap and stone products that are used for construction purposes (as defined in the *Land Act*). Construction means the use of rock or other natural substances for roads, buildings, berms, breakwaters, runways, rip-rap and fills and includes crushed rock. Dimension stone means any rock or stone product that is cut or split on two or more sides, but does not include crushed rock.

The apparent expected end use of the Alumina resource (that of supporting a cement plant raw materials) from Duck Lake Mineral Claim comes within the Industrial Use definition and therefore can be considered under the *Mineral Tenure Act*. Claims require $4 of assessment work per ha (or cash-in-lieu) each of the first three years and $8 per ha each year after.

Claim 532098 (April 14, 2007, 125.124 ha (6 cells) is owned by J. M. Owen.

LANG BAY Duck lake Claims

First Nations Layers

Indian Reserves

Parks Layers

BC Parks (July 2004) outline (<1M)

Mineral Titles Layers

MTO Mineral Titles Online Labels <200K
- Placer
- Mineral

MTO Mineral Titles Online Polygons
- Placer
- Mineral

Topographic Layers

Forestry Roads (<250K)

Coast 1:20K (<1M)

Lakes 1:50K (<300K)

Rivers 1:50K (<300K)

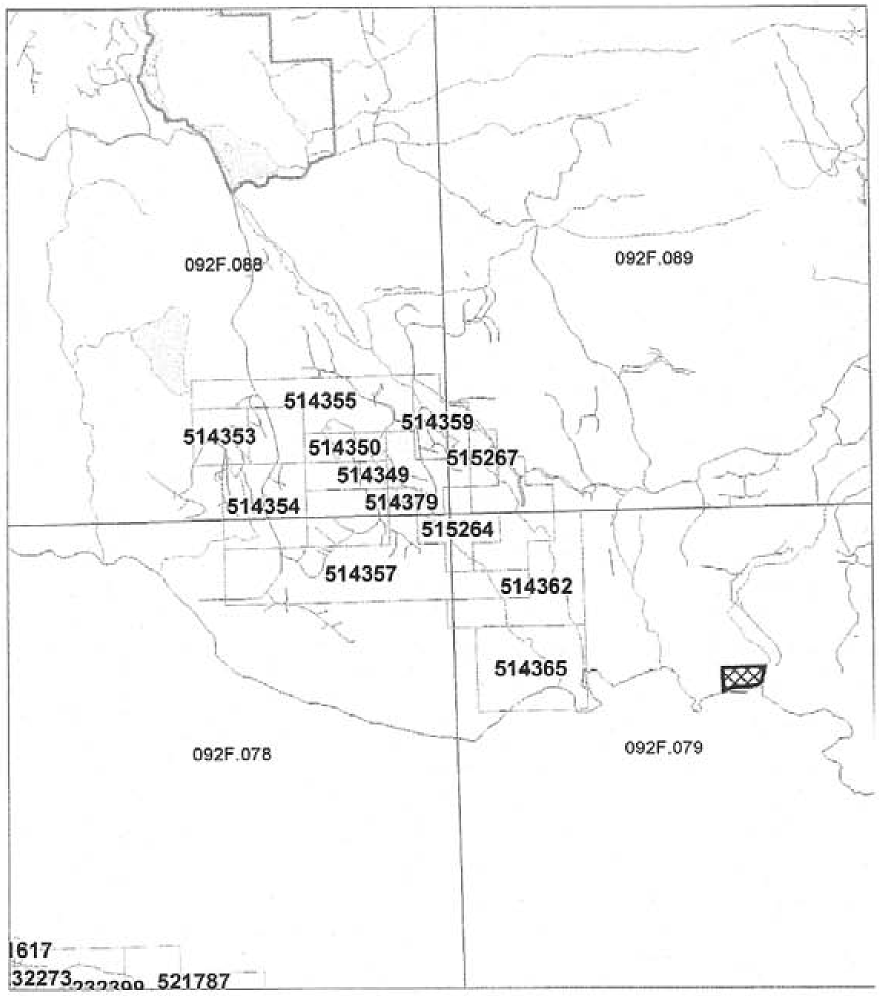
Border line 1:250K (<2M)

Grid Layers

Grid 1:20K maps - labels

Grid 1:20K maps - outline

Grid 1:250K maps - outline



SCALE 1 : 124,020

LANG BAY Duck lake Claims

First Nations Layers

Indian Reserves

Parks Layers

BC Parks (July 2004) outline (<1M)

Mineral Titles Layers

MTO Mineral Titles Online Labels <200K
- Placer
- Mineral

MTO Mineral Titles Online Polygons
- Placer
- Mineral

Topographic Layers

Roads 1:20K undefined

Coast 1:20K (<1M)

Lakes 1:50K (<300K)

Rivers 1:50K (<300K)

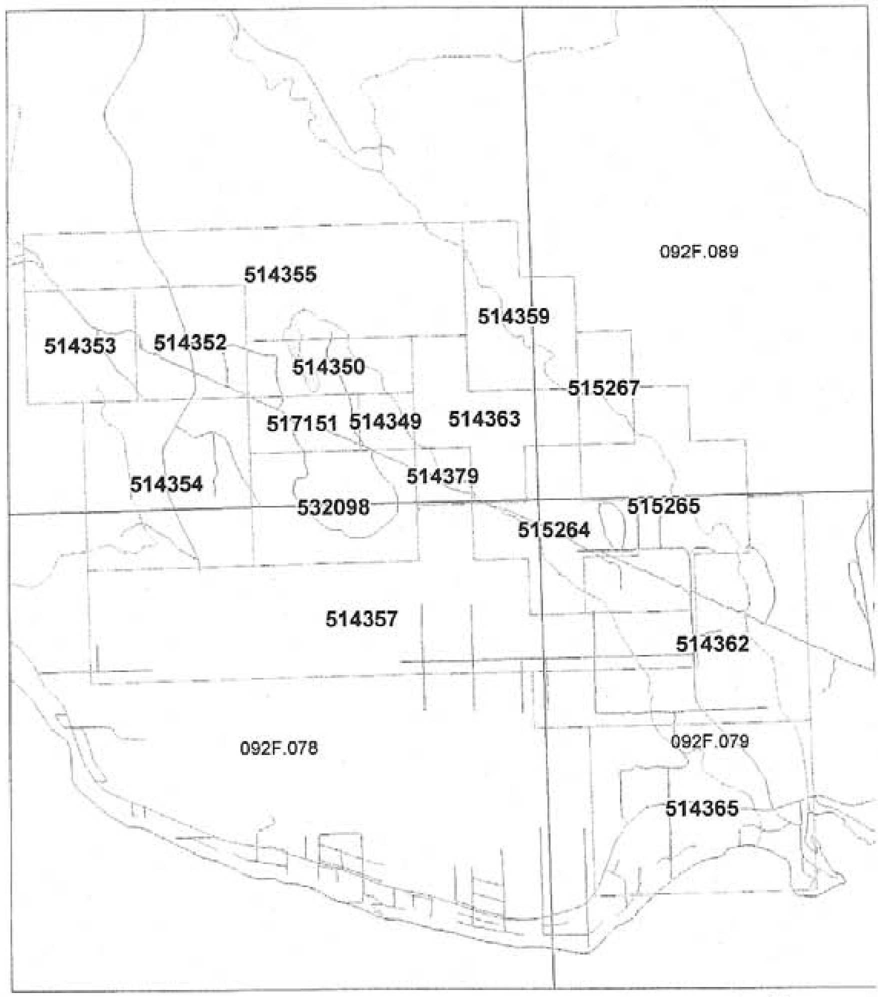
Border line 1:250K (<2M)

Grid Layers

Grid 1:20K maps - labels

Grid 1:20K maps - outline

Grid 1:250K maps - outline



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MILES

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Wednesday, October 04, 2006 4:30 PM

HISTORY

In 1948 a spectrographic research study on the coals of British Columbia discovered high values of germanium in the carbonaceous shales and sandstones found in the Lang Creek area. In 1957 the mineral rights to the area were acquired by the now defunct Taiga Mines Ltd. who carried out a bulldozer trenching and a churn and diamond drilling program throughout 1958 and 1959.

In 1981 the property was acquired by Fargo Resources Limited, who conducted a number of trenching and sampling programs between August 1981 and April 1984. Work in 1985 consisted of research on methods of recovering germanium from the arkosic sandstone formation.

In 1986-1987, a drilling program of 9 holes was carried out for a more detailed exploration of germanium bearing brown beds. Tests on clay/shale horizons contained within the brown beds determined that they contain a high quality kaolin.

In May 1987, a hole drilled a distance of 1 km to the northwest of the previous area of sampling also contained kaolin, indicating a potentially large resource of this commodity at Lang Bay.

Starting in May 1987, most of the work at Lang Bay centred on evaluating the property as a kaolin deposit. It was envisaged that if a mine were to ever come into production, the primary product would be kaolin clay with germanium and gallium being valuable by-products.

The 1987 Program

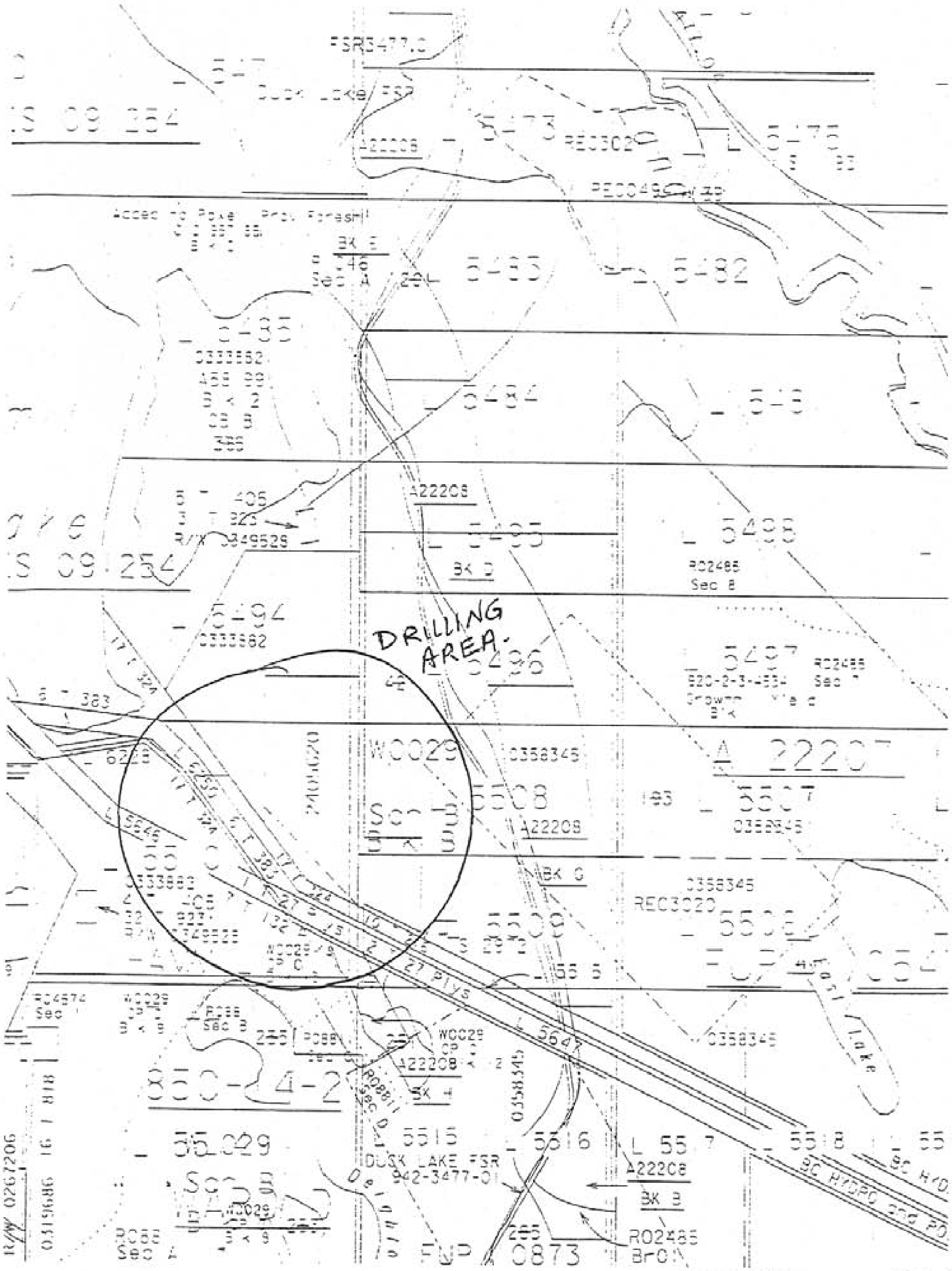
The 1987 drilling program confirmed the presence of a significant thickness of kaolin clay within the prospect. However, the reverse circulation drilling method destroyed the texture of the Insitu clay structure and confused any distinction between:

a) primary kaolins derived from Insitu alteration (weathering or basement granitoid rocks; or
b) secondary kaolins within the basin sediments.

The geophysical surveys included seismic profiling, ground magnetic surveys, dipole-dipole resistivity surveys and Schlumberger vertical electric soundings. The seismic surveys were undertaken to define the profile of the basement rocks across the basin. The magnetic surveys were carried out to locate near surface basement rocks, which were found to have strong magnetic signatures. The electrical resistivity surveys were used to locate conductive clay horizons in the subsurface.

The magnetic surveys successfully modelled the shallowing of the basement rocks towards the edge of the basin, although significant 'geologic noise' was encountered due to the presence of large altered granitic boulders in the glacial till. Interpretation of the seismic profiling was constrained by the complexity of the sedimentary units in the basin and the lack of contrast in seismic velocity between certain of these units and the basement. The electrical resistivity surveys successfully delineated conductive clay horizons although it was not possible to distinguish between the primary and secondary kaolins.

Benefication studies and laboratory testing of selected samples from the 1987 reverse circulation drilling were carried out by Sutton (1987) who confirmed that certain of the clay horizons were suitable for processing to paper filler clay specifications.



1:20,000 FIG 4

SURFACE TENURE

Mineralogical investigations of borehole samples from the 1987 drilling by Mak (1987) demonstrated that the kaolin content of the primary kaolin (weathered granitoid rocks) decreases with increasing depth below the surface.

Preliminary testing and examination of cores of the secondary kaolin indicates that the quality and composition of these clays may be highly variable. A test sample of 6 tonnes was shipped to the Elk Falls paper mill near Campbell River in 1992 with apparently favourable results. Other samples were sent to pulp and paper concerns to be mill tested for linerboard and filler in the manufacture of adhesives.

A calcining test was carried out on a sample of Lang Bay kaolin by Nord Kaolin Company of Jeffersonville, Georgia. The sample was first beneficiated by Magnetic separation and ozone bleaching and this improved the brightness to that of a standard performance filler. The sample was then calcined and brightness values equivalent to those of imported calcined grades were achieved. This is significant because calcined kaolin produces a superior performance and sells for up to four times the price of filler grade. The calcined grade requires heating by natural gas, which only recently has been made available for industrial users in the Powell River area.

LANG BAY Geology

First Nations Layers

Indian Reserves

Parks Layers

BC Parks (July 2004) outline (<1M)

Mineral Titles Layers

MTO Mineral Titles Online Labels <200K
- Placer
- Mineral

MTO Mineral Titles Online Polygons
- Placer
- Mineral

Topographic Layers

Coast 1:20K (<1M)

Lakes 1:50K (<300K)

Rivers 1:50K (<300K)

Border line 1:250K (<2M)

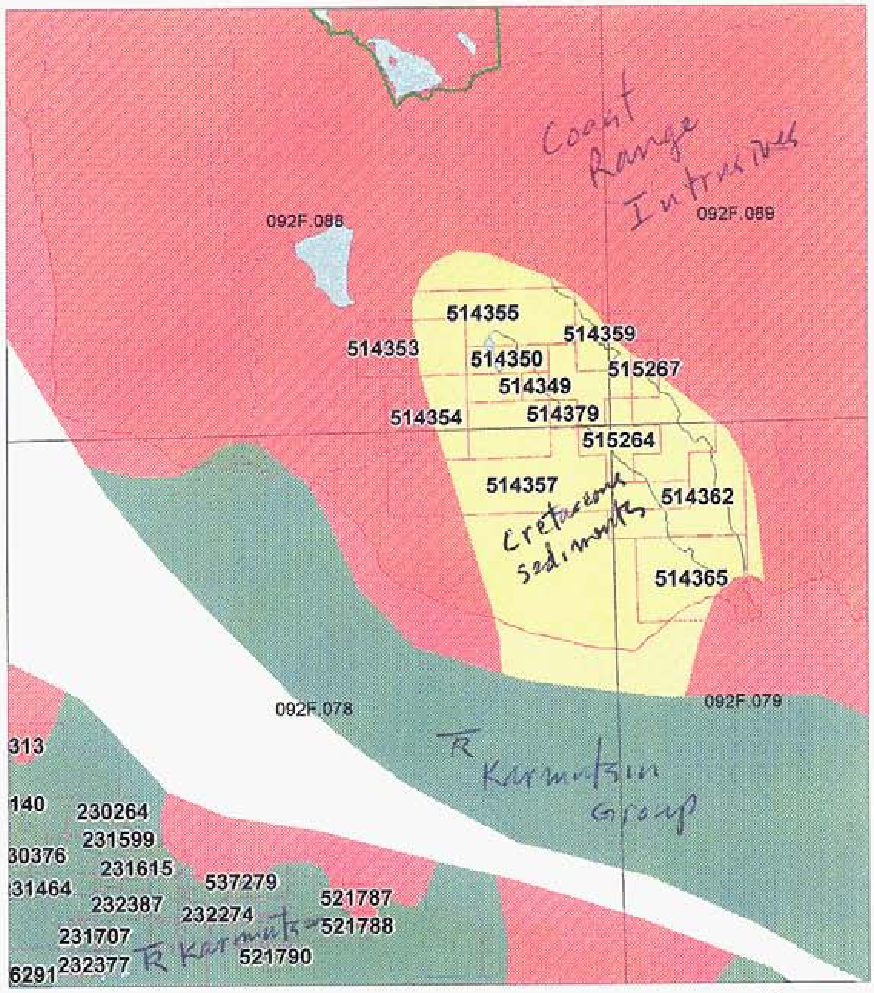
Grid Layers

Grid 1:20K maps - labels

Grid 1:20K maps - outline

Grid 1:250K maps - outline

BCGS Geology Layers 2005



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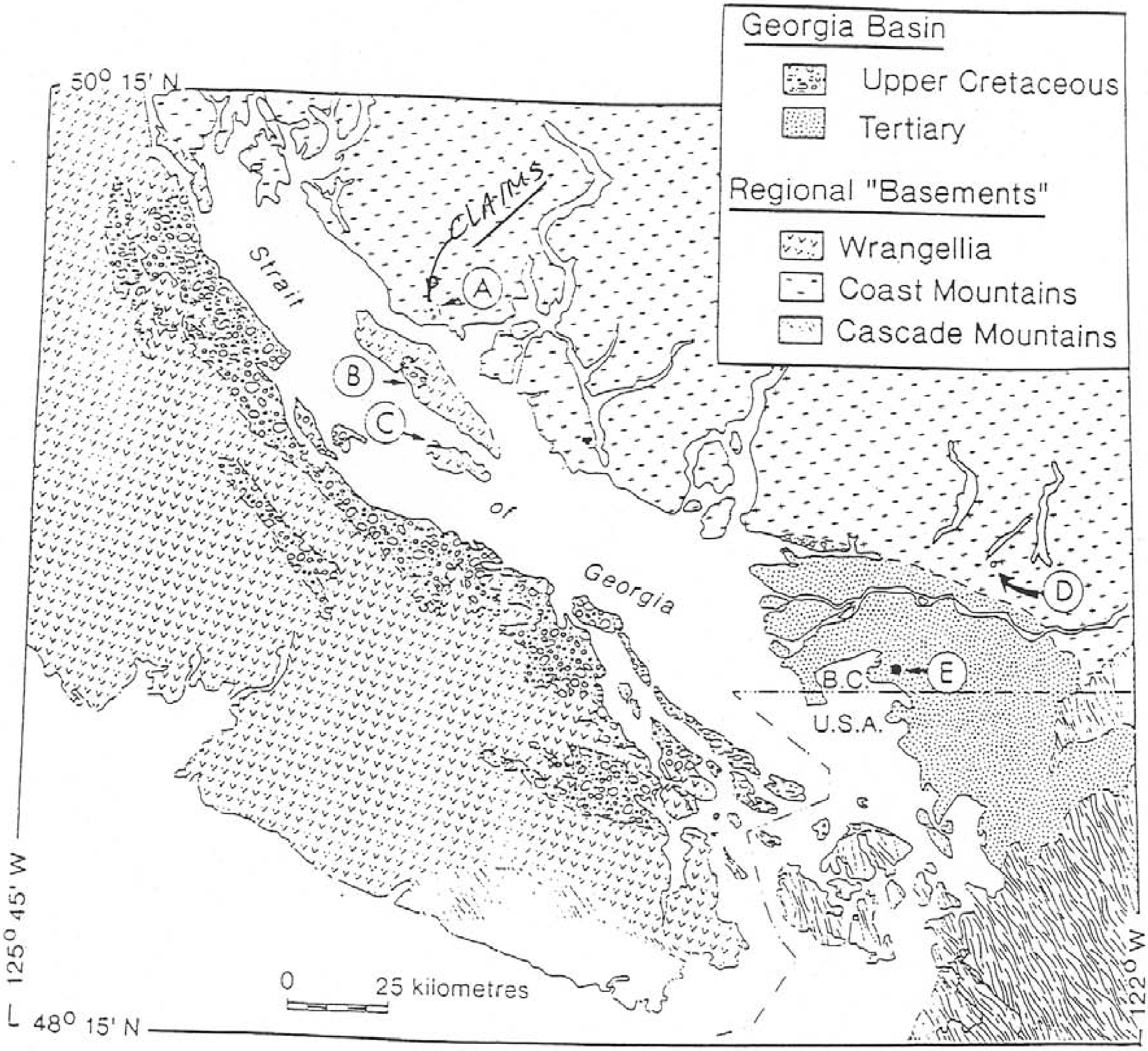


Figure 5 Regional setting of the Georgia Basin (modified from Monger, 1990). Letters indicate localities discussed in this study. A. Lang Bay outlier; B. Mouet Creek outlier; C. Lasqueti Island outlier; D. Blue Mountain outlier; E. Richfield-Pure Sunnyside exploration well.

REGIONAL GEOLOGY

Figure 5

REGIONAL GEOLOGY

The sedimentary rocks underlying the Duck Lake Claims are a small outlier of the extensive Georgia Basin, which is well known in the Nanaimo-Comox area due to large scale coal mining.

The Georgia Basin overlies three different basement entities: Wrangellia terrane on Vancouver Island: the Coast Belt on the mainland of British Columbia: and Cascade terranes in northwest Washington State. The main structural control on the sub-Georgia Basin rocks and the Georgia Basin itself is underthrusting of the Farallon/Kula oceanic plates beneath the North American Plate (Mustard and Rouse, 1991). A mid to late Cretaceous west-vergent thrust system is preserved at the southern margin of the Georgia Basin and in the eastern Coast Belt, mainly east of Harrison Lake. Dextral strike-slip faults influenced both basin formation and depositional patterns during the Tertiary. The basin has also been affected by early Tertiary compression, which resulted in southwest directed thrusting in the Nanaimo Group and possibly caused northwest plunging folds in the Chuckanut Formation. Younger (Miocene?) northeast trending faults and folds are evident on gravity and seismic profiles of the Fraser River lowlands. These are probably the subsurface expression of Tertiary structures preserved in the Coast and Cascade Mountains to the east and north (Mustard and Rouse, 1991).

The Nanaimo Group constitutes up to 4 km of Santonian (locally Turonian) to Maastrichtian age sedimentary rocks. The strata are commonly subdivided into nine formations comprising conglomerate, sandstone and mudstone with coal in lower units. The basal, coal-bearing formations appear to have formed in coastal plain, deltatic and shallow marine environments. Most recent interpretations of the other formations emphasize submarine fan models. Interpretations of the tectonic controls on basin sedimentation include forearc, strike-slip and foreland models (Mustard and Rouse, 1991).

Except for an isolated occurrence of Paleocene rocks on Lasqueti Island, the Tertiary rocks of the Georgia Basin are only exposed in the lower Fraser Valley and northwestern Washington. The main stratigraphic components are non-marine clastics of the Paleocene-Eocene Chuckanut Formation of Washington State, the partly equivalent upper Burrard and Kitsilano Formations of the Vancouver area, the late Eocene to Oligocene age Huntingdon Formation and younger (mostly Miocene) sedimentary rocks known from a few surface exposures and subsurface drilling. Upper Cretaceous rocks occur disconformably beneath the Tertiary strata at Burrard Inlet in Vancouver (Rouse et al., 1975) and in the western Fraser River delta subsurface.

LOCAL GEOLOGY

A sedimentary outlier of about 35 km is preserved at Lang Bay, about 13 km southeast of Powell River. Outcrop is limited to discontinuous exposures in Lang Creek (Mustard and Rouse, 1991). Conglomerate, sandstone and mudstone dip 10-15° to the southwest. The sequence unconformably overlies granodiorite and, in the northwest, part of the outlier, mafic volcanics. Crickmay and Pocock (1963) and Bradley (1972) reported late Cretaceous palynomorphs from this outlier and suggested correlation with the lower Nanaimo Group (Comox or Extension Formations). White (1986) reviewed the exploration history of the area, which most recently was evaluated for industrial kaolin. More than 50 drillholes were emplaced during 1987-89 by Fargo Resources Ltd. and Brenda Mines Ltd. to evaluate the kaolin deposits. The thickest drill intersection of Upper Cretaceous strata is about 70m, with Quaternary alluvium directly overlying the Cretaceous strata.

Two of the core logs from the 1987 work are shown in Figure 7 (Mustard and Rouse, 1991). Fining and thinning upward trends are apparent, both on the scale of the preserved sequence (tens of metres) and as smaller cycles (a few metres or less). Conglomerates are clast-supported and moderately sorted with subround pebbles and rare cobbles in an arkosic matrix. Conglomerate clasts are predominantly granitic or mafic volcanic in composition, compatible with local derivation. Sandstones are arkosic or lithic arenites. Mudstones are brown or grey-green and massive, rarely laminated. Normal grading is common in both conglomerate and sandstone beds. Many sandstones display planar or (less common) trough crossbedding. The few well-exposed crossbeds in Lang Creek indicate paleoflow towards the southwest. The small scale fining upward cycles display gradational upward change from coarse, graded sandstone with abundant mudstone ripups to trough crossbedded medium grained sandstone, to rippled or wavy bedded fine grained sandstone and siltstone, to massive mudstone. Many mudstones are carbonaceous and contain abundant plant debris. Rare coal lenses are present in Lang Creek and in one place; in situ root systems are preserved (Mustard and Rouse, 1991).

The metre-scale cycles display features of fluvial channel and point-bar deposits. The isolated graded sandstone beds in mudstones are interpreted as crevasse-splay deposits. These features, plus the presence of coal lenses, and in situ rootlets support a fluvial-floodplain depositional model.

Palynomorph assemblages have been obtained from about 6 surface samples along Lang Creek and 6 mudstone layers in drillcore (Table 1). Most palynomorphs range from the Santonian to Campanian, but a few range to Albian-Cenomanian, and others into the Maastrichtian. The Santonian-Campanian range agrees with the invertebrate-based range given for the Comox through Extension Formations.

At Lang Bay, several palynomorph species appear restricted to the upper beds, viz. *Proteacidites thalmanni, P. marginus, Tricolpopollenites divergens*, and *Tricolporopollinitespunctatus* (Mustard and Rouse, 1991). These are also found in the Extension-Protection Formations of Vancouver Island, and the Lions Gate Formation at Vancouver (Rouse et al., 1975, p. 469, Table 1), but appear absent from Comox and older equivalents. Hence, preliminary results suggest that there is a contact between younger and older segments of the Santonian-Campanian series near the top of the Lang Bay sequence.

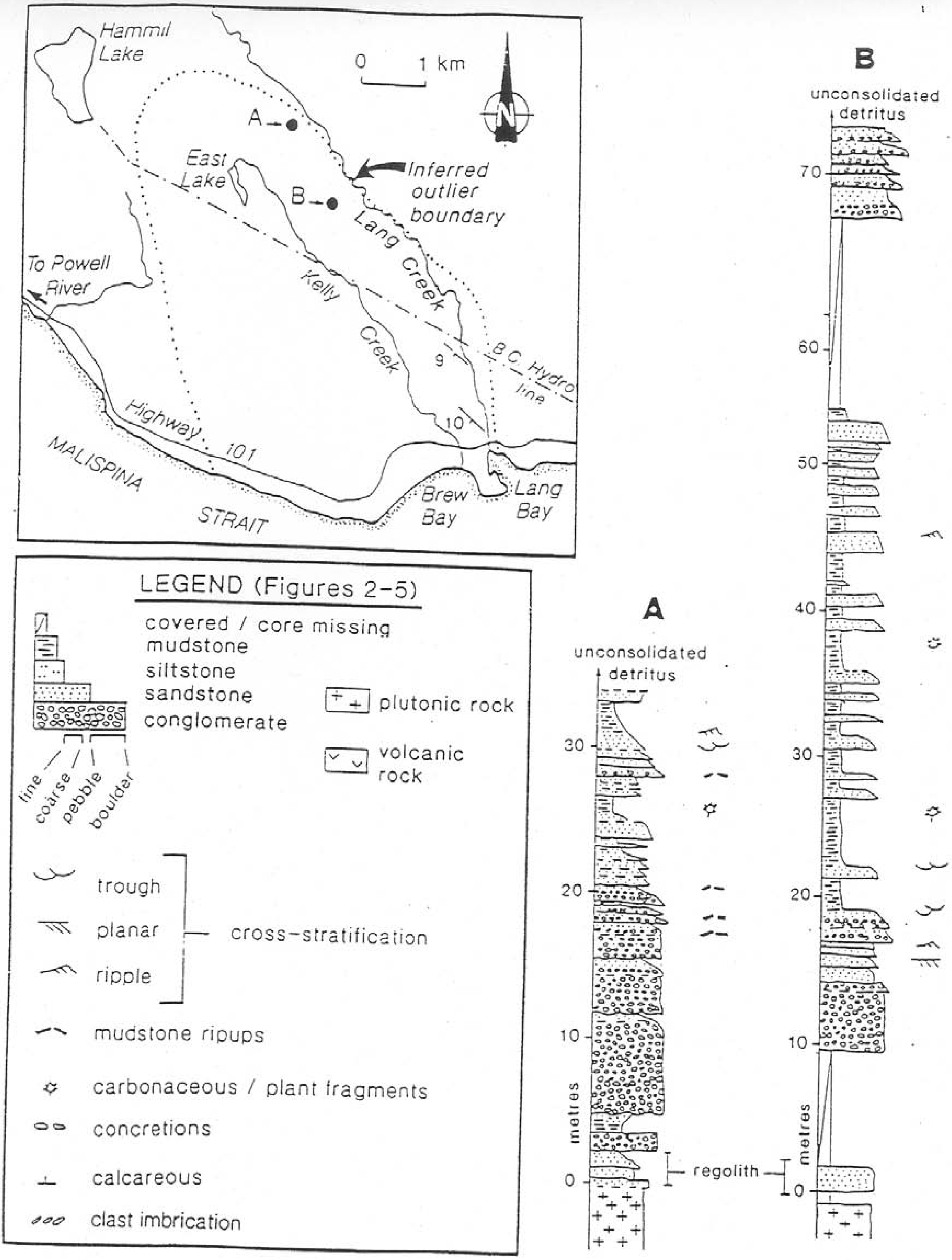


Figure 2. Lang Bay outlier with logs from two drillholes. Outlier boundary is modified from White (1986).
(after Mustard + Rouse).

Fig 6

1999 DIAMOND DRILLING

In May 1999 a program of 4 diamond drill holes were completed as summarized in Table II.

TABLE II DIAMOND DRILL HOLE DATA							
Hole #	Location Northing	Easting	Elevation	Azimuth	Dip	Length	Comments
DL-99-01	2600N	2400E	154m	000	-90	56.24m (184.5ft)	92 ft overburden
DL-99-02	0600N	2200W	135m	000	-90	50.29m (165ft)	15 ft overburden
DL-99-03	3800N	6000W	142m	000	-90	47.85m (153ft)	115 ft overburden
DL-99-00	9200N	1600W	156m	000	-90	(150ft)	>150' of overburden
					Total	198.88m (652.5ft)	

Grid centre is at the intersection of the Duck Lake Road and the Powerline Road.

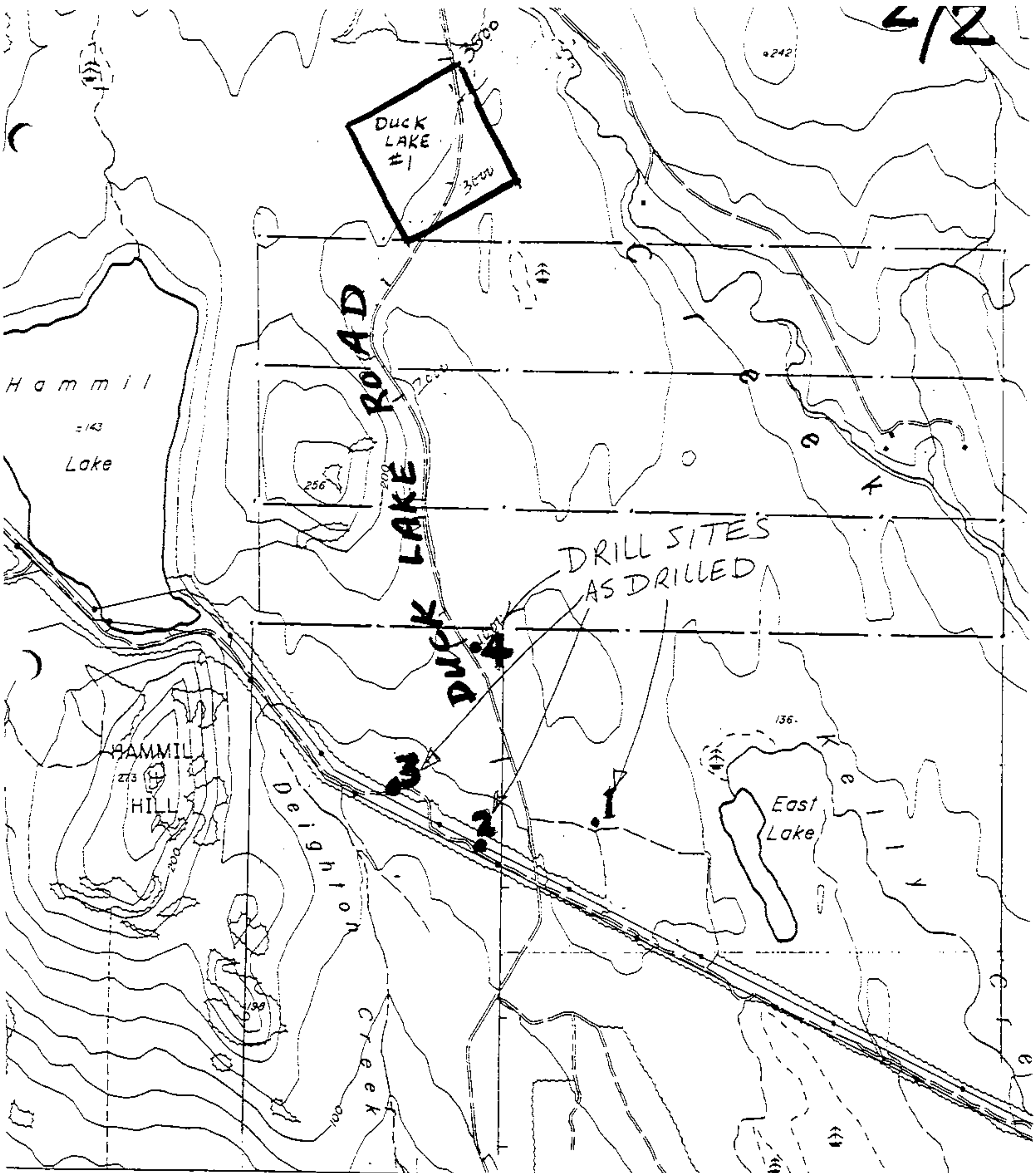
The drill used was a unitized Boyles 37A which was required to penetrate the variable thickness of boulder gravel, sand and till.

Hole #DL-99-01, located 260m north of the powerline encountered 92 feet (28.04m) of coarse gravel and till. The Cretaceous section consists of dark green shale which grades to shaly sandstone. Well altered green pebble conglomerate occurs between 152'2" to 156'5". Green to brown sandstone was found below the pebble conglomerate horizon which contain minor slickensides at 30° to core axis. A well altered, friable pebble conglomerate occurs at the bottom of the hole. This pebble conglomerate is characterized by matrix supported granite clasts. More whitish matrix is found at the bottom of the hole.

Diamond drill hole #DL-99-02 was located west of Duck Lake Road on the north side of the powerline. Overburden was only 16.5fr (4.72m) and consists of boulders, glaciomarine stony clay over 1 foot of granitic boulders. The Cretaceous sequence was similar to Hole #1 which was alternating green-brown shale and coarse green speckled sandstone. Minor wispy coal partings were noted in the sandstone between 50.3m to 51.4m. The layering bedding is at 82° to core axis. The sequence appears to be a prograding deltaic depositional environment in which minor coal is forming elsewhere in lagoonal portions in the immediate vicinity and being eroded and redeposited in the outer delta turbiditic sequence. Near the bottom of Hole #2 an intense brown shale was encountered. Some sections are a dark red brown. Slickensides at 55° to core axis were noted between 137.10 ft to 139.5ft.

Hole #DL-99-03 was drilled close to the west edge of the basin west of hole #2 along the powerline. There was over 115 feet of coarse gravel and sand overburden. Strong water inflow at 52' and again at 80' made driving of the casing difficult. The Cretaceous sequence is characterized by dark brown shale. The bottom of the hole encountered grey-green conglomerate composed of matrix supported rounded to angular fragments of mostly lighter grey shale. Numerous narrow lamphrophic dykes were noted. Some sections (approx 15%) are heavily oxidized and leached particularly at the bottom of the hole.

Hole #DL-99-04 was located on the Duck Lake Road, however over 150 feet of sand and gravel was encountered without hitting bedrock.



TRIM MAP 1:20,000 FIG 7

ours generated from Digital Elevation Model.
our interval 20 metres.
ations in metres above Mean Sea Level.

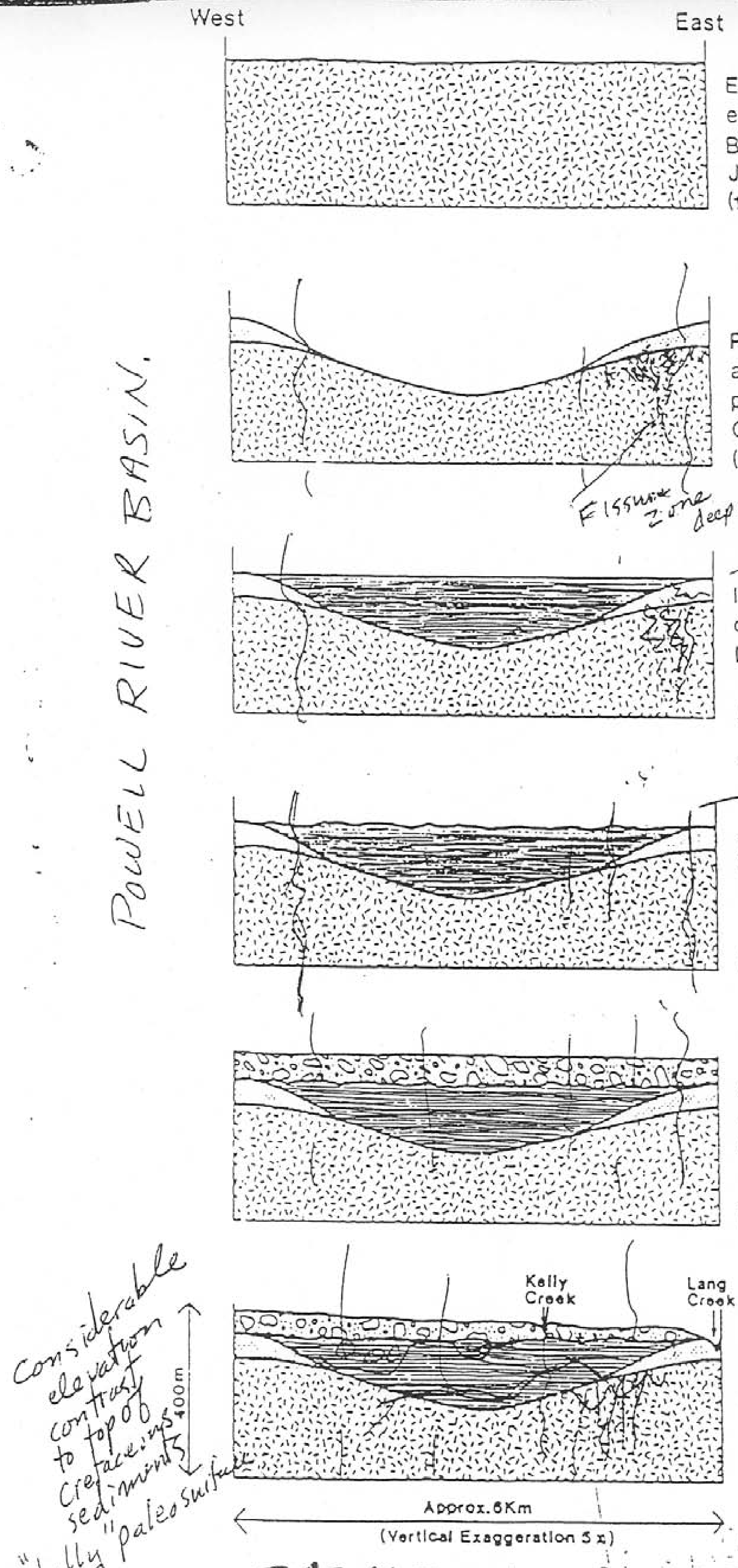
DIGITAL DATA AVAILABLE			
PLANIMETRY	☒	CONTOUR	☒
CADASTRAL	☐	DEM	☒

GEOPHYSICS

A large amount of geophysical testing was completed in the period 1986 to 1989 including ground magnetometer, seismic refraction, electrical conductivity, dipole-dipole resistivity and some down-the-hole electrical soundings.

Seismic refraction work in 1999 was carried out primarily to give some indication on the areas of thinner overburden but unfortunately the velocities of the compacted clay-rich till and glacial-fluvial stony clays give very similar values to the velocities encountered in the Cretaceous shales which form the bedrock.

POWELL RIVER BASIN



Empiacement and subsequent erosion of Granitoid Basement Rocks
Jurassic – Cretaceous
(180 – 100 million years ago)

Primary Kaolin developed as weathering profile preserved on basin margin
Cretaceous
(100 – 70 million years ago)

Infilling of basin by cyclothemic sediments
Late Cretaceous
(70 million years ago)

Uplift and erosion
Tertiary
(<60 million years ago)

Glacial action and deposits of glacial till
Quaternary
(<1·5 million years ago)

Recent erosion to produce the present Landform

GEOLOGICAL MODEL

BASIN DEVELOPMENT

CONCLUSIONS and RECOMMENDATIONS

The Duck Lake Property (Lang Bay Project) consists of 16 dell claims located about 15 km southeast of Powell River Townsite. The claims are 3 km north of Highway 101 at Myrtle Point. Access is via the Duck Lake Forestry Road or alternatively along the Powerline of Zilinsky Road.

The area is underlain by Upper Cretaceous shale-sandstone and minor coal, which can be correlated with the Nanaimo Group.

Previous work on the eastern margin of the outlier basin in the 1980's and early 1990's suggest that there is good potential to define primary and secondary low alkali kaolin deposits.

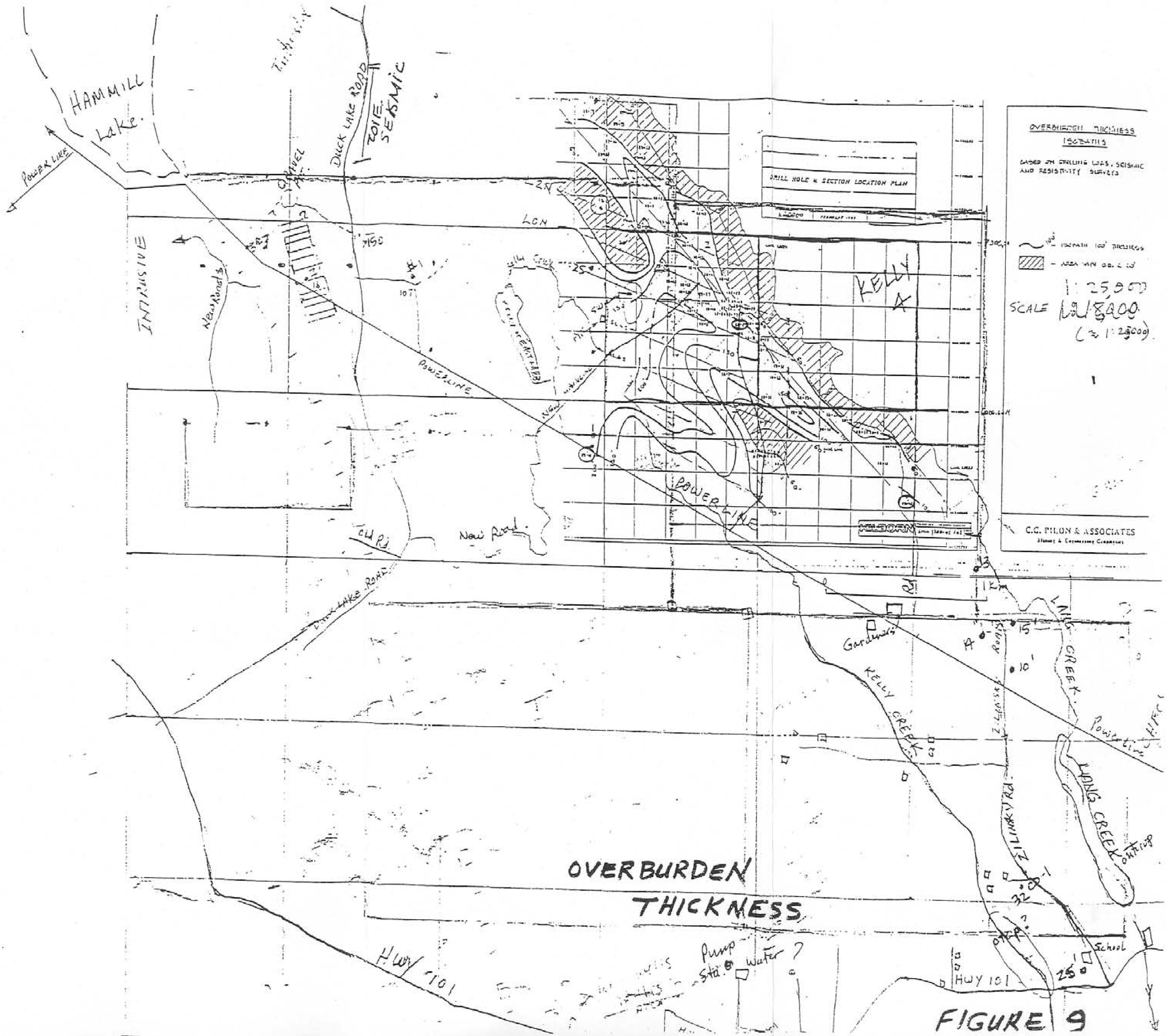
A 1999 program consisted of 4 diamond drillholes (totalling 198.88m) and 4.3 km of seismic refraction geophysics. The drilling encountered dark green shale, shaly sandstone and green pebble conglomerate. In some holes a distinct alternating sequence of green to very brown shale. The interval appears to be a prograding detatic depositional environment in which minor coal is forming in lagoonal portions in the immediate vicinity and then being eroded and redeposited in the outer delta-turbiditic sequence.

A major problem in the economic evaluation the area is the variable thickness of till and clay-rich overburden which ranges form <15 feet to >150 feet within relatively short distances.

The seismic refraction survey gave ambiguous results since the velocities of the compacted till are very similar to the velocities in the Cretaceous shale. It is recommended that a resistivity survey be done over the seismic lines to differentiate between overburden and altered bedrock. The resistivity data will provide location and depth distribution of shallow, electrically conductive materials that may be correlated with alteration zones. Based on previous experience in the area, the sedimentary bedrock where the alteration occurs has seismic velocities of the order of 2500 m/s to 3100 m/s. In order to clarify that the conductive anomalies are in the sedimentary rock sequence and not within the overburden, seismic refraction surveying should be carried out in the target areas. This seismic information together with the resistivity data would be used to select drillhole locations and would serve as the basis for additional exploration in the area.

Respectfully submitted,

J.T. (Jo) Shearer, M.Sc., P.Geo.
Consulting Geologist
August 15, 2006



OVERBURDEN THICKNESS

FIGURE 9

COST ESTIMATE for FUTURE WORK

The Duck Lake Claims require continued geological mapping and hand trenching in certain areas. A small diamond drill program is recommended. The nature of industrial minerals suggests that a bulk sample would be useful to conduct test work for specific markets.

Drill Supervision			
Senior Geologist, 12 days @ $500			$ 6,000.00
Assistant, 12 days @ $250			3,000.00
		GST	540.00
		Subtotal	$ 9,540.00
Diamond Drilling of 10 Holes @ 100m Depth Each:			
Footage price	$21 x 1,500 (NQ)		$31,500.00
Mob/demob			2,500.00
Standby/machine time (if required)	Field costs		5,500.00
Moving	Field costs		3,000.00
Meals/Accommodations		At Contractor's Expense	
Set up	Field costs		3,000.00
		Subtotal	$45,500.00
Dozer time in moves/road access			
	Road - 15 hrs @ $85		$ 1,275.00
	Moves - 15 hrs @ $85		1,275.00
		Subtotal	42,550.00
		GST	2,883.00
	Diamond Drilling Subtotal		$50,933.00
Metallurgical Ongoing Work			
Samples out to end users & Followup			$ 6,000.00
Calcining Followup			2,500.00
Magnetic Separation to Address Iron Content			2,500.00
Classification of Undersize Thickener & Hydrocycloning			10,000.00
Market & Customer Study, Update of 1989 Study			19,000.00
		Subtotal	$ 40,000.00
Bulk Sample			
Environmental Survey & Report			$ 8,000.00
Application & Preparation of required reports & documents for Bulk Sample Permit			6,000.00
Tote Road Preparation			10,000.00
Bulk Sample Mining & Crushing 10,000 tons + Loadout			45,000.00
Trucking Sample to Loadout			35,000.00
Final Report Preparation			6,000.00
		Subtotal	$110,000.00
		TOTAL	**$200,933.00**

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APPENDIX I

STATEMENT OF QUALIFICATIONS

J. T. SHEARER, M.Sc., F.G.A.C., P.Geo.

AUGUST 15, 2006

Appendix I

STATEMENT OF QUALIFICATIONS

I, Johan T. Shearer of 3572 Hamilton Street, in the City of Port Coquitlam, in the Province of British Columbia, do hereby certify:

1. I graduated in Honours Geology (B.Sc., 1973) from the University of British Columbia and the University of London, Imperial College, (M.Sc. 1977).
2. I have practiced my profession as an Exploration Geologist continuously since graduation and have been employed by such mining companies as McIntyre Mines Ltd., J.C. Stephen Explorations Ltd., Carolin Mines Ltd. and TRM Engineering Ltd. I am presently employed by Homegold Resources Ltd.
3. I am a fellow of the Geological Association of Canada (Fellow No. F439). I am also a member of the Canadian Institute of Mining and Metallurgy, and the Geological Society of London. I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia (P.Geo., Member Number 19,279).
4. I am an independent consulting geologist employed since December 1986 by Homegold Resources Ltd. at Unit #5 2330 Tyner Street, Port Coquitlam, British Columbia.
5. I am the author of the report entitled "Geological and Metallurgical Assessment Report on the Lang Bay (Duck Lake) Kaolinite Deposit, August 15, 2006".
6. I visited the property in May, June, July and August 1999. I supervised and logged the diamond drill core. I worked on drillcore and reverse circulation samples on January 5 to 7 and 10 to 12, 2006. I am familiar with the regional geology and geology of nearby properties. I have become familiar with the previous work conducted on the Duck Lake Property by examining in detail the available reports, plans and sections, and have discussed previous work with persons knowledgeable of the area.

Dated at Port Coquitlam, British Columbia, this 15th day of August, 2006.

Respectfully Submitted

Shearer

J.T. Shearer, M.Sc., F.G.A.C., P.Geo.
August 15, 2006

APPENDIX II

STATEMENT OF COSTS

AUGUST 15, 2006

Appendix II

STATEMENT of COSTS 2006

LANG BAY PROJECT (DUCK LAKE CLAIMS)

Geological and Metallurgical Assessment Report

Wages and Benefits		
J.T. Shearer, M.Sc., P.Geo., Quarry Supervisor 98-3550		
6 days @ $500, January 5, 6, 7, 11, 12 &19		$ 3,000.00
G. Richards, Linecutter		
6 days @ $200.00, January 5, 6, 7, 19, 11, 12 & 19		1,200.00
		$ 4,200.00
	GST	252.00
	Subtotal Wages	$ 4,452.00
Expenses		
Transportation		
Truck Rental, Fully equipped 4x4		
6 days @ $75/day		450.00
Gas		220.00
Ferries		174.70
Motel, Meals		458.75
Metallurgy Stage 1, Process Research Associates		5,066.00
Metallurgy Stage 2, Process Research Associates		4,416.00
Report Preparation		750.00
Drafting		100.00
Word Processing and Reproduction		200.00
	Subtotal Expenses	$ 11,835.45
	Total	**$ 16,287.45**

APPENDIX III

Stage I Metallurgical Report

By G. Tan, Ph.D.

AUGUST 15, 2006

Process Research Associates Ltd.

A Metallurgical and Environmental Laboratory

Company:	Homegold Resources		**Date:**	June 7, 2006
Attention:	Mr. Jo Shearer		**Sent:**	By e-mail
From:	Gie Tan	**No. Of pages (including this page):**		2

First Status Report on 0600901

As per our phone conversation today, a brief summary of the work in progress follows:

Objectives: Characterization of interval samples received, allowed the selection of lower-grade composites for production development and evaluation tests.

Summary:

Samples received: 34 dry pulps, representing 2-m intervals at various depths scattered over 14 locations; total weight was 541kg and the number of head assays was reduced to 30 by selecting four 4-m intervals.

Assay Results: consistent whole rock and ICP scans displayed pockets of lower alumina grades, with major impurities of concern relatively stable at ~55% SiO_2, 5% Fe_2O_3 and 1.5% TiO_2.

Test Grinds: Minor impact of adding 100g/t of CMC (Carbo-methoxy cellulose) as a deflocculant reduced the +200-mesh oversize from 45.6% to 43.7% after a 30 minute grind of 2kg batches at 50% solids. Whole rock assays of the oversize suggest some general upgrading potential by size classification.

Production Design: Literature was downloaded on the procedures for clay beneficiation, with a side-focus on meta-kaolin. One larger grind/dispersion test (20kg) on lower-grade samples was intended for hydro-cyclone testing but the pulp at 35% solids blocked and disabled the sand-pump. A device for elutriation (teetering bed thickening) is being contemplated, while awaiting replacement parts for the sand pump as well.

Conclusions:

The work as proposed has been 90% completed and, in theory, complications have not been encountered. The challenge, however, is to device practical methods for larger scale operations and conduct more detailed evaluation of different classes of products. A follow-up proposal will be submitted, once the remaining sized classifications on the 20kg test charge has been completed (estimated in 2 weeks, subject to delivery of spare parts and equipment).

Best Regards,

Gie Tan, Senior Metallurgist

Canadian Company Capabilities

Complete Profile

[New Search]

Process Research Associates Ltd.

Last Updated: 2005-11-23

Legal Name: Process Research Associates Ltd.
Operating Name: Process Research Associates Ltd.

Mailing Address
11620 Horseshoe Way
RICHMOND, British Columbia
V7A 4V5

Location Address
11620 Horseshoe Way
RICHMOND, British Columbia
V7A 4V5

Telephone: (604) 322-0118
Fax: (604) 322-0181
Email: pra@pralab.com
Website URL: http://www.pralab.com

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Contact Information

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Telephone: (604) 322-0118
Fax: (604) 322-0181
Email: ptse@pralab.com

Michel Robert
Title: Manager
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Fax: (604) 322-0181
Email: mrobert@pralab.com

Gie Tan
Title: Manager

Telephone: (604) 322-0118
Fax: (604) 322-0181
Email: gtan@pralab.com

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Company Description

PROCESS RESEARCH ASSOCIATES LTD. (PRA) is a research and testing laboratory serving the mining and exploration industries. The company specializes in the evaluation of mineral samples for process development as well as environmental research. PRA exceeds customer's expectations by producing high qulaity test results with fast turn-around times. Our work carries the high level of credibility required for feasibility studies and regulatory submissions.

PRA's labs are equipped with all the laboratory equipment necessary for mineral processing, hydrometallurgy, and environmental studies. The company continuously upgrades its capabilities to meet the needs of a growing list of clients.

PRA has been in business since 1992 and has performed more than 1,000 major projects and processed over 10,000 samples from around the world. Our clients include major mining companies and consulting engineering firms of the mining communities. Our tests covered all types of precious metal and base metal ores as well as many industrial minerals. Environmental services are primarily in the fields of cyanide destruction and acid rock drainage (ARD) prediction.

Country of Ownership:	Canada
Year Established:	1992
Exporting:	Yes
EDI Ready:	No
Quality Certification:	ISO 9002
Primary Industry (NAICS):	541380 - Testing Laboratories
Primary Business Activity:	Services
Total Sales ($CDN):	$1,000,000 to $4,999,999
Export Sales ($CDN):	$100,000 to $199,999
Number of Employees:	10

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Product / Service / Licensing

Product Name:	Removal of sulphur by flotation. (Exporting)
Service Name:	Flotation Testing (Exporting)

Carry out test work to evaluate froth flotation as a means of mineral recovery for precious metals, base metals and industrial minerals.

Service Name: Cyanide Leaching (Exporting)

Carry out test work to evaluate cyanite leaching as a means of mineral recovery for precious metals using bottle tests and column tests.

Service Name: Bio-Leaching (Exporting)

Carry out shake flask and column tests to evaluate biological leaching as a means of mineral recovery for copper and gold.

Service Name: Chemical Leaching (Exporting)

Carry out tank and column leaching tests to evaluate chemical leaching as a means of mineral recovery for copper and cobalt.

Service Name: Gravity Concentration (Exporting)

Carry out tests using jigs, shaking tables, dense liquid and and centrifugal concentrators to evaluate gravity concentration as a means of mineral recovery for gold and diamonds.

Service Name: Bond Work Index (Exporting)

Carry out crushing and grinding studies, including Bond Work Index Testing, to evaluate the grinding and power requirements of mineral samples.

Service Name: Biotechnology

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Market Profile

Alliances:

Sales/Marketing:	Domestic, Foreign
Technology:	Domestic, Foreign

Industry Sector Market Interests:

- Agriculture
- Construction
- Consumer Products
- Culture
- Environment
- Fishery
- Forestry
- Information Technology and Telecommunications
- Manufacturing
- Medical/Biotechnology/Chemical
- Mining/Petroleum/Gas
- Service Industry
- Tourism
- Transportation
- Wholesale/Retail

Geographic Markets:

Export Experience:

- Algeria
- Chile
- Mexico
- Peru
- Russian Federation
- United States

Top

[New Search]

HEAD ASSAY REPORT

Client: Homegold Resources
Sample: as per ID

Date: 17-Mar-06
Project: 0600901

Elements	Units	Sample ID								Analytical Method
		87- 9 119-121	87- 9 127-129	87-15 114-116	87-17 106-108	87-17 122-124	87-22 176-178	87-22 184-186	87-24 245-247	
Al	ppm	78739	67050	99809	106861	95,638	111,816	104,703	73,396	ICPM
Sb	ppm	<5	<5	<5	<5	<5	<5	<5	<5	ICPM
As	ppm	<5	<5	<5	<5	<5	<5	<5	<5	ICPM
Ba	ppm	672	694	346	256	540	113	450	687	ICPM
Bi	ppm	<2	<2	<2	<2	<2	<2	<2	<2	ICPM
Cd	ppm	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	ICPM
Ca	ppm	26368	43209	3172	5196	3,923	3,408	5,243	39,742	ICPM
Cr	ppm	6	53	46	30	47	59	37	64	ICPM
Co	ppm	16	11	15	26	16	21	19	9	ICPM
Cu	ppm	20	22	21	61	59	25	37	259	ICPM
Fe	ppm	39536	26813	33830	43388	36,728	44,508	40,560	23,796	ICPM
La	ppm	14	12	16	20	20	24	20	14	ICPM
Pb	ppm	46	41	47	39	48	53	36	42	ICPM
Mg	ppm	6626	5970	6234	5364	7,367	4,857	6,995	5,401	ICPM
Mn	ppm	927	1695	343	391	434	372	506	1,429	ICPM
Hg	ppm	<3	<3	<3	<3	<3	<3	<3	<3	ICPM
Mo	ppm	6	6	5	6	5	5	4	4	ICPM
Ni	ppm	3	8	4	11	13	11	7	4	ICPM
P	ppm	<100	318	<100	<100	<100	<100	<100	210	ICPM
K	ppm	20253	12558	12989	7064	21,307	2,754	14,991	21,261	ICPM
Sc	ppm	10	9	9	15	11	16	13	6	ICPM
Ag	ppm	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ICPM
Na	ppm	11563	14677	2315	3708	3,391	611	2,308	14,197	ICPM
Sr	ppm	105	140	61	81	68	51	65	89	ICPM
Tl	ppm	<2	<2	<2	<2	<2	<2	<2	<2	ICPM
Ti	ppm	2467	2135	2543	3525	2,898	3,635	3,389	1,754	ICPM
W	ppm	6	5	8	5	8	<5	6	<5	ICPM
V	ppm	70	60	63	98	78	102	92	40	ICPM
Zn	ppm	111	100	87	85	66	82	85	42	ICPM
Zr	ppm	12	10	17	20	16	16	14	18	ICPM

HEAD ASSAY REPORT

Client: Homegold Resources
Sample: as per ID

Date: 17-Mar-06
Project: 0600901

Elements	Units	Sample ID								Analytical Method
		87-25 208-210	87-26 298-300	87-27 270-272	87-28 120-122	87-28 126-130	87-28 138-140	87-28 144-146	87-28 148-150	
Al	ppm	105491	75841	85256	111674	119,000	102,915	97,105	98,555	ICPM
Sb	ppm	<5	<5	<5	<5	<5	<5	<5	<5	ICPM
As	ppm	<5	<5	<5	<5	<5	<5	<5	<5	ICPM
Ba	ppm	441	829	588	257	105	562	487	575	ICPM
Bi	ppm	<2	<2	<2	<2	<2	<2	<2	<2	ICPM
Cd	ppm	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	ICPM
Ca	ppm	8356	29176	12209	3431	3,623	8,346	4,210	4,000	ICPM
Cr	ppm	36	75	104	37	54	41	41	60	ICPM
Co	ppm	18	11	13	27	29	21	17	17	ICPM
Cu	ppm	67	19	84	84	64	57	33	44	ICPM
Fe	ppm	35847	29214	35323	42128	46,073	44,858	41,486	43,671	ICPM
La	ppm	21	23	20	32	34	20	20	22	ICPM
Pb	ppm	52	41	40	40	37	40	32	38	ICPM
Mg	ppm	4470	5122	5877	2515	3,797	7,293	7,311	7,370	ICPM
Mn	ppm	425	472	440	494	342	843	495	501	ICPM
Hg	ppm	<3	<3	<3	<3	<3	<3	<3	<3	ICPM
Mo	ppm	4	5	6	6	4	5	4	5	ICPM
Ni	ppm	9	5	7	5	7	5	6	4	ICPM
P	ppm	114	229	<100	<100	<100	395	<100	<100	ICPM
K	ppm	10949	17989	22098	866	2,011	16,974	20,586	22,580	ICPM
Sc	ppm	13	7	10	19	18	14	13	14	ICPM
Ag	ppm	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ICPM
Na	ppm	2336	23060	10087	811	811	4,638	2,622	2,729	ICPM
Sr	ppm	51	161	76	48	43	295	56	58	ICPM
Tl	ppm	<2	<2	<2	<2	<2	<2	<2	<2	ICPM
Ti	ppm	3445	2013	2558	3733	3,900	3,273	3,127	3,210	ICPM
W	ppm	6	<5	10	<5	<5	<5	<5	6	ICPM
V	ppm	102	50	67	104	117	99	88	92	ICPM
Zn	ppm	73	42	70	49	77	110	57	55	ICPM
Zr	ppm	15	21	19	18	18	17	16	17	ICPM

HEAD ASSAY REPORT

Client: Homegold Resources
Sample: as per ID

Date: 17-Mar-06
Project: 0600901

Elements	Units	Sample ID								Analytical Method
		87-28 150-154	87-28 166-167	87-29 124-126	87-30 205-207	87-31 190-194	87-31 198-200	87-31 202-204	87-31 206-208	
Al	ppm	93587	77694	104461	78630	86,427	92,139	89,337	97,090	ICPM
Sb	ppm	<5	<5	<5	<5	<5	<5	<5	<5	ICPM
As	ppm	<5	<5	<5	<5	<5	<5	<5	<5	ICPM
Ba	ppm	568	586	178	791	513	402	190	185	ICPM
Bi	ppm	<2	<2	<2	<2	<2	<2	<2	<2	ICPM
Cd	ppm	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	ICPM
Ca	ppm	4581	53037	4167	25932	9,477	9,662	9,701	6,141	ICPM
Cr	ppm	53	47	48	65	50	82	57	84	ICPM
Co	ppm	16	12	17	11	8	12	10	9	ICPM
Cu	ppm	139	41	51	18	52	56	41	41	ICPM
Fe	ppm	40501	28045	41687	29590	18,668	24,876	20,228	24,446	ICPM
La	ppm	22	15	29	16	35	29	22	21	ICPM
Pb	ppm	36	40	35	42	53	46	47	55	ICPM
Mg	ppm	7756	6747	6782	7543	2,530	3,244	2,671	2,787	ICPM
Mn	ppm	495	2492	374	653	296	384	304	284	ICPM
Hg	ppm	<3	<3	<3	<3	<3	<3	<3	<3	ICPM
Mo	ppm	4	5	6	4	3	5	6	6	ICPM
Ni	ppm	4	6	<1	3	6	5	4	3	ICPM
P	ppm	<100	316	<100	261	128	117	<100	<100	ICPM
K	ppm	22395	18531	7275	21003	13,633	11,209	4,676	5,233	ICPM
Sc	ppm	12	10	14	8	6	8	5	7	ICPM
Ag	ppm	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ICPM
Na	ppm	3963	19342	881	26192	6,010	6,825	3,168	3,707	ICPM
Sr	ppm	70	183	52	280	201	190	106	76	ICPM
Tl	ppm	<2	<2	<2	<2	<2	<2	<2	<2	ICPM
Ti	ppm	3027	2404	3375	2229	1,620	1,869	1,586	2,277	ICPM
W	ppm	<5	<5	<5	<5	<5	<5	8	<5	ICPM
V	ppm	83	69	92	59	39	47	34	54	ICPM
Zn	ppm	68	48	97	48	42	52	44	46	ICPM
Zr	ppm	15	12	15	19	44	44	37	46	ICPM

HEAD ASSAY REPORT

Client: Homegold Resources
Sample: as per ID

Date: 17-Mar-06
Project: 0600901

Elements	Units	Sample ID								Analytical Method
		87-31 214-216	87-31 226-228	87-31 236-238	87-33 166-170	87-34 226-228	268-270	RE 87- 9 119-121	RE 87-30 205-207	
Al	ppm	89949	51896	116308	81606	109,423	84,950	80,338	76,468	ICPM
Sb	ppm	<5	<5	<5	<5	<5	<5	<5	<5	ICPM
As	ppm	<5	<5	<5	<5	<5	<5	<5	<5	ICPM
Ba	ppm	422	440	364	856	1,243	590	702	755	ICPM
Bi	ppm	<2	<2	<2	<2	<2	<2	<2	<2	ICPM
Cd	ppm	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	ICPM
Ca	ppm	6877	31918	17643	7547	5,099	13,242	27,675	25,280	ICPM
Cr	ppm	88	110	58	70	54	77	7	61	ICPM
Co	ppm	9	12	12	10	11	13	17	11	ICPM
Cu	ppm	41	53	97	25	61	37	23	18	ICPM
Fe	ppm	23258	24377	34439	21846	22,722	32,235	39,787	28,716	ICPM
La	ppm	17	10	35	21	21	21	15	16	ICPM
Pb	ppm	58	46	49	57	49	44	48	44	ICPM
Mg	ppm	3670	2442	4871	2909	2,884	5,501	7,154	7,347	ICPM
Mn	ppm	339	382	438	327	267	429	976	637	ICPM
Hg	ppm	<3	<3	<3	<3	<3	<3	<3	<3	ICPM
Mo	ppm	5	6	4	5	5	5	6	4	ICPM
Ni	ppm	5	12	<1	4	6	7	3	3	ICPM
P	ppm	<100	142	<100	<100	<100	<100	<100	262	ICPM
K	ppm	18610	11105	14403	25152	37,681	21,782	20,908	20,919	ICPM
Sc	ppm	6	10	10	5	8	9	11	7	ICPM
Ag	ppm	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ICPM
Na	ppm	5371	13353	12657	3113	3,037	8,932	12,207	25,268	ICPM
Sr	ppm	93	122	57	47	59	71	107	268	ICPM
Tl	ppm	<2	<2	<2	<2	<2	<2	<2	<2	ICPM
Ti	ppm	1857	1900	3001	1608	2,428	2,405	2,796	2,140	ICPM
W	ppm	7	8	7	<5	6	8	6	<5	ICPM
V	ppm	44	83	73	35	43	58	80	58	ICPM
Zn	ppm	45	53	51	39	47	53	124	47	ICPM
Zr	ppm	31	15	24	34	25	21	14	18	ICPM

WHOLE ROCK ANALYSIS REPORT

Client: Homegold Resources
Sample: as specified

Date: 17-Mar-06
Project: 0600901

Compounds	Units	Sample ID								Analytical Method
		87- 9 119-121	87- 9 127-129	87-15 114-116	87-17 106-108	87-17 122-124	87-22 176-178	87-22 184-186	87-24 245-247	
		Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	
Al2O3	%	15.76	13.03	18.86	19.4	18.45	20.39	19.63	14.33	WRock
BaO	%	1.25	1.04	1.45	1.48	1.43	1.54	1.51	1.14	WRock
CaO	%	2.77	6.16	<0.01	<0.01	<0.01	<0.01	<0.01	5.41	WRock
Fe2O3	%	5.7	3.98	5.03	6.06	5.45	6.26	5.96	3.55	WRock
K2O	%	3.65	2.35	2.87	2.21	3.74	2.11	2.88	3.38	WRock
MgO	%	2.27	1.94	2.44	2.32	2.58	2.34	2.63	1.98	WRock
MnO	%	0.76	0.73	0.8	0.82	0.79	0.86	0.85	0.75	WRock
Na2O	%	2.56	2.57	1.93	2.08	2.01	2.00	2.00	2.66	WRock
P2O5	%	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	WRock
SiO2	%	54.45	55.9	55.43	50.4	55.31	50.36	52.37	54.08	WRock
TiO2	%	1.43	1.16	1.61	1.76	1.64	1.85	1.76	1.21	WRock
LOI	%	7.83	8.59	8.78	12.01	8.00	12.07	9.87	8.77	2000 F
Total	%	98.42	97.5	99.2	98.54	99.41	99.78	99.46	97.28	WRock

WHOLE ROCK ANALYSIS REPORT

Client: Homegold Resources
Sample: as specified

Date: 17-Mar-06
Project: 0600901

Compounds	Units	Sample ID 87-25 208-210	87-26 298-300	87-27 270-272	87-28 120-122	87-28 126-130	87-28 138-140	87-28 144-146	87-28 148-150	Analytical Method
		Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	
Al2O3	%	20.67	15.18	17.29	20.41	21.49	19.64	18.85	18.58	WRock
BaO	%	1.59	1.21	1.35	1.55	1.62	1.52	1.46	1.44	WRock
CaO	%	<0.01	3.44	0.13	<0.01	<0.01	<0.01	<0.01	<0.01	WRock
Fe2O3	%	5.2	4.53	5.4	6.09	6.43	6.42	6.10	6.33	WRock
K2O	%	3.03	2.89	3.81	1.83	1.90	3.12	3.71	3.98	WRock
MgO	%	2.36	1.99	2.29	2.01	2.26	2.62	2.65	2.56	WRock
MnO	%	0.88	0.67	0.75	0.88	0.90	0.90	0.82	0.8	WRock
Na2O	%	2.09	3.71	2.51	2	2.07	2.18	1.99	1.98	WRock
P2O5	%	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	WRock
SiO2	%	51.79	55.8	55.37	51.78	48.34	50.82	53.43	52.85	WRock
TiO2	%	1.85	1.31	1.52	1.86	1.94	1.75	1.70	1.66	WRock
LOI	%	10.31	8	7.68	11.21	12.51	10.17	8.93	8.84	2000 F
Total	%	99.77	98.76	98.1	99.63	99.46	99.19	99.64	99.03	WRock

WHOLE ROCK ANALYSIS REPORT

Client: Homegold Resources
Sample: as specified

Date: 17-Mar-06
Project: 0600901

Compounds	Units	Sample ID								Analytical Method
		87-28 150-154	87-28 166-167	87-29 124-126	87-30 205-207	87-31 190-194	87-31 198-200	87-31 202-204	87-31 206-208	
		Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	
Al2O3	%	18.15	15.04	19.74	16.01	16.95	18.14	17.59	19.06	WRock
BaO	%	1.41	1.18	1.51	1.27	1.32	1.40	1.34	1.44	WRock
CaO	%	<0.01	7.62	<0.01	2.76	<0.01	<0.01	<0.01	<0.01	WRock
Fe2O3	%	5.93	4.14	6.01	4.52	2.86	3.75	3.09	3.76	WRock
K2O	%	3.96	3.08	2.56	3.32	2.89	2.91	2.05	2.08	WRock
MgO	%	2.63	2.22	2.58	2.44	1.76	1.99	1.83	1.95	WRock
MnO	%	0.79	0.91	0.83	0.73	0.71	0.77	0.74	0.79	WRock
Na2O	%	2.08	3.57	2.03	4.09	2.17	2.34	1.96	2.12	WRock
P2O5	%	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	WRock
SiO2	%	54.07	51.16	53.08	57.8	60.81	57.91	59.61	57.48	WRock
TiO2	%	1.63	1.33	1.77	1.4	1.38	1.49	1.41	1.6	WRock
LOI	%	8.8	8.81	9.55	4.65	6.52	7.85	8.30	8.67	2000 F
Total	%	99.45	99.11	99.67	98.99	97.36	98.55	97.92	98.94	WRock

WHOLE ROCK ANALYSIS REPORT

Client: Homegold Resources
Sample: as specified

Date: 17-Mar-06
Project: 0600901

Compounds	Units	Sample ID								Analytical Method
		87-31 214-216	87-31 226-228	87-31 236-238	87-33 166-170	87-34 226-228	268-270	RE 87- 9 119-121	RE 87-30 205-207	
		Pulp	Pulp	Pulp	Pulp	Pulp	Pulp	Repeat	Repeat	
Al2O3	%	17.53	11.04	21.29	15.59	20.28	16.64	16.08	15.54	WRock
BaO	%	1.35	0.87	1.63	1.24	1.62	1.30	1.27	1.23	WRock
CaO	%	<0.01	4.89	0.43	<0.01	<0.01	0.36	3.07	2.83	WRock
Fe2O3	%	3.44	3.94	4.86	3.16	3.24	4.85	5.98	4.55	WRock
K2O	%	3.28	2.28	3.02	4.11	5.05	3.45	3.54	3.49	WRock
MgO	%	1.96	1.29	2.39	1.69	2.04	2.15	2.34	2.38	WRock
MnO	%	0.74	0.49	0.9	0.66	0.84	0.72	0.78	0.71	WRock
Na2O	%	2.13	2.42	3.38	1.78	2.15	2.39	2.65	4.22	WRock
P2O5	%	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	WRock
SiO2	%	58.52	63.08	47.68	60.88	54.44	56.42	54.28	59.26	WRock
TiO2	%	1.44	1.02	1.81	1.26	1.68	1.45	1.44	1.35	WRock
LOI	%	8.67	7.8	12.29	7.82	8.60	8.95	7.97	3.91	2000 F
Total	%	99.06	99.18	99.68	98.2	99.94	98.69	99.39	99.45	WRock

SAMPLE RECEIVING LOG SHEET

Receiving Date: 20-Jan-06	**Project No:** 0600901
Carrier: Client	**Client:** Homegold Resources
Receiver: Eric	**Page:** 2 of 2

Count	Sample Label		Container Type	Sample Type (C, R, P, Sl, S)	Wet /Dry	Top Size	Weight (kg)
1	87-29	124-126	Plastic Bag	P	Dry	20 mesh	17.1
2	87-30	205-207	Plastic Bag	P	Dry	20 mesh	19.7
3	87-31	190-192	Plastic Bag	P	Dry	20 mesh	14.8
4	87-31	192-194	Plastic Bag	P	Dry	20 mesh	17.6
5	87-31	198-200	Plastic Bag	P	Dry	20 mesh	25.4
6	87-31	202-204	Plastic Bag	P	Dry	20 mesh	17.7
7	87-31	214-216	Plastic Bag	P	Dry	20 mesh	22.9
8	87-31	226-228	Plastic Bag	P	Dry	20 mesh	18.9
9	87-31	236-238	Plastic Bag	P	Dry	20 mesh	17.2
10	87-33	166-168	Plastic Bag	P	Dry	20 mesh	15.7
11	87-33	168-170	Plastic Bag	P	Dry	20 mesh	17.6
12	87-33	206-208	Plastic Bag	P	Dry	20 mesh	18.8
13	87-34	226-228	Plastic Bag	P	Dry	20 mesh	18.1
14	?	268-270	Plastic Bag	P	Dry	20 mesh	21.9
15							
16							
17							
18							
19							
20							
Note :							**263.4**

Core, Rock, Pulp, Slurry, Solution

SAMPLE RECEIVING LOG SHEET

Receiving Date: 20-Jan-06	**Project No:** 0600901
Carrier: Client	**Client:** Homegold Resources
Receiver: Eric	**Page:** 1 of 2

Count	Sample Label		Container Type	Sample Type (C, R, P, SI, S)	Wet /Dry	Top Size	Weight (kg)
1	87-9	119-120	Plastic Bag	P	Dry	20 mesh	5.6
2	87-9	127-129	Plastic Bag	P	Dry	20 mesh	6.7
3	87-15	114-116	Plastic Bag	P	Dry	20 mesh	17.8
4	87-17	106-108	Plastic Bag	P	Dry	20 mesh	22.1
5	87-17	122-124	Plastic Bag	P	Dry	20 mesh	17.5
6	87-22	176-178	Plastic Bag	P	Dry	1/8 inch	11.4
7	87-22	184-186	Plastic Bag	P	Dry	1/8 inch	16.9
8	87-24	245-247	Plastic Bag	P	Dry	20 mesh	17.3
9	87-25	208-210	Plastic Bag	P	Dry	20 mesh	19.1
10	87-26	298-300	Plastic Bag	P	Dry	1/8 inch	18.6
11	87-27	270-272	Plastic Bag	P	Dry	20 mesh	20.3
12	87-28	120-122	Plastic Bag	P	Dry	1/8 inch	12.0
13	87-28	126-128	Plastic Bag	P	Dry	1/8 inch	12.5
14	87-28	128-130	Plastic Bag	P	Dry	1/8 inch	11.6
15	87-28	138-140	Plastic Bag	P	Dry	1/8 inch	12.3
16	87-28	144-146	Plastic Bag	P	Dry	1/8 inch	12.6
17	87-28	148-150	Plastic Bag	P	Dry	20 mesh	13.1
18	87-28	150-152	Plastic Bag	P	Dry	20 mesh	12.7
19	87-28	152-154	Plastic Bag	P	Dry	20 mesh	11.9
20	87-28	166-167	Plastic Bag	P	Dry	1/8 inch	5.7
							277.7

Note :

Core, Rock, Pulp, Slurry, Solution

QUOTATION

Company: Homegold Resources Ltd.
Address: 5 - 2660 Tyner
Port Coquitlam, B.C.
phone: (604) 944-6102

Date: 25-Jan-06
Proposal No: P0601001

Contact Name: Jo Shearer (604) 970-6402

Objective: Phase I: Characterization and design of test program for beneficiation of clay

ITEM	Weight kg/test	Number of Tests	Cost ($ Can.) Labour / test	Analy. / test	Total	Comments
Sample Preparation	**540**					Sample receive + inspection + riffling
Sample Characterization	0.1	34	25	47.00	2448.00	Head assay each interval for Whole rock and ICP
Composite Blending	<200	3	200		600.00	Sort, mix and blend 3 main composites
Composite Characterization	0.5	3	100	235.00	1005.00	Size fraction assays: SG, Whole Rock, ICP
Tests						tba (Phase II)
design of detailed test program					n/c	based on characterization data
				Laboratory Total	4053.00	
				Supervision and reporting	1013.25	
				TOTAL ($Can)	**5066.25**	

Applicable taxes, shipping charges are not included.

Remaining sample can be stored, disposed of or shipped back to client.

Samples storage charges apply following 6 months after project completion.

APPENDIX IV

Stage II Metallurgical Report

By G. Tan, Ph.D.

AUGUST 15, 2006

Process Research Associates Ltd.
11620 Horseshoe Way, Richmond, BC V7A 4V5
Tel. (04) 272-8110, Fax: (604) 272-0851

STATUS REPORT 2

To	Joe Shearer	Company:	Homegold Resources
From	Gie Tan	Date	September 28, 2006
Project No	0600901 Send:	By e-mail	

1. OBJECTIVES

The main objective was to explore the upgrading process for a lower-grade sample to assess a viable production scheme.

2. SUMMARY OF WORK TO DATE

» The initial interval assays and process design initiatives were summarized in Status Report 1, dated June 7, 2006.

» Sample 87-31 (226-228) was selected for processing, and the entire 18.4kg remaining after head assays was ground for 1 hour in a large rod mill at 65% solids, without any additives.

» The size classification was addressed by several methods, and recommendations will be presented.

» Roasting of a product sub-sample was conducted, to explore meta-kaolin production.

Process Research Associates Ltd.
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STATUS REPORT 2

3. PRODUCT ASSAY RESULTS

Work to date suggests that the material tested is amenable to a conventional clay beneficiation process as described by R.N. Shreve, "The Chemical Process Industries", McGraw-Hill 1956, 2nd Edition, pp.175-177. Based on milling and size classification alone, significant degrees of upgrading were achieved. Table 1 compares the results of larger-scale rod-milling for 1 hour to those of 30 minute batch-milling an intermediate grade sample with and without CMC.

Table 1 – Upgrading of Sample #87-31 (226-228)

Sample ID	Mass distr.%	%Al_2O_3	%CaO	%Fe_2O_3	%MgO	%SiO_2	%TiO_2	%Loss on Ignition (LOI)
Head Ore	100	11.04	4.89	3.94	1.29	63.08	1.02	7.80
+44μm grit	7.59	11.22	1.02	5.78	0.65	70.61	0.22	4.03
-44μm clay	92.4	18.11	1.07	6.26	0.49	60.79	0.39	7.19
calcine	85.2	20.32	1.18	5.92	0.48	62.97	0.43	3.24
TG1 +44μm	28.4	11.37	3.02	4.33	1.65	65.78	0.90	3.99
TG3 +44μm	28.7	11.56	3.25	4.20	1.66	65.43	0.91	3.76

For the 2kg Test Grinds on a relatively coarse sample #87-26 298-300 (15.2% Al_2O_3), >28% grit remained after 30 minutes of grinding at 50% solids pulp density, with or without dispersant (100g/t CMC). The grit was ~10% higher in SiO_2 than the head grade (55.8% SiO_2) and the potential for upgrading by size classification was demonstrated.

In the larger scale test, after grinding for 1 hour at 65% solids without any additives, only 7.6% of residual grit remained, grading 70.6% SiO_2. The ground product settled very well to allow direct decanting of slimes with minimal Al losses and significant removal of Ca, Mg, Ti and LOI components. Some iron from the grinding media was incorporated, judging from the assay data in Table 1. Various methods for size classification were then explored as discussed in the next Section.

One scoping test on roasting of the clay without any special pretreatment to generate meta-kaolin by rapid heating to 750°C and maintaining this temperature for 1 hour, yielded a weight loss of 9.32%. Evaluation of the calcine through BET surface area measurements and XRD is still in progress.

4. PROCESS CONSIDERATIONS

Dispersion of the material deposits tested was efficiently achieved without CMC with 1-hour of grinding at 65% solids, while 30-minutes at 50% solids pulp density was inadequate. Settling and decanting of slimes would upgrade the recovered pulp by removal of softer gangue. The critical separation of grit from the clay, however, would benefit from paramagnetic removal of iron oxides and gravity separation of accessory minerals such as mica.

While the ground pulp settled quite well, further optimization might require even finer grinding with deterioration of the settling characteristics. Hence control of dilution volumes will be of significant impact on process economics. In the laboratory, size classification on 325 mesh by screening appeared to be practical, while hydro-cycloning of pulps containing >30% solids did produce recurring equipment problems for separating at a target of 200 mesh (75 μm).

In view of these observations and expecting that classification at a fine size of 20 μm might be required, the hydraulic classification method with elutriation water as discussed in the "SME Mineral Processing Handbook", N.L. Weiss (Ed.), CME-AIME 1985, Vol.1, Section 3D, should be contemplated.

At this stage, however, it should be pointed out that the plant design will likely be driven by the principal product specifications, and that a more detailed review by specialists in the field of the ceramics industry should be commissioned, to guide further testing along.

5. SUMMARY AND CONCLUSIONS

Compared to the viscous Giscome clay samples tested in 2004, the current Lang Bay samples display excellent amenability to a simple conventional classification circuit, without undue concerns over dispersion and settling characteristics, or supernatant clarity issues, related to the free-flowing nature of feed and milled products.

Fine-tuning of the upgrading potentials to attain high-end product specifications would benefit from input of experienced specialists in the ceramics processing field. Based on exploratory test results, detailed discussions of process alternatives and preliminary economic evaluations are recommended.

Furthermore, the removal of micron-size impurities including iron and anatase (TiO_2) should be attempted to upgrade the final product, and to open up wider applications. Flotation, high intensity magnetic separation or leaching may be considered for this purpose. For preliminary evaluation, however, only those references with direct relevance to the Phase 1 test work have been appended.

Process Research Associates Ltd.
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Tel. (04) 272-8110, Fax: (604) 272-0851

STATUS REPORT 2

Excerpts of References Cited:

Acrobat Document

attained 2.5 billions. Both have declined since those maxima. Ohio and Pennsylvania are the chief manufacturing states for the ceramic industries with New Jersey, West Virginia, California, and Missouri following in sequence.

BASIC RAW MATERIALS

The three main raw materials used in making the common ceramic products are (1) clay, (2) feldspar, called *spar* in the industry, (3) sand, called *flint* in the industry. Clays are more or less impure hydrated aluminum silicates that have resulted from the weathering of igneous rocks in which feldspar was a noteworthy original mineral. The reaction may be expressed,

$$\underset{\text{Potash feldspar}}{K_2O \cdot Al_2O_3 \cdot 6SiO_2} + CO_2 + 2H_2O \rightarrow K_2CO_3 + \underset{\text{Kaolinite}}{Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O} + \underset{\text{Silica}}{4SiO_2}$$

There are a number of mineral species called *clay minerals* but the most important are kaolinite, $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$; beidellite, $Al_2O_3 \cdot 3SiO_2 \cdot H_2O$; montmorillonite, $Al_2O_3 \cdot 4SiO_2 \cdot H_2O$; and halloysite, $Al_2O_3 \cdot 2SiO_2 \cdot 3H_2O$. From a ceramic viewpoint clays are plastic and moldable when sufficiently finely pulverized and wet, rigid when dry, and vitreous when fired at a suitably high temperature. Upon these properties depend the manufacturing procedures.

TABLE 2. BASIC RAW MATERIALS FOR CERAMICS

	Kaolinite	Feldspar	Quartz or flint
Formula	$Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$	$K_2O \cdot Al_2O_3 \cdot 6SiO_2$	SiO_2
Plasticity	Plastic	Nonplastic	Nonplastic
Fusibility	Refractory[a]	Easily fusible binder	Refractory[a]
Melting point	3245°F.; 1785°C.	2100°F.; 1150°C.	3110°F.; 1710°C.
Shrinkage on burning	Much shrinkage	Fuses	No shrinkage

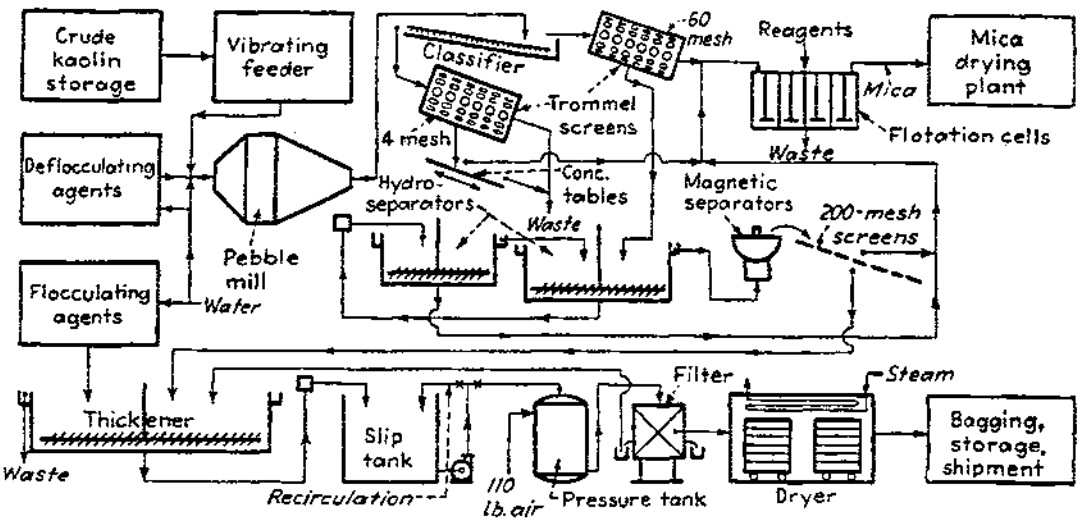
[a] Infusible at highest temperature of coal fire (1400°C.).

Accompanying the clay minerals in the clays of commerce are varying amounts of feldspar, quartz, and other impurities such as oxides of iron. In nearly all the clays used in the ceramic industry, the basic clay mineral is kaolinite, although bentonite[1] clays based on montmorillonite are used to some extent where very high plasticity is desired. This property of the plasticity[2] or workability of clays is influenced most by the physical

[1] See PERRY, *op. cit.*, pp. 1085–1091 for flotation.

[2] LEWIS, SQUIRES, and BROUGHTON, "Industrial Chemistry of Colloidal and Amorphous Materials," bentonite, pp. 241–248; plasticity, pp. 453–456, The Macmillan Company, New York, 1942.

condition of the clay and varies greatly among the different types of clay. Clays are chosen for the particular properties desired and are frequently blended to give the most favorable result. Clays vary so much in their physical properties and in the impurities present, that it is frequently necessary to upgrade them by the *beneficiation* procedure. Figure 1 shows the steps[1] necessary for such a procedure wherein sand and mica are removed. The steps in this flow sheet apply almost altogether to the physical changes or *unit operations* such as size separation by screening or selective settling, filtration, and drying. However, the colloidal properties are controlled by appropriate addition agents, such as sodium silicate and alum.



Note: Quantities cannot be given since clay recovery varies from 8 to 18 percent, depending on crude clay used. Plant shown here designed for 30 tons per day output regardless of crude clay variations

FIG. 1. China clay beneficiation. (*Courtesy of Harris Clay Company.*)

There are three common types of feldspar: potash feldspar, $K_2O \cdot Al_2O_3 \cdot 6SiO_2$; soda feldspar, $Na_2O \cdot Al_2O_3 \cdot 6SiO_2$; and lime feldspar $CaO \cdot Al_2O_3 \cdot 6SiO_2$, all of which are used in ceramic products to some extent. The first is the most common. Feldspar is of great importance as a fluxing constituent in ceramic formulas. It may exist in the clay as mined, or it may be added as needed.

The third main ceramic constituent is sand or *flint*. Its essential properties for the ceramic industries are summarized along with the similar characteristics of clay and feldspar in Table 2. For the light-colored ceramic products, sand with a low iron content should be chosen.

In addition to the three principal raw materials there is a wide variety of other minerals, salts, and oxides that are used as fluxing agents and special refractory ingredients. Some of the more *common fluxing agents* are

[1] SMITH, Deflocculation and Controlled Separation Improve Domestic China Clay, *Chem. & Met. Eng.*, **44**, 594 (1937).

Borax, $Na_2B_4O_7 \cdot 10H_2O$
Boric acid, H_3BO_3
Soda ash, Na_2CO_3
Sodium nitrate, $NaNO_3$
Pearl ash, K_2CO_3
Fluorspar, CaF_2
Cryolite, Na_3AlF_6
Iron oxides
Antimony oxides
Lead oxides

Some of the more common *special refractory ingredients* are

Alumina, Al_2O_3
Olivine, $(FeO, MgO)_2SiO_2$
Chromite, $FeO \cdot Cr_2O_3$
Aluminum silicates, $Al_2O_3 \cdot SiO_2$ (cyanite, sillimanite, andalusite)
Dumortierite, $8Al_2O_3 \cdot B_2O_3 \cdot 6SiO_2 \cdot H_2O$
Magnesite, $MgCO_3$
Lime, CaO, and limestone, $CaCO_3$
Zirconia, ZrO_2
Titania, TiO_2
Hydrous magnesium silicates, *e.g.*, talc, $3MgO \cdot 4SiO_2 \cdot H_2O$
Carborundum, SiC
Mullite, $3Al_2O_3 \cdot 2SiO_2$

UNIT PROCESSES INCLUDING FUNDAMENTAL CERAMIC CHEMISTRY

All ceramic products are made by combining various amounts of the foregoing raw materials, shaping, and heating to firing temperatures. These temperatures may be as low as 700°C. for some overglazes or as high as 1300 to 1400°C. for many vitrifications. Such temperatures cause a number of reactions which are the chemical bases for the *unit processes* of

1. Dehydration or "chemical water smoking" at 150 to 650°C.
2. Calcination, *e.g.*, of $CaCO_3$ at 600 to 900°C.
3. Oxidation of ferrous iron and organic matter at 350 to 900°C.
4. Silicate formation at 900°C and higher.

Some of the initial chemical changes are relatively simple, like the calcination of $CaCO_3$ and the dehydrations and decompositions of kaolinite. Other reactions, such as silicate formations, are quite complex and change with the temperature and constituent ratios as depicted by Figs. 2 and 4.

The phase-rule[1] studies as exemplified by Fig. 2 and also by Fig. 4 have been of *revolutionary importance* in interpreting the empirical observations in the ceramic industries and in making predictions for improvements. For instance, the data of Fig. 2 on the Al_2O_3-SiO_2 system have led to the important development of processes for mullite refractories (see page 192). This diagram shows that any percentage of liquefaction

[1] BIRCH, Phase-equilibrium Data in the Manufacture of Refractories, *J. Am. Ceram. Soc.*, **24**, 271 (1941); HALL and INSLEY, A Compilation of Phase Rule Diagrams of Interest to the Ceramist and Silicate Technologist, *J. Am. Ceram. Soc.*, **16**, 455 (1933).

Section 3D

Classification

CONTENTS

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1. CLASSIFICATION THEORY

B. FITCH and E. J. ROBERTS

Definitions and Terminology

Classification is defined within this section as the separation of solid particles into size or weight fractions or classes by differential settling through a fluid. It is usually thought of as a size separation, but is actually made on the basis of particle settling rate, and so is affected by any variations in particle density and shape. The fluid may be liquid (wet classification) or gas (dry or air classification). This section will treat only wet classification.

There are two basic types of classification; **pool** and **hydraulic**. In pool classification a suspension of feed particles is fed into and out of a pool of some kind at such a rate that only part of them—the coarser and faster-settling part—has time to settle out. The remainder overflows as fines. In **hydraulic** classification the feed suspension is introduced into or above one or more columns or pockets through which water is rising at a controlled velocity. Coarse particles subside through the pockets and are removed through spigots. Those which settle slower than the rising velocity in any column or pocket are (at least ideally) prevented from subsiding and so must overflow. Hydraulic classifiers or **sizers** are capable of making far sharper separations than pool classifiers.

The force causing settling may be gravity, or alternatively may be from centrifugal acceleration as developed in a centrifuge or hydrocyclone.

Two things are needed to characterize the separation produced by classification: first, the size, D_s, or equivalently the screen mesh at which it is made; second the sharpness of separation.

Separation size may be defined in various ways. In closed-circuit grinding it is commonly specified by some point in the overflow screen analysis: For example, 5% on 65 mesh. In other applications, notably with hydrocyclones, it is often taken as that of the particle size class which splits half to the overflow and half to the underflow.

For theoretical analyses it is convenient to define separation size as that of particles which settle just fast enough **on the average**, to be totally collected in the underflow. There will always be some variation in settling rates of particles nominally of the same size and specific gravity, because of differences in shape and because of mixing or turbulence in the classifier. As a result, the overflow analyses will show a small amount of particles coarser than the theoretical mesh of separation, which is allowed for in calculations. This definition, like many others, is meaningful only for particles of uniform **density**. If the feed contains two or more minerals of different densities each will have its own separation size and the higher density mineral will have the smaller separation size.

Sharpness of separation can be fully characterized only by showing how particles of each size present split between overflow and underflow. In hydraulic classification it is frequently given by specifying percent elimination of first, second, and third criticals. A **critical** is a band of particle sizes one screen mesh in width (its upper size is $\sqrt{2}$ times as large as its lower size). The first critical is the band whose upper boundary is the separation size, the second critical is the one below the first, and so on. **Elimination,** (E), in this case, means the fraction eliminated from the underflow (reporting to the overflow). In pool classification separation sharpness is commonly judged indirectly by **settling factors** for each critical.

Nomenclature

- a Void fraction in suspension at separation level
- a_f Void fraction in feed
- B Velocity parameter in dimensionless correlation for u_o
- c_j Volume fraction of j-class particles
- c_{jf} Volume fraction of j-class particles in feed
- d Fluid density
- d_s Solids density
- D_p Particle diameter
- D_s Diameter of separation size particle
- E Fraction of size band eliminated to overflow, empirical
- E_j Fraction of size class eliminated to overflow, theoretical
- F Roberts empirical settling factor for size band
- F_j u_j/u_s
- g Acceleration of gravity
- h Depth of overflow fraction removed in batch test
- H Hindrance factor
- I Shape factor
- J Areal efficiency factor
- K Settling rate change factor
- m Fluid viscosity
- M Fraction of feed solids finer than D_s
- P_f Percent solids in feed
- Q_f Volume of water per unit time in feed
- Q_o Volume of water per unit time in overflow
- Q_u Volume of water per unit time in underflow
- S_f Weight of solids within size band in feed
- S_u Weight of solids within size band in underflow
- t Time
- T Volume of teeter water per unit time
- u_j Settling rate of j-class particle
- u_o Settling rate of spheres of diameter D_s at infinite dilution
- u_s Settling rate of separation sized particles in suspension
- V_o Volume dilution of solids in overflow
- V_f Volume dilution of solids in feed
- W Total grams of solids reporting to gross overflow
- X Reduced Reynolds No., dimensionless
- Y Reduced velocity, dimensionless

Theory of Classification

In **ideal classification** pulp is fed to a pool of area A. The feed pulp will contain Q_f volumes of water per unit time. Underflow is taken with Q_u volumes of water per unit time, and overflow with Q_o units. In the case of hydraulic classification, elutriation water added at rate T. In ideal classification theory the fraction E_j of ar size class of particles having a slip velocity u_j which reports to tl overflow (is eliminated from the underflow) will be:

$$\text{Fraction eliminated} = E_j = \left(\frac{Q_o}{Q_f}\right)(K)(1 - F_j). \qquad (1$$

Slip velocity is settling velocity of particles with respect to water **Settling factor** F_j is the ratio u_j/u_s, where u_s is the slip velocity o separation size particles. The ratio F_j turns out to be relatively insensi- tive to solids concentration, even though u_s and u_j individually are not. K is a factor which accounts for changes in settling rate of the size class during sedimentation as a result of changes in total solids concentration as coarser sizes progressively settle out. Its relevance will become apparent in the following derivation, and its evaluation is treated by Fitch.[1] In classification practice it has usually been assumed equal to unity and hence ignored.

Eq. 1 is derived as follows: An initially well-mixed aqueous or liquid suspension containing particles of various sizes and settling rates is allowed to settle (with or without injection of teeter water). The top-most particles of any size class will be settling in a neighborhood devoid of faster-settling sizes, but still containing concentrations of all slower-settling ones. After some time of sedimentation, all suspension above the top-most particles of some separation size having a slip velocity u_s will be separated as overflow. The fraction of the particles of any given slower-settling size class j that will be contained in the overflow split is derived as follows:

Volume occupied by size class j particles in feed per unit time

$$= \frac{Q_f c_{jf}}{a_f} \qquad (2)$$

where a is void fraction at level of topmost separation-size (s-class) particles, a_f is void fraction in feed, c_j is volume fraction of size class j at level of top-most separation-size particles, and c_{jf} is volume fraction of size class j in feed.

Volume of j-class particles passed by topmost s-class particles

$$= c_j(u_s - u_j)A. \qquad (3)$$

Fraction of j-class particles passed by top-most s-class particles and hence eliminated into overflow is Eq. 3 divided by Eq. 2

$$E_j = \frac{c_j(u_s - u_j)A}{Q_f c_{jf}/a_f}. \qquad (4)$$

Volume of water passed by topmost s-class particles

$$Q_o = u_s a A. \qquad (5)$$

Eliminating A between Eqs. 4 and 5

$$E_j = \left(\frac{Q_o}{Q_f}\right)\left(\frac{c_j/a}{c_{jf}/a_f}\right)\left(\frac{u_s - u_j}{u_s}\right).$$

Let $K = (c_j/a)/(c_{jf}/a_f)$

$$E_j = \left(\frac{Q_o}{Q_f}\right)(K)(1 - F_j). \qquad (1)$$

In gravity pool classification the ratio Q_o/Q_f is always less than unity and settling factors F_j are always greater than zero. And as shown by Fitch,[1] concentration change factors K will always be greater than unity. It therefore follows from Eq. 1 that there will be no particle size class totally eliminated from the underflow in pool classification. In hydraulic classification, on the other hand, the ratio Q_o/Q_f may exceed unity because of the elutriation water added. If it does, there will be some value of F_j for which elimination F_j theoretically equals unity, and hence some cutoff size below which all particles are (ideally) eliminated from the underflow. However, unless Q_o/Q_f is infinite, the cutoff size (below which $E_j = 1$) will be lower than separation size (above which $E_j = 0$), and separation will not be perfect, even under the ideal conditions assumed.

Practical Classification

Under most practical conditions, properly designed gravity pool classifiers of all types make a separation whose sharpness deviates little from ideal. Unless the percent solids by weight in the feed is very low, density stratification in the pool inhibits short-circuiting. Turbulence acts to decrease u_f and u_u, but not to change their ratio F_i significantly. It does throw a little more stray oversize into the overflow.

The performance of gravity pool classifiers has long been predicted with considerable accuracy, essentially on the basis of the model given by Eq. 1, but without the concentration build-up factor K. That is:

$$E = \frac{Q_o}{Q_f}(1 - F) \qquad (6)$$

where E (without subscript) denotes fraction of a size band one screen mesh wide eliminated into the overflow, and F (without subscript) denotes the settling factor determined empirically by Roberts[2] for the size band. Empirical factors are used for the effect of turbulence on settling rates and on strays. The same can be done for centrifuge-type classifiers, although with perhaps less precision. Performance of cyclone classifiers is more complicated because Roberts' factors, F, vary with cyclone design.

Fluidized bed or **hindered settling** classification apparently does not, in practice, conform to the assumptions of the ideal theory presented previously. Mathematical models have been proposed[3] but have not been proved. In practice, empirical relationships showing elimination E for each critical band as a function of the ratio of teeter water to underflow solids have been used for design purposes. The ideal theory presented is to be taken as only qualitative or illustrative for hydraulic classification.

Calculation of Separation Sharpness

Material balances and product screen analyses for **pool classifiers** are calculated by the following procedure:[2] Desired separation size D_s is specified. The feed solids screen analysis is given, and is divided into a series of size bands or partials, usually one $\sqrt{2}$ screen size wide. In principle, Eq. 6 is then applied to each partial in turn, with appropriate values for F, to determine its split between underflow and overflow.

Since Q_o is not known initially, Eq. 6 cannot be applied directly, and a procedure must be supplied to determine Q_o/Q_f. Also the traditional procedure is based on certain substitutions in Eq. 6 as follows: If S_f is the weight of solids within any size band in the feed, S_u is the weight in the underflow, then by definition $E = (S_f - S_u)/S_f$. Also, if $T = 0$, then by water balance $Q_o = Q_f - Q_u$. Substituting these values in Eq. 6

$$E = \frac{S_f - S_u}{S_f} = \left(\frac{Q_f - Q_u}{Q_f}\right)(1 - E)$$

$$S_u = FS_f + \frac{Q_u}{Q_f}(S_f - FS_f). \qquad (7)$$

Eq. 7 may be interpreted physically as follows: The first term to the right, namely FS_f, gives the weight of solids in a band which would settle if the underflow were dry solids. Under this condition $(S_f - FS_f)$, the second factor in the second term to the right, would be the weight solids in the band which reported to the **gross overflow**, along with all the feed water. Then Q_u/Q_f is the fraction of the gross overflow which would have to be added back to the settled solids as **void filling** to give the expected underflow moisture. And the entire second term equals the weight of solids in the size band which are added to the underflow in the void filling. (Note that Eq. 7 is restricted to pool classification.)

Appropriate settling factors for calculating gravity pool classification, and also representative ones for hydrocyclones, are given in Table 1. The first column gives the ratio D_p/D_s at the lower bound of each size band or **critical**, where D_p is diameter of particles at the particle diameter corresponding to the lower bound. The following seven columns are headed by the Tyler mesh and also the corresponding micron size of separation, D_s. Entries show corresponding values for settling factors, F. Entries in the last two columns give typical values for hydrocyclones. Settling factors for all bands coarser than those shown equal 1.0.

Detailed Example of Calculation Procedure. Problem: A slurry of solids is to be classified at a diameter of separation, D_s, of 347 μm (about 42 mesh Tyler) in a rake classifier. Specific gravity of the solids is 2.65 and they are suspended in water at 52.0% solids. Screen analysis of the feed is as follows:

Mesh (Tyler)	Cumulative % plus
28	13.7
35	24.0
48	42.3
65	56.5
100	67.2
150	73.3
200	77.9

It is desired to calculate the screen analyses of the products.

Procedure: 100 g of feed solids are used as a basis.

1) Plot feed screen analysis—particle diameter (screen openings) in microns vs. cumulative percent plus the diameter, shown as feed in Fig. 1. This permits choosing the proper size range bands for the calculations. A standard log-probability plot as shown in Fig. 1 displays screen analysis data conveniently.

2) Using layout or form similar to that shown in Table 2, fill its column 1 with values for ratio D_p/D_s copied from column 1 of Table 2 (identical to column 1 of Table 1).

3) Write the separation size D_s (347 μm in the example) on the first line of column 2. On the following lines of column 2 write the product of D_s times the ratio on the same line in column 1. Column 2 now lists the lower size boundaries D_p of the size bands to be used in calculations. (Particles finer than the separation size are thus

Table 1. Settling Factors F

Relative lower bound of size band, D_p/D_s	For gravity classifier							Cyclones	
	Separation size D_s							Cyclone diam	
	Tyler mesh 28, μm 589	35, 417	48, 295	65, 208	100, 147	150, 104	200, 74	10 mm	1–3 ft
1.00	*	*	*	*	*	*	*	0.967	0.972
0.707	0.780	0.780	0.780	0.780	0.780	0.750	0.722	0.910	0.852
0.50	0.465	0.465	0.465	0.465	0.450	0.380	0.361	0.800	0.575
0.35	0.275	0.275	0.275	0.268	0.266	0.190	0.181	0.635	0.254
0.25	0.165	0.165	0.158	0.134	0.113	0.095	0.091	0.440	0.063
0.18	0.098	0.094	0.079	0.067	0.056	0.048	0.046	0.258	0.008
0.13	0.056	0.047	0.040	0.033	0.028	0.024	0.023	0.126	0.000

* See text for empirical corrections.

Jo Shearer

From: "Gie Tan" <gtan@pralab.com>
To: "Jo Shearer" <homegold@telus.net>
Sent: Friday, May 19, 2006 3:12 PM
Attach: 06E1088 TG1, TG3.xls
Subject: Status

Hi Jo:

Two grinding tests were conducted, one with and the other without a deflocculating agent (CMC). The results were very similar, and some selectivity in removal of Si in the coarse fraction is observed.

Since dispersing the feed is not as problematic as was the case with Giscome clays, the need for lime to alter the settling is not required, and a hydrocyclone may work for sand separation from the clays. Please let us know if a 20kg feed sample (randomly selected) will be adequate for proof of concept purposes.

Best Regards

Gie

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ISO 9001:2000 CERTIFICATION Intertek

Certificate#: 06E1088
Client: Process Research Associates Ltd
Project: 0600901
Shipment#:
PO#: 6406
No. of Samples: 2
Analysis #1: Whole Rock analysis
Analysis #2:
Analysis #3:
Comment #1:
Comment #2:
Date In: May 10, 2006
Date Out: May 15, 2006

Sample Name	SampleType	Al2O3 %	BaO %	CaO %	Fe2O3 %
TG1 Oversize	Pulp	11.24	0.86	3.01	4.31
TG3 Oversize	Pulp	11.56	0.88	3.25	4.20
RE TG1 Oversize	Repeat	11.50	0.88	3.02	4.34
Minimum detection		0.01	0.01	0.01	0.01
Maximum detection		100	100	100	100
Method		WRock	WRock	WRock	WRock

** Values highlighted (in yellow) are over the high detection limit for the corresponding methods. Other testing n*

K2O	MgO	MnO	Na2O	P2O5	SiO2	TiO2	LOI
%	%	%	%	%	%	%	%
3.06	1.63	0.49	3.18	<0.01	66.66	0.89	4.04
2.99	1.66	0.50	3.24	0.04	65.43	0.91	3.76
3.02	1.67	0.50	3.25	<0.01	65.89	0.91	3.94
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
100	100	100	100	100	100	100	100
WRock	WRock	WRock	WRock	WRock	WRock	WRock	2000 F

ıethods would be suggested. Please call for details.

Total
%
99.38
98.41
98.92
0.01
105
WRock

Process Research Associates Ltd.

Metallurgical and Environmental Testing for the Mining Industry

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March 27, 2006 P0601001A

PROPOSAL
Clay Process Development Exploration
Homegold Resources

OBJECTIVE

Deposit has been sampled, and refinement of a practical beneficiation route is sought.

RATIONALE

Previous work in 2004, indicated that the size fractionation by timed decanting can be further improved by alternative feed dispersion and classification methods.

Further work should focus first on practical feed preparation methods for larger scale processing. Development of a milling route will be explored, with contingencies for more direct process control by classification and product analysis.

PROGRAM OUTLINE

The prudent approach would be to composite client-selected sample lots, and to specify a product top size and grade specification. Dispersion and classification will be tested on a bench scale, prior to piloting on a larger scale, once all the processing criteria have been fixed.

The scoping tests will provide fundamental operating data for further design and testing purposes, including larger scale piloting.

COST ESTIMATE

The characterization phase for the deposit was budgeted at $5,066, and the exploratory Phase II testing will cost an additional $4,350 to bring the Phase I+II total to $9,416 (see attached), excluding GST, shipping and 3rd party disbursements.