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Ministry of Energy, Mines & Petroleum Resources
Mining & Minerals Division
BC Geological Survey

Assessment Report
Title Page and Summary

TYPE OF REPORT [type of survey(s)]:

TOTAL COST: 22,045

AUTHOR(S): J. T. Shearer, M.Sc., P.Geo.

SIGNATURE(S): J Shearer

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S):

YEAR OF WORK: 2014

STATEMENT OF WORK - CASH PAYMENTS EVENT NUMBER(S)/DATE(S): 5531421 + 5530156

PROPERTY NAME: Nimpkish Iron

CLAIM NAME(S) (on which the work was done):

COMMODITIES SOUGHT: Iron

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN: 092L.034

MINING DIVISION: Nanaimo

NTS/BCGS: 92L/07W (92L.026)

LATITUDE: 50 ° 15 ' 29 " LONGITUDE: 126 ° 51 ' 36 " (at centre of work)

OWNER(S):
1) J. T. Shearer
2)

MAILING ADDRESS:
Unit 5 - 2330 Tyner Street
Port Coquitlam, BC V3C 2Z1

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):
Triassic Karmutsen Volcanics (basalt) in contact with Quatsino Formation Limestone intruded by Diorite of the Adams Pluton forming skarn zones rich in Magnetite. Skarn mostly red garnet and green epidote and amphibole

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:
Assessment Reports: 6769, 5394, 4895, 8644, 23,551,29,408, 1821,

Next Page

TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area)			
Ground, mapping			
Photo interpretation			
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic			
Other			
Airborne			
GEOCHEMICAL (number of samples analysed for...)			
Soil			
Silt			
Rock			
Other	Metallurgical Samples		10,000
DRILLING (total metres; number of holes, size)			
Core			
Non-core			
RELATED TECHNICAL			
Sampling/assaying			
Petrographic			
Mineralographic			
Metallurgic			12,045 100
PROSPECTING (scale, area)			
PREPARATORY / PHYSICAL			
Line/grid (kilometres)			
Topographic/Photogrammetric (scale, area)			
Legal surveys (scale, area)			
Road, local access (kilometres)/trail			
Trench (metres)			
Underground dev. (metres)			
Other			
		TOTAL COST:	22,045

METALLURGICAL ASSESSMENT REPORT
ON THE
NIMPKISH IRON PROJECT

TENURE # 689846 + 689864 + 837441

NIMPKISH RIVER AREA, WOSS B.C.

NTS 92L/07W (92L.026)+

Latitude 50°15’29”N, Longitude 126°51’36”W

Nanaimo Mining Division

Event #5530156 AND 5531421

for

Guohua Furen Mining Inc.
#204-4155 Central Boulevard,
Burnaby, B.C.
V5H 4X2

By

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V3C 2Z1
Phone: 604-970-6402
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November 21, 2014

Fieldwork completed between December 2, 2013 and November 10, 2014

BC Geological Survey
Assessment Report
35179

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FIGURE 1 Location Map

3.0 SUMMARY

An exploration program was carried out from March 25, 2014 to November 10, 2014 on a claim group which includes the Nimpkish Iron Mine and former processing area (tailings and waste dumps) located in north central Vancouver Island. The Nimpkish Iron Mine is underlain by Triassic Karmutsen and Quatsino Limestone in contact with the Nimpkish Batholith. The contact zones contain semi-massive magnetite over considerable widths.

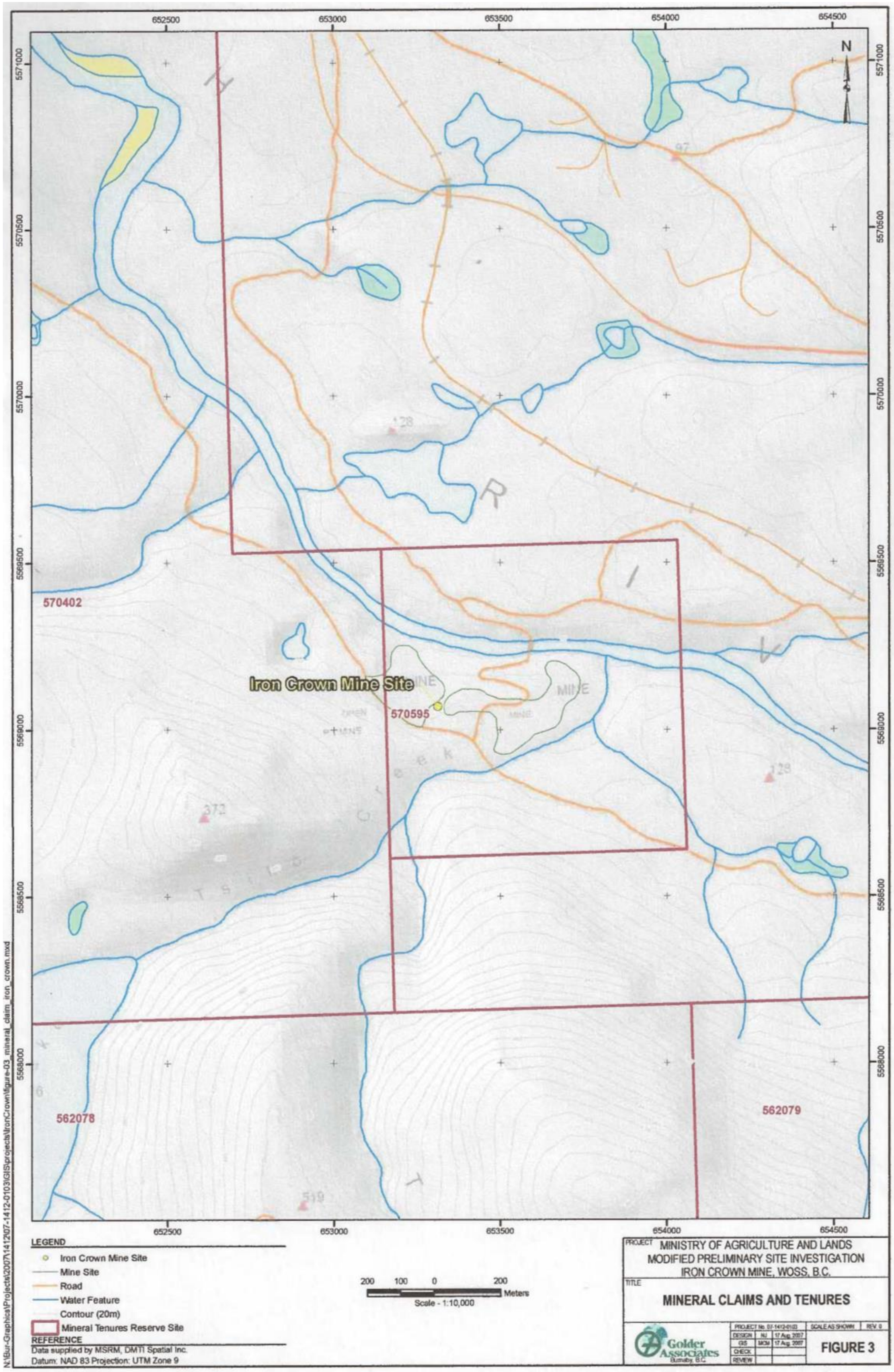
The Nimpkish Iron property lies within a belt of iron-rich skarn deposits located on the east and south sides of Nimpkish Lake on northern Vancouver Island. The area is east of Zeballos, and south of Port McNeill. The property contains multiple occurrences of high grade iron mineralization with possible associated gold mineralization within garnet and magnetite skarn lenses.

Locally, the andesite has been altered to garnet-epidote skarn which hosts lenses of massive magnetite or pyrrhotite. The current logging road system provides access to the central portion of the claims, on both sides of the Nimpkish River.

A series of samples were collected from the final Canyon Lake tailings area in 2014, shipped to China and a series of metallurgical tests completed. Test results suggest (1) gravity does not appear to be an effective recovery method and probably not worth pursuing; (2) based on the information provided in the report, flotation tests should be the preferred approach for the Nimpkish tailings – optimization tests can be done to improve the recovery and upgrade the concentrate to be saleable (>20% Cu); and (3) an ICP scan on the material as well as a mineralogy report would be helpful.

Respectfully submitted

J. T. Shearer, M.Sc., P.Geo. (BC & Ontario)
November 21, 2014



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Mine Site
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Mineral Tenures Reserve Site
REFERENCE
Data supplied by MSRM, DMTI Spatial Inc.
Datum: NAD 83 Projection: UTM Zone 9
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Meters
Scale - 1:10,000
PROJECT MINISTRY OF AGRICULTURE AND LANDS
MODIFIED PRELIMINARY SITE INVESTIGATION
IRON CROWN MINE, WOSS, B.C.
TITLE
MINERAL CLAIMS AND TENURES
Golder Associates
Burnaby, B.C.
FIGURE 3

FIGURE 2 General Area Google Image

4.0 INTRODUCTION AND TERMS OF REFERENCE

This report and the completed work program in 2014 described within was prepared to summarize historic data, document the 2014 work by the company and recommend an exploration program for future work in 2015 to further evaluate the property.

J. T. Shearer, M.Sc., P.Geo., who was retained by Chang Fu Dong, President of Guohua Furen Mining Inc. to compile this Technical Report, visited the property various times, the latest being March 25 and July 3, 2014, and make recommendations for an appropriate exploration program to be conducted in 2015.

4.1 Preamble

Guohua Furen Mining Inc. has acquired by staking, and purchase 123.8 hectares of mineral claims grouped into the Nimpkish Iron Project. Refer to Figure 2 for descriptions of the claim group.

4.1.1 Background

The Nimpkish Iron Project is known from historical background and exploration of the last 100 years to contain high assays of iron.

4.2 This Study

4.2.1 Terms of Reference

Guohua Furen Mining Inc. retained J. T. Shearer, M.Sc., P.Geo. to review the project, draw conclusions, make recommendations and propose an appropriate exploration program to evaluate the property in 2015.

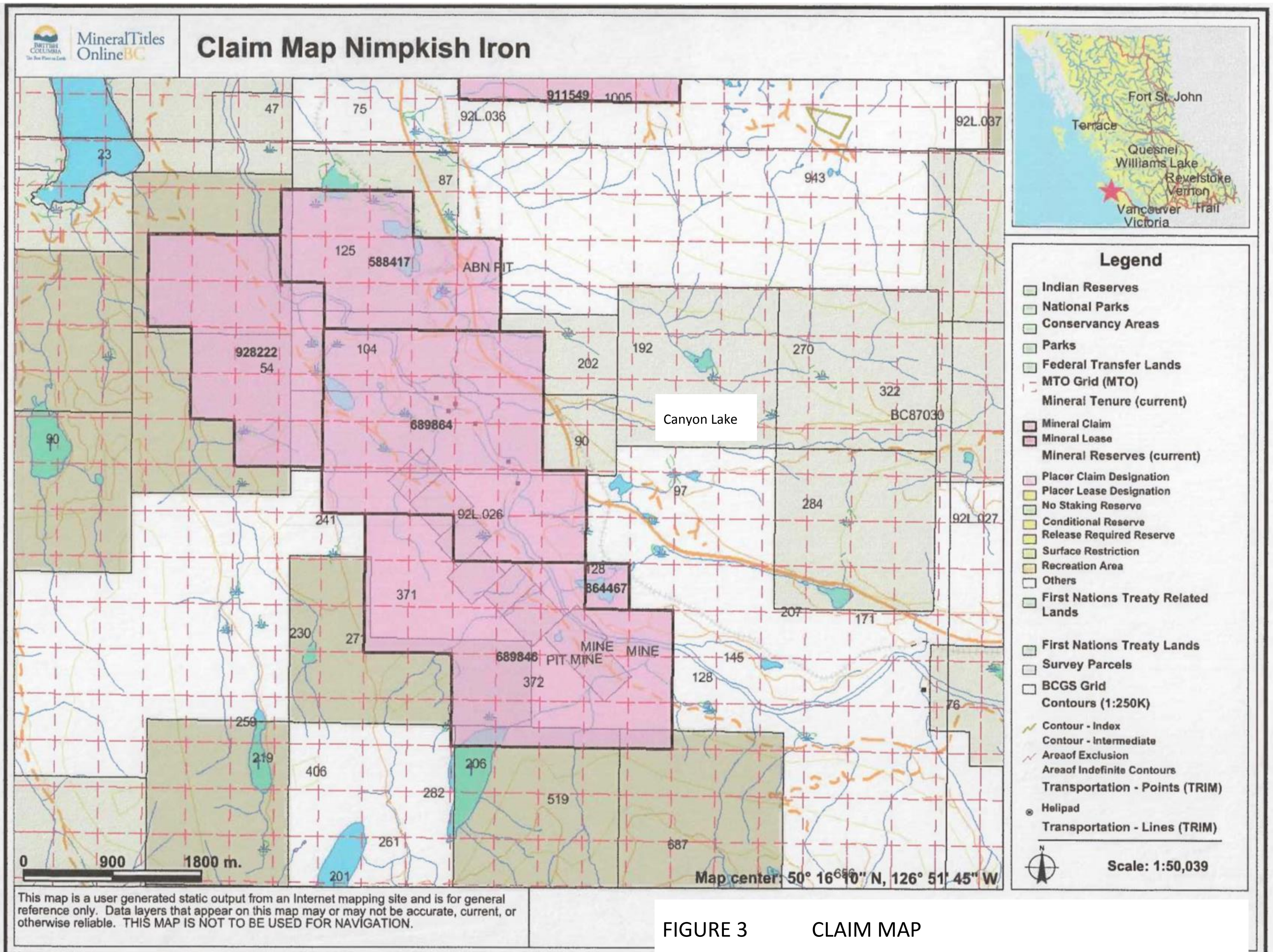


FIGURE 3 CLAIM MAP

5.0 PROPERTY DESCRIPTION and LOCATION

The claims lie in northern Vancouver Island, about 10 km north of the village of Woss. Access is by logging road which leaves the Island at the Zeballos turn-off (Steele Creek) then across the Nimpkish River southerly. Branch logging roads lead south to the centre of the claims along the Nimpkish River.

The area is about 125km northwest of Campbell River and 80km south-southwest of Port Hardy in NTS mapsheet 92L/07W (92L.026).

5.1 OWNERSHIP and CLAIM STATUS

The property (Figure 3) consists of the four claims totalling 1,032.87 ha and are listed below:

Table 1
Nimpkish River Claims

Claim Name	Tenure No.	Area (ha)	Located Date	Current Expiry Date*	Registered Owner
Klac 1	689846	495.87	December 26, 2009	December 1 2017	Guohua Furen Inc.
Nimp 1	689864	495.69	December 26, 2009	December 1 2017	Guohua Furen Inc.
Canyon Lake	864467	20.66	July 5, 2011	December 1 2017	Guohua Furen Inc.
Klac 3	928222	20.65	November 4, 2011	December 1 2017	Guohua Furen Inc.

Total ha: 1,321.98

* by applying assessment work documented by 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.

Cash may be paid in lieu if no work is performed. Following revisions to the Mineral Tenures Act on July 1, 2012, claims bear the burden of $5 per hectare for the initial two years, $10 per hectare for year three and four, $15 per hectare for year five and six and $20 per hectare each year thereafter.

6.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

6.1 Access

The claims lie in northern Vancouver Island, about 10 km north of the village of Woss. Access is by logging road which leaves the Island north of the Zeballos turn-off then across the Nimpkish River bridge and southerly to the west side of Nimpkish River. Branch logging roads lead south to the centre of the claims.

The area is about 125km northwest of Campbell River and 80km south-southwest of Port Hardy in NTS mapsheet 92L/07W (92L.026).

6.2 Climate

The climate on the north island is relatively mild. The summers are warm and generally dry, while the winters are cool and wet. Snow will accumulate on the higher peaks, but generally the valley bottoms and lower hills are clear for year round work.

6.3 Physiography

The topography is rugged and steep, with elevations on the property ranging from 120 metres in the valley bottom to 1020 metres. The claims are generally covered with dense stands of spruce, fir, balsam and cedar. The underbrush is dense and thick. Several areas of the claim have recently been logged with second generation growth at various stages of development. Secondary logging roads in various degrees of deactivation provide access to most of the property.

6.4 Infrastructure and Local Resources

The logistics of working in this part of the province are excellent. Gravel road access will allow the movement of supplies and equipment by road. Heavy equipment is available locally in Port Hardy, Port McNeill or Campbell River, as are supplies, fuel and lodging. Limited fuel, supplies and lodging are also available locally in Woss.

7.0 PROPERTY HISTORY

The mineral showings, now covered by Nimpkish Iron Project are referred to in the MINFILE as No. 092L.034. Several periods of work are mentioned.

The claims lie within a belt of iron rich skarn deposits located on the east and south sides of Nimpkish Lake on northern Vancouver Island. The area is east of Zeballos, and south of Port McNeill. The property contains multiple occurrences of high-grade iron mineralization with associated gold/silver/zinc mineralization within garnet and magnetite skarn lenses.

1955: The Iron Crown (Lot 126) and Rhoda (Lot 919) Crown-granted mineral claims have been optioned by Nimpkish Iron Mines Ltd. A. H. Upton, president; J. M. Black, consulting geologist. The claims are on the Nimpkish River about 5 miles from the south end of Nimpkish Lake. In 1954 seven holes were diamond drilled, totalling 1,350 feet. In 1955 exploration of the iron deposit was continued by surface work and diamond drilling on both lots. Six inclined and sixty-two vertical holes were drilled, totalling 7,050 feet.

1959: The operation is reported is reported in 1959 as follows (ARMM 1959 page 133):

This company is jointly owned by Standard International Mines, a Canadian subsidiary of Standard Slag Co. of Youngstown, Ohio, and International Iron Mines, a Canadian company. The property comprises two Crown-granted and eight recorded claims on the southwest side of Nimpkish River north of Teisum Creek. Access to the property is by 6 miles of road south from the south end of Nimpkish Lake or by 26 miles of logging railway south from Beaver Cove on the east coast of Vancouver Island.

The magnetite occurs in an area about 600 feet square on the west side of the Nimpkish River, as three massive concentrations in tuffaceous and other volcanic rocks along an irregular north-south contact between limestone and basaltic laws. The limestone and volcanic rocks are intruded by granodiorite. The most southerly and northerly of the three orebodies are small; the central body is a larger U-shaped mass with granodiorite in the core. This is the principal source of ore. The bodies have been found to range from 150 to 200 feet in depth, with walls that dip inward at about 70 degrees to form steep troughs. According to the mine superintendent, magnetite has been found to occur in limestone only in limited amounts. Skarn wallrock is common and in places forms a breccia healed with magnetite. Limestone in contact with magnetite has been altered to marble. The magnetite is very noticeably porous, a fact which suggests that the deposit may have been formed at medium to low pressures. The magnetite is veined by stingers and irregular masses, suggestive of vug fillings, of pyrite, chalcopyrite and pyrrhotite.

The company estimates ore reserves in the order of 1,500,000 tons. (note: now largely mined out)

Mining is by conventional open-pit methods, maintaining an 18 foot bench. Drilling is done with two hydraulically controlled Gardner-Denver air-track drills. The explosive used in dry holes is a mixture of ammonium nitrate and diesel oil, whereas 40 per cent Forcite is used in wet holes. Two Northwest shovels of 1.5 and 2 cubic yard capacities are used to load the broken material onto five 15 ton Euclid rear-dump trucks.

The ore is trucked to a dry magnetic separation plant on the southwest side of Nimpkish River and is delivered to a 42 by 30 inch Kue-Ken primary crusher. The product, minus 5 inches in size, is stockpiled by radial stacker over an 8 foot 6 inch diameter Rosco reclaiming tunnel. The stockpiled material is conveyed to a double-deck screen, the plus ½ inch products being crushed to minus 0.5 inch size in a gyratory crusher. The crusher discharge feeds directly to two Stearns W.D. (dry) magnetic separators. The non-magnetic portion is rejected to the waste stockpile and the magnetic portion is united with the initial undersized screen product. The concentrate is conveyed across the Nimpkish River to a dry storage shed over another 8-foot 6-inch Rosco reclaiming tunnel. The storage discharge is fed by conveyor to an 8 by 12 foot Marcy rod mill for grinding to minus 20 mesh. The rod mill discharge is fed to two 60 inch Stearns W.E.D. (wet) double-drum magnetic separators. The magnetite concentrate is then dewatered on a horizontal Dorr-Oliver-Long filter and conveyed to the stockpile or to railway cars. The concentrate is conveyed by the Canadian Forest Products railway to a newly constructed loading dock at Beaver Cove for shipment to Japan.

During 1959 the milling plant and dock-loading facilities were constructed and milling commenced in mid-November; 50,000 cubic yards of waste material was removed, 12,800 tons of ore was mined, and 8,123 tons of concentrate produced. The average number of men employed was forty-five.

1960:   Mining and ore-treatment operations are descripted in the annual Report for 1959, page 134. Statistics for 1960: Ore mined, 480,000 tons; waste stripped, 163,265 solid cubic yards; concentrate shipped, 283,000 tons. The average number of men employed was fifty-five.

Magnetite was discovered in the area in 1897, and the deposits were reported on by E. Lindeman in 1910, who drew a magnetic map which fairly accurately indicates the orebodies now being mined on the Iron Crown claim (Lot 126).

The Iron Crown claim lies about 5 miles south of the southern end of Nimpkish Lake on the southwest bank of the Nimpkish River, and south of the junction of the river and Mukwilla Creek. On the opposite side of the Nimpkish River a creek flows from a small lake into the river.

The regional geology has been described by Gunning (1930-1933) and Hoadley (1953). In the vicinity of Nimpkish Iron Mines, basic volcanic rocks underlie crystalline limestone and the contact between them trends northwest through the Iron Crown claim. The volcanic rocks have been intruded by rocks ranging in composition from monzonite to gabbro. The magnetite deposits lie within an embayment of the intrusive rock with tongues extending across the river to the north and south of the workings.

The valley of the Nimpkish River is less than 500 feet above sea level, and is extensively covered with drift material, so that natural outcrops are very scarce, apart from those occurring along the river banks. Before the present operations began, magnetite was observed on the southwest river bank over a length of 180 feet, forming cliffs 25 to 30 feet high. Smaller outcrops of magnetite were mapped at distances of 100 feet and 600 feet southwest from the river bank.

Diamond drilling and subsequent excavation have proved the presence of four orebodies, which have been named the East, South, Road and River. The developments have proved that the South and Road orebodies are connected by a neck of magnetite, and this entity constitutes the major source of ore. The East orebody is small. The River orebody is an extension of the river-bank exposure. The three large orebodies (Fiver, Road and South) are shaped like elongated basins with their long axes lying roughly parallel to the surface trace of the limestone-volcanic rock contact. Ore depths are as great as 200 feet, and the walls dip inward at angles of the order of 70 degrees.

The headwall of the main pit exposes massive crystalline limestone with no definite indication of bedding. Fracturing is noticeable in limestone adjacent to magnetite, and there is also much fractured, polished and slickensided intrusive greenstone, some of which is basaltic.

The major part of the ore is enclosed within and intimately associated with greenstones, some of which are dykes and sills and some are rocks of the regional volcanic assemblage. Feldspar porphyry is abundant, with phenocrysts constituting from 5 to 20 per cent of the rock. In places there are a few amygdules, most of which contain calcite, but some are filled with epidote. A specimen taken from the river bank below the River orebody is composed of fine-grained hornblende with sericite, chlorite, and epidote distributed heterogeneously through the rock. A similar rock was taken from a drill hole below the River orebody, but these rocks are so close to the ore deposit and the intrusive contact that metamorphism and alteration have been extensive.

Exposures of granitic rock occur in the river both up and downstream from the ore zone, and also within the ore zone itself. Upstream from the mine the intrusive is quartz monzonite, a coarse-grained rock with large anhedral quartz grains, andesine, potash feldspar and green hornblende largely altered to biotite and chlorite.

Within the ore zone, diorite occurs as a plug between the South and Road orebodies, and there are small exposures in the River open pit. Downstream, steep walls of diorite are exposed where the intrusive extends across the river. The attitude of the diorite contact in the vicinity of the iron deposits is not known, but the intrusive plug in the ore zone must have steeply dipping contacts.

The ore is composed of magnetite with minor copper and iron sulphides, skarn minerals such as calcite, chlorite, epidote and garnet and included fragments of country rock. Skarn is mostly developed in the greenstone areas of the pits. Close to the limestone-magnetite contact, masses of coarsely crystalline pyroxene intergrown with magnetite were picked up from the broken ore, although this material was not seen in place. The small East orebody is mostly enclosed with limestone, and contacts are sharp and well defined. Crystalline garnet, in places up to one half inch across, is disseminated through the limestone close to the magnetite, and also in steeply dipping bands traceable for distances of 1 to 2 feet.

The magnetite is dense and fine grained and small amounts of pyrite, pyrrhotite, and chalcopyrite are found as irregular masses throughout the ore. All these sulphides have been found forming a lamellar pattern within magnetite, in occurrences close to the limestone contact. In one specimen, lamellar pyrrhotite and chalcopyrite were cut by a veinlet of pyrite, indicating that some of the pyrite is probably a part of later mineralization.

Magnetite in the River orebody forms an intrusive relationship with greenstone rocks, in places developing a brecciated greenstone cemented by iron ore. This in turn is cut by calcite veins and where calcite is abundant it cements angular fragments of both greenstone and magnetite. Parts of the River orebody contain magnetite fragments with rims of pyrite surrounded by coarsely crystalline calcite. Much of the late calcite is associated with euhedral cubes of pyrite. Brown sphalerite set in calcite was also observed by the writer.

A structural feature in the ore is the intersection of the magnetite by numerous slip planes, commonly well-polished and often with chlorite developed along them. The slip planes are randomly oriented and movements were probably small, but they are indicative of some post-ore disturbances. Additional evidence of post-ore activity is indicated by the occurrence of dykes cutting through the magnetite. One rock exposure with somewhat debateable relationships is composed of fine-grained quartz, mica, and chlorite with scattered grains of pyrite, and may be termed an alaskite dyke. Another observation was of a dyke cutting cleanly through massive magnetite in the River orebody and exposing smooth, polished and slickensided walls. The rock is a feldspar porphyry with a basaltic matrix now extensively altered.

Exposures to date have revealed that this deposit is in a similar environment to other magnetite deposits along the west coast. It appears to be genetically related to the diorite intrusion, adjacent limestone and volcanic rocks and possibly to faulting.

1961: A crew of sixty-five mined 666,361 tons of ore from which 423,826 tons of concentrate was produced and shipped by Canadian Forest Products Limited railway to the loading-dock at Beaver Cove. In addition, 183,435 cubic yards of waste rock was removed from the ore zone. Sixteen diamond-drill holes totalling 2,595 feet were completed on an extension of the ore zone on the south side of the pit. In addition, several holes were diamond drilled to test a magnetic anomaly about 1,000 feet northwest of the pit.

The camp is on Anutz Lake, immediately south of Nimpkish Lake, and the pit is 5 miles farther south, on the southwest bank of the Nimpkish River. The crushers are immediately southeast of the pit, and the mill is across the river. The access road for the entire operation passes across the pit headwall.

The regional geology is described in Geological survey of Canada Memoir 272 and illustrated on Map 1029A. Near the pit the Nimpkish River more or less follows a contact zone between Quatsino limestone on the southwest and a large intrusion of quartz diorite and related rocks on the northeast. The rock of the contact zone is mostly fine grained and medium to dark green, and was assigned by Hoadley to the Karmutsen group. In the pit, however, it appears to intrude the limestone and is locally medium grained. It may be an intrusion associated with the Bonanza Group or a chilled marginal phase of the quartz diorite. It is called greenstone in this report.

The local geology is described in the Annual Report for 1960 and is illustrated by Figure 13 herewith. Relations are complex in detail, but in general diorite underlies the east part of the pit, limestone the west part, and greenstone occurs between these rocks on the north, near the river. Four magnetite orebodies lie athwart the limestone-diorite contact; from north to south they are called the River, Road, South and East orebodies. The Road and South orebodies are incompletely separated by a wedge of diorite. The east orebody is small, and mining from it has been incidental to pit preparation.

Skarn and sulphide minerals are abundant only in the River orebody, where the host rock is largely greenstone. In the other orebodies the magnetite is generally massive and contains only sparse pyrite and pyrrhotite. Some garnet, epidote, and pink microcline have formed in diorite adjacent to magnetite, but limestone is generally merely recrystallized. Considerable ankerite is developed in sheared limestone west of the South orebody, but it is not known whether it is related to magnetite deposition. In the River orebody the principal minerals associated with the magnetite are garnet, epidote, calcite, and pyrite, with less amphibole, pyrrhotite and chalcopyrite.

1962: In 1962 the Annual Report of the Ministry of Mines indicates that the camp on Anutz Lake immediately south of Nimpkish Lake and the pit is 5 miles farther south, on the southwest bank of

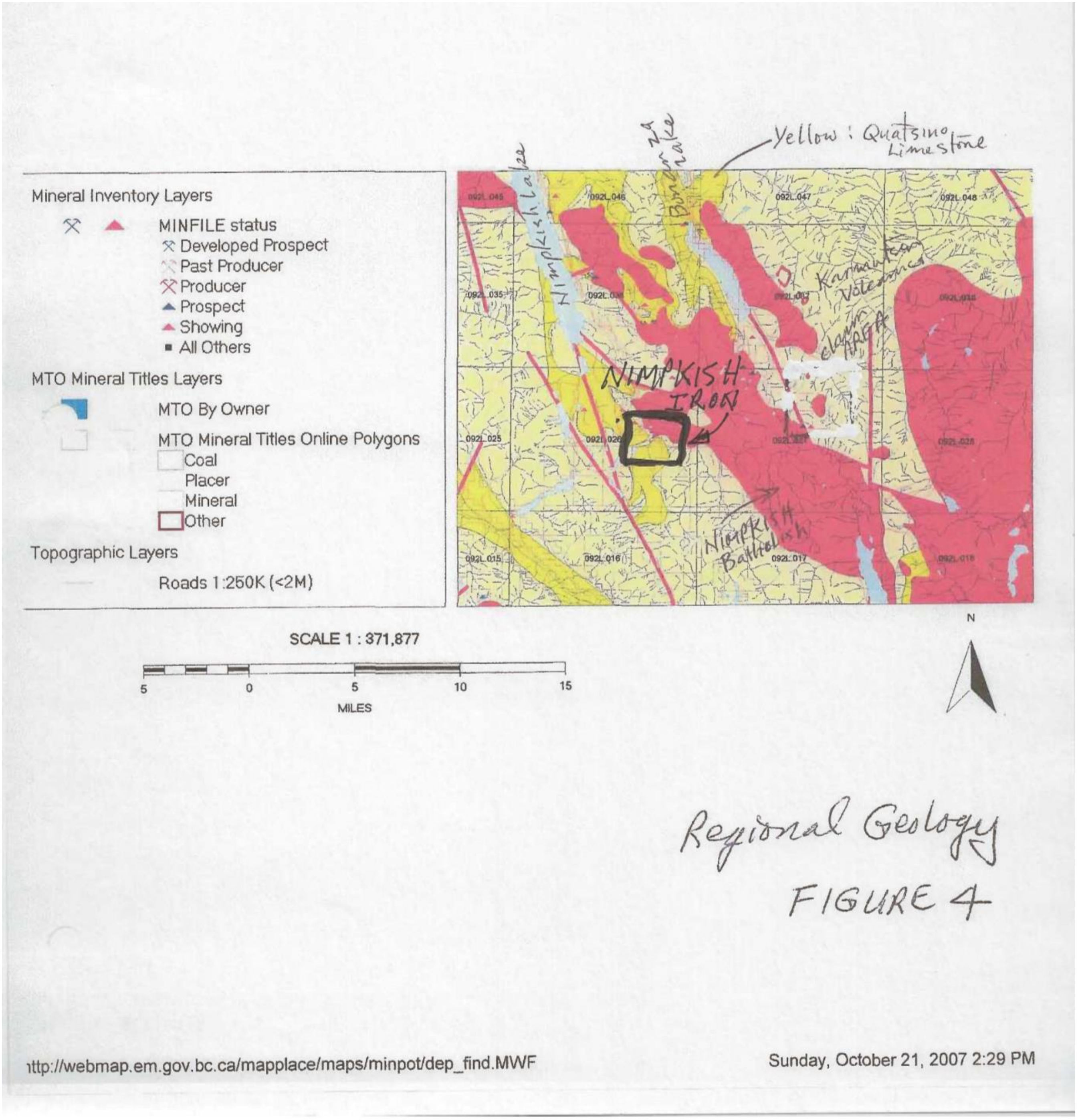
Nimpkish River. The crushers are immediately southeast of the pit and the mill is across the river and adjacent to the Canadian Forest Products Limited railway. Iron concentrate was shipped by this railway to the loading-dock at Beaver Cove.

Open pit quarrying continued on the Road, East, South and River pits, the bottom of the river pit being slightly below river level. Stripping and initial drilling were done in the area of the “A” magnetic anomaly, approximately 1,000 feet northwest of the main pit.

During 1962, 672,008 tons of ore was mined, to produce 362,271 tons of concentrate. In addition, 375,000 cubic yards of waste was removed. Twenty-one diamond drill holes totalling 2,998 feet were completed in outlining the “A” orebody and in investigating an extension of the ore zone crossing the main road. Fifty eight men were employed.

FIELD PROCEDURES

Tailings samples were collected along prospecting traverses and along access roads and tied to GPS waypoint locations.



Regional Geology
FIGURE 4

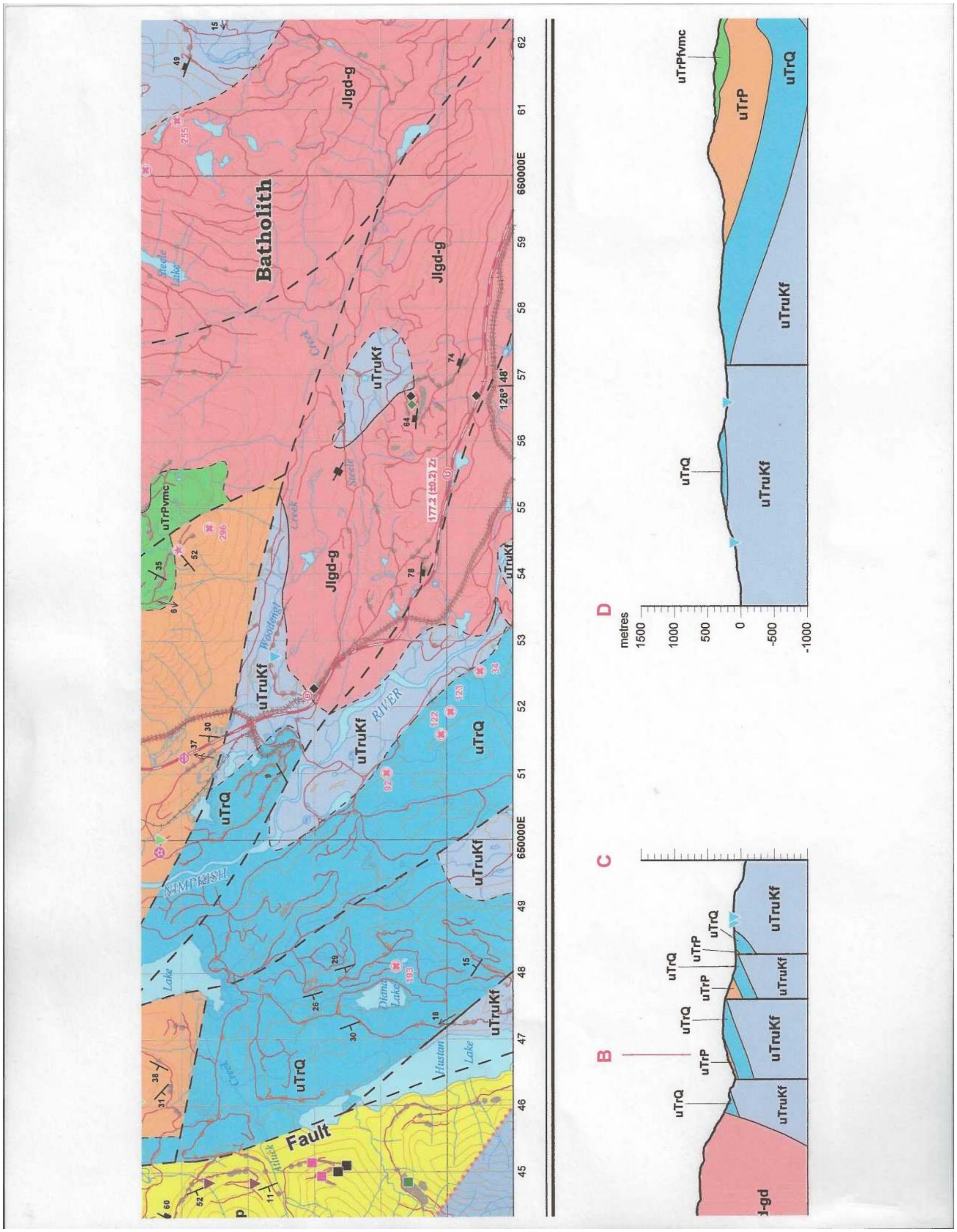


Figure 4a Detail Geology

8.0 GEOLOGICAL SETTING

8.1 Regional Geology

Muller (1977) shows an area northwest of Bonanza River and west of Bonanza Lake to be underlain by rocks of the Lower Jurassic Bonanza Group and Triassic Karmutsen Volcanics which typically consists of volcanic rocks of basaltic to rhyolitic composition with related sediments.

A Jurassic intrusive (the Nimpkish Batholith) is shown to the northeast of the claims.

The Claim group lies in the south-central portion of the Nimpkish map sheet (Map 1029A), which reportedly is underlain almost entirely by members of the Vancouver group volcanics and sediments. These are intruded by plutons of acid to intermediate character which form part of the Coast Intrusions.

The Vancouver group is a conformable series and was subdivided by Gunning (1932) and modified as shown in the following table of information after Hoadley (1953) and Carlisle (1927). The table is, of course, generalized to fit the geologic situation for all of Vancouver Island and full thicknesses of these units do not occur in the Nimpkish sheet.

A number of contact-metasomatic replacement deposits of magnetite, chalcopyrite and sphalerite, containing silver and gold, occur in the west half of the Nimpkish sheet on the flanks of Mt. Kinman and Mt. Hoy. These deposits occur in limestone, calcareous sedimentary rocks and, less commonly, in fragmental volcanic rocks close to the contact of the granodiorite. Gunning (1930) is of the opinion that the periphery of the granodiorite is a flat-lying sheet underlain at no great depth by rocks of the Vancouver Group.

8.2 Property Geology

The Nimpkish Iron Claims are largely underlain by a block of Karmutsen basalts and Quatsino limestone which lie in intrusive contact on the southwest with Jurassic Coast Intrusives. The contact is relatively easily distinguished on the magnetic maps. The pluton is granodiorite to quartz monzonite in composition but locally has dioritic phases. All the intrusives mapped on or immediately adjacent to the property are medium-grained, leucocratic and contain unassimilated basic inclusions near the contact areas. Commonly, potassium feldspar alteration occurs along shears and joint planes. Garnet-epidote skarn development is evident in the intrusives, as well as in the basalts. The attitude of the intrusive contact is not evident in outcrop and will need to be tested by drilling.

The Karmutsen volcanic flows are, in general, basaltic to andesitic in composition. Flow tops are only occasionally discernible and largely untraceable. Amygdaloidal sections are frequent but not distinguishable as distinct mappable flows. The amygdules are often filled with epidote, prehnite, pumpellyite and, more rarely, pyrite and chalcopyrite. In colour, the Karmutsen rocks are dark green to a mottled black and normally fine-grained. Chlorite and epidote alteration is widespread. The epidote content increases adjacent to the southwest intrusive contact.

In general, outcrop is only exposed in areas of moderate to strong relief, or along roads. A portion of the property immediately south of Nimpkish Lake is covered by glacial-fluvial gravels, boulder till and swamp, and has few outcrops.

FIGURE 5 Sample Locations 2011

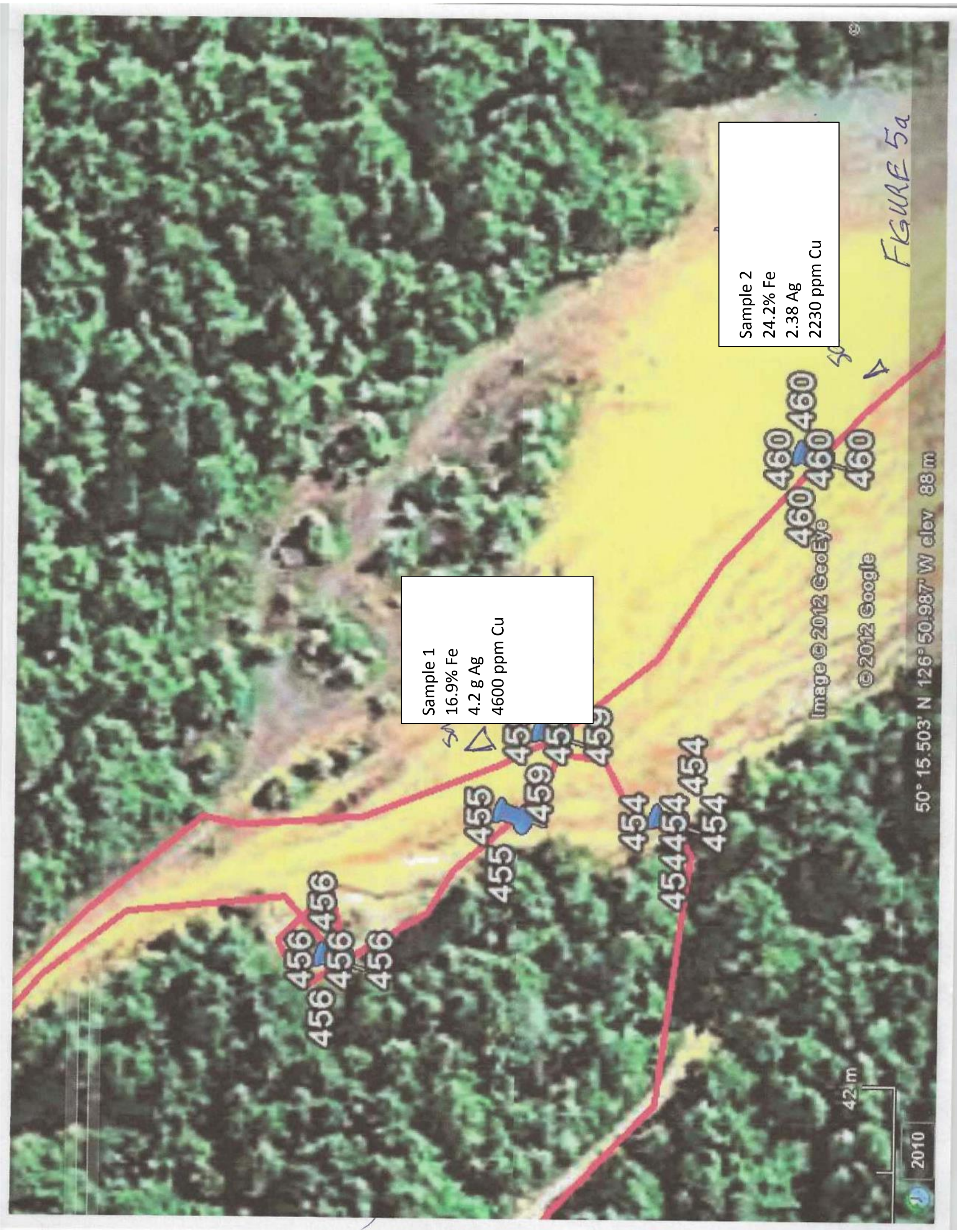
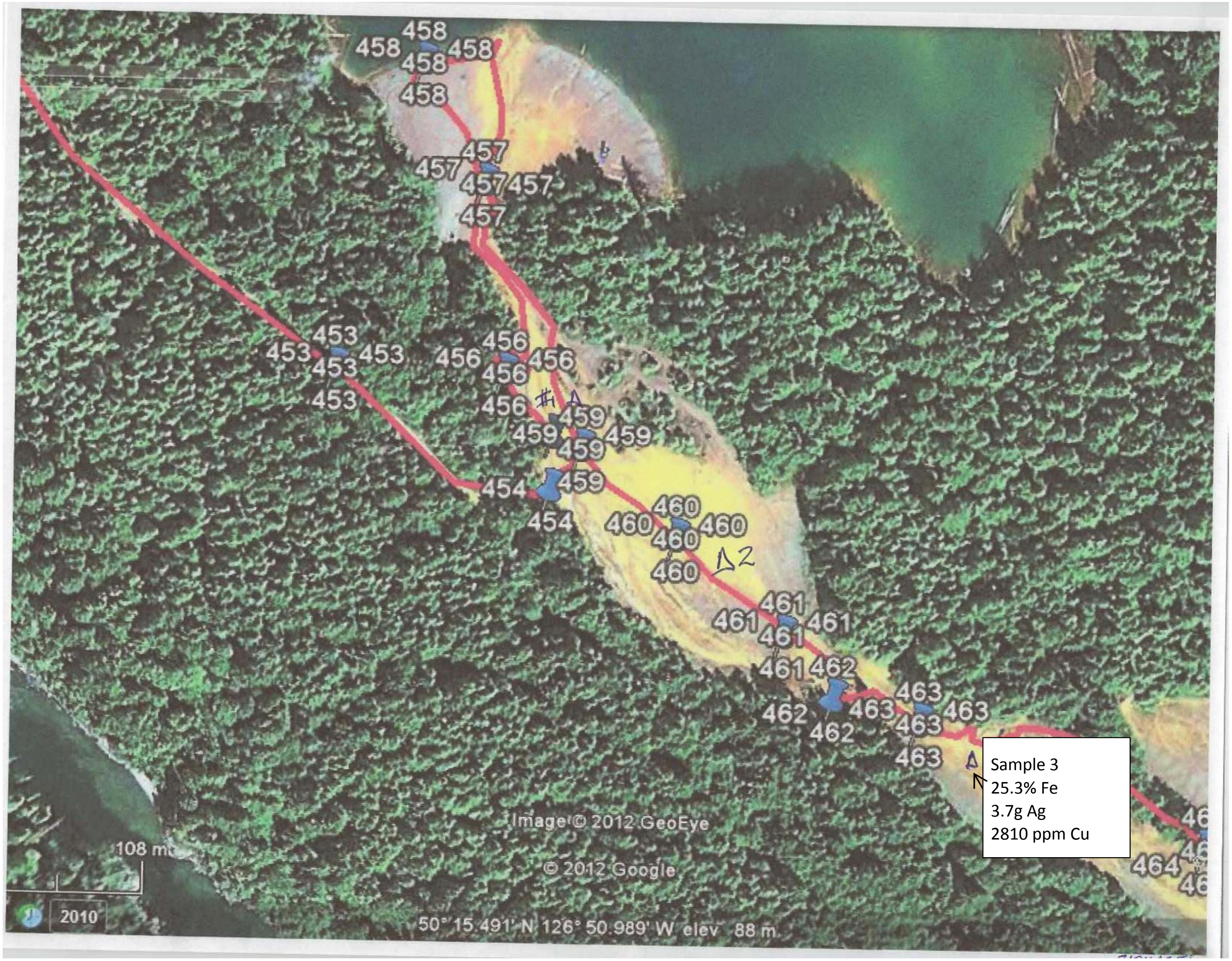


Figure 5a Previous Detail Sample Location and Results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464
#1 Δ
Δ2
Sample 3
25.3% Fe
3.7g Ag
2810 ppm Cu
Image © 2012 GeoEye
© 2012 Google
108 m
2010
50° 15.491' N 126° 50.989' W elev 88 m

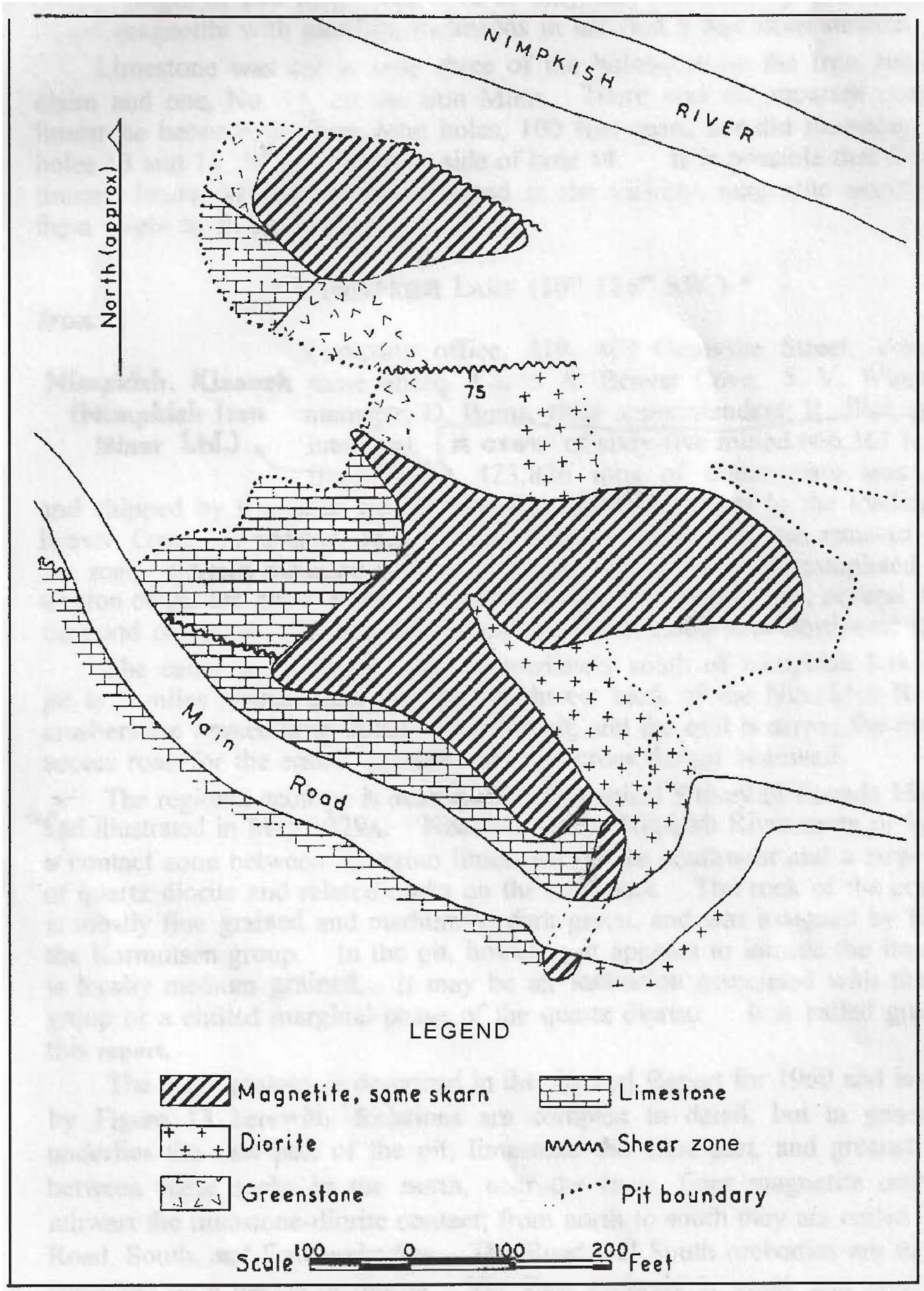


FIGURE 6 Map of Zones Pre-Mining

In the area of the Iron Crown occurrence, north striking carbonates and calcareous sediments of the Quatsino and Parson Bay formations overlie Karmutsen Formation tholeiitic basalts, all of the Upper Triassic Vancouver Group. Lower Jurassic Bonanza Group andesitic to rhyodacitic lava, tuff, breccia and minor sediments are coeval with, or genetically related to, granodiorite of the Nimpkish batholith of the Early-Middle Island Plutonic Suite. Strong regional north to northwest trending faults, often defining intrusive and lithological contacts, traverse the area.

The occurrence is at the contact between coarsely crystalline Quatsino Formation limestone and fine-grained massive amygdaloidal andesite exhibiting sericite, calcite and actinolite alteration with amygdules filled with epidote, calcite or actinolite. Pyrite and pyrrhotite are disseminated through the andesite. Laumontite and calcite veins are present.

Leucocratic quartz monzonite and diorite intrude the volcanics and limestone. Contacts with the volcanics are diffuse, and recrystallized andesite cannot readily be distinguished from intrusive rocks. Feldspar porphyry dykes, an aplite dyke and a felsite dyke are also recognized. The magnetite contact with the limestone is sharp. The andesite is diffuse and evidenced by skarn. The magnetite is relatively pure, but contains up to 50 per cent calcite lenses with chalcopyrite, pyrite and sphalerite. Calcite and sulphides are considered to be post-ore (Geological Survey of Canada Bulletin 172, page 73).

A 55 metre long, 8 to 9 metre wide magnetite exposure occurs along the Nimpkish River. Some 200 metres west of the river, several outcrops of magnetite occur along a ridge and are estimated to represent a lens at least 116 metres long and 18 metres wide. A third magnetite body, indicated by magnetometer surveys only, measures 146 by 18 metres and lies between the river and ridge deposits. These 3 occurrences are believed to represent the 3 fault-separated orebodies of Sangster (Geological Survey of Canada Bulletin 172, page 73). The faults are marked by breccia zones up to 1.5 metres wide, gouge, chlorite, hematite-coated slip surfaces and slickensided magnetite ore and country rock.

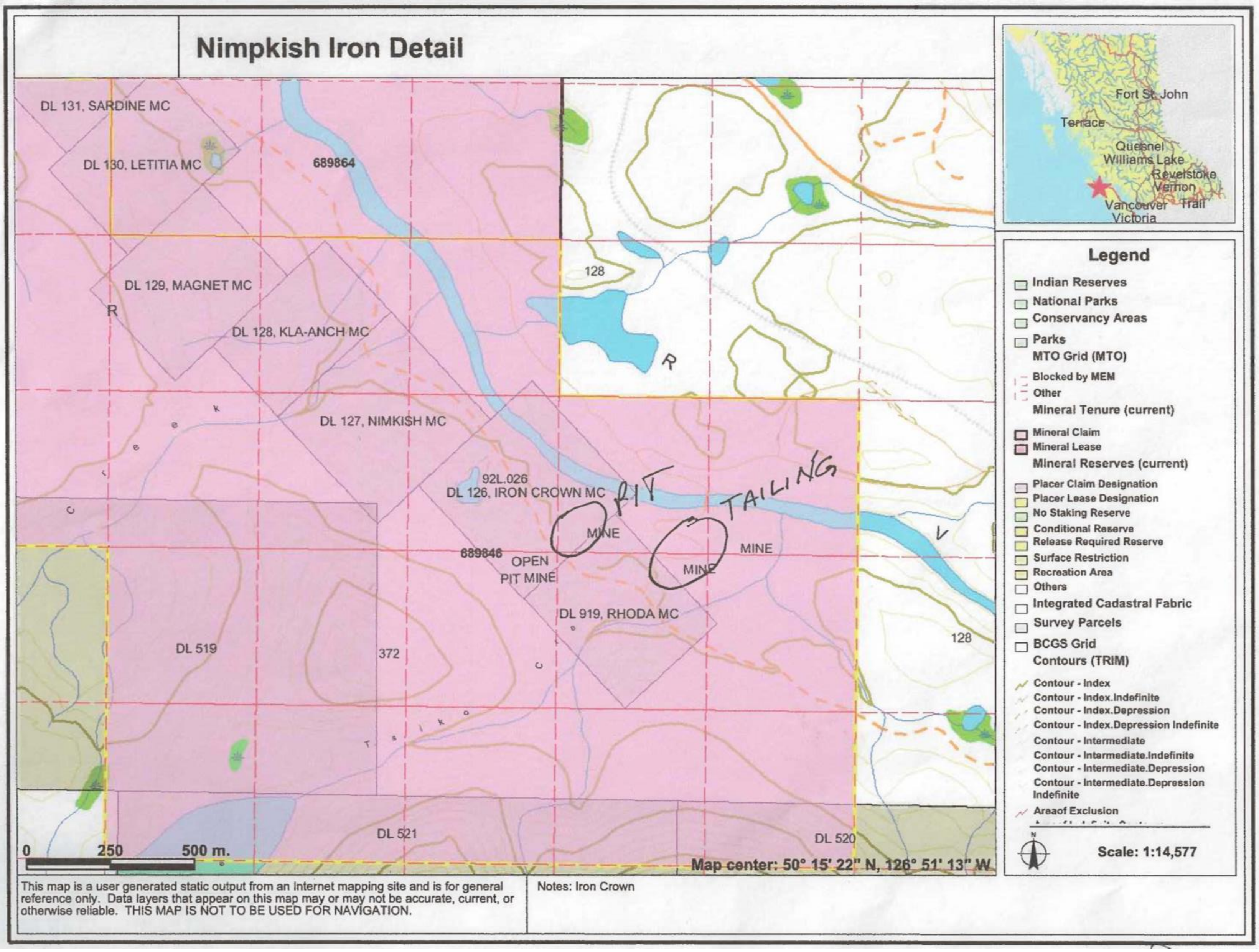
Ore samples taken in 1942 assayed 59.6 to 63.9 per cent iron, averaging 62.1 per cent iron (Cameron, 1942). Phosphorous and sulphur contents are reported to be very low. Between 1959 and 1963, 2,175,683 tonnes of ore were mined.

Indicated (probable) reserves at Iron Crown were 1,632,924 tonnes grading 3.5 grams per tonne gold, 46.2 per cent iron and 1.33 per cent sulphur (Minister of Mines Annual Report 1956). The deposit is mined out (refer to History section).

The Klaanch occurrence lies on strike with the Iron Crown occurrence (092L 034), 0.6 kilometres to the south. Massive magnetite contains irregular small quantities of pyrite and chalcopyrite and disseminations in volcanic rocks. The massive mineralization is up to 3 metres wide.

The Magnet occurrence lies on strike with the Iron Crown occurrence (092L 034), 1.2 kilometres to the south. Massive magnetite contains more pyrite than adjacent occurrences. The massive mineralization is 7 metres wide.

FIGURE 7 Nimpkish Iron Detail



The quartz monzonite intrusive which outcrops in the northeast and south parts of the property seems to generate the pyrometasomatic copper-iron deposits in the adjacent Karmutsen volcanics and Quatsino limestone. This is evidenced by the numerous copper-magnetite skarn showings along this contact. Calc-silicate and sulphide skarn mineralization is found within the intrusive and the adjacent volcanics.

8.2.1 Structure and Metamorphism

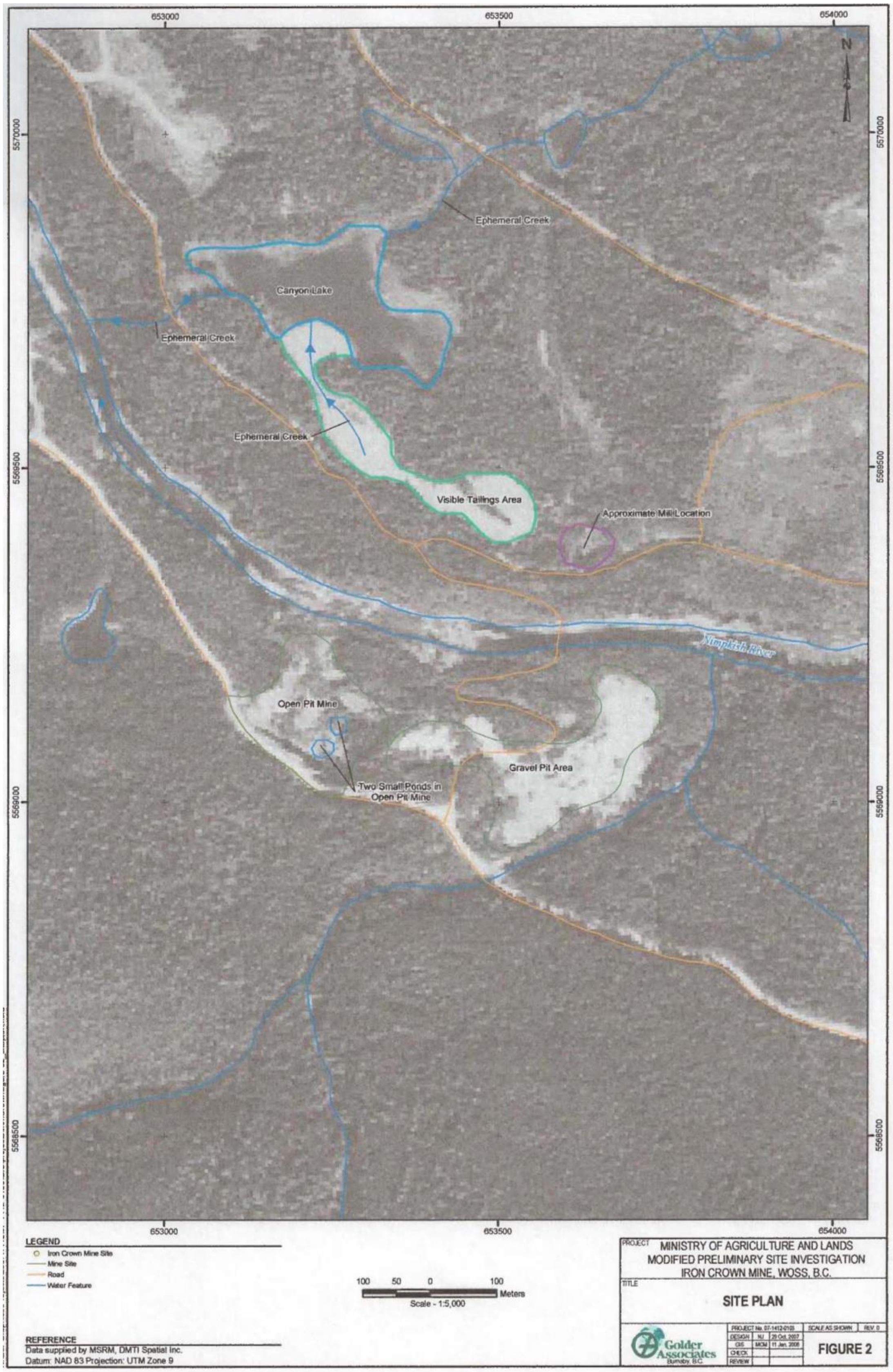
All the volcanic rocks on the property are weakly to strongly magnetic. Fractures and veinlets filled with the same minerals as the amygdules are ubiquitous. When in contact with the intrusive, the rock has been hornfelsed to fine grained hornblende, which in turn is variably altered to chlorite.

8.3 Regional Geophysics

The regional magnetic data shows the Nimpkish Iron claims are centred over a NW-SE oriented magnetic low trend that is part of the regional package of similarly oriented magnetic high and low trends. Most of the magnetic high trends that make up these regional linears contain localized magnetic anomalies often elliptical in shape and paralleling the regional trends. There are several disruptions along these trends including two prominent NE-SW trending magnetic lows that cross the northern and southeastern edges of the claim block. These cross striking trends are suggestive of NE-SW faulting however a detailed examination of the data shows a close correlation between the magnetic features and topography; with magnetic highs and lows being associated with topographic highs and lows respectively. This is most likely an artefact of the survey method. While the survey was intended to be flown at a constant terrain clearance of 305 metres, this condition is difficult to maintain in areas with extreme topography. Consequently, some of the magnetic variations are likely generated by changes in the distance between the sensor and the ground.

Over and above the topographic correlations there are several magnetic responses that appear to agree with the mapped geology. The granodiorites intrusion to the SW of the claims coincides with a large magnetic low. In addition, there are several small magnetic responses that do not appear to be directly related to either the topography or the geological mapping.

In summary the high altitude airborne magnetic data roughly correlates with the geological mapping published by the BC Department of Mines and Energy Resources. A regional NW strike is evident in both data sets and disruptions along these trends are indications of NE faulting. Although the magnetic high trends are generally associated with topographic highs, the correlation is not exact. This suggests that while some of the magnetic relief is attributed to terrain clearance effects from the airborne survey, there are also geological factors influencing the responses and the magnetic intensity appears to differentiate between the major lithologies in the area. It is suspected that ground or low altitude airborne magnetic surveying will reveal significantly more structural and lithological detail than is currently mapped.


653000
653500
654000
5570000
5569500
5569000
5568500
N
Ephemeral Creek
Canyon Lake
Ephemeral Creek
Ephemeral Creek
Visible Tailings Area
Approximate Mill Location
Nimpkish River
Open Pit Mine
Gravel Pit Area
Two Small Ponds in Open Pit Mine
LEGEND
Iron Crown Mine Site
Mine Site
Road
Water Feature
100 50 0 100
Meters
Scale - 1:5,000
REFERENCE
Data supplied by MSRM, DMTI Spatial Inc.
Datum: NAD 83 Projection: UTM Zone 9
PROJECT
MINISTRY OF AGRICULTURE AND LANDS
MODIFIED PRELIMINARY SITE INVESTIGATION
IRON CROWN MINE, WOSS, B.C.
TITLE
SITE PLAN
Golder Associates
Burnaby, B.C.
SCALE AS SHOWN
REV. 0
DESIGN
CHECK
REVIEW
FIGURE 2

9.0 EXPLORATION

On the north side of the Nimpkish River is Canyon Lake and the tailings deposit. The lake covers a surface area of approximately 4.3 ha, with exposed tailings representing approximately 3.3 ha. Canyon Lake was observed to be blue in colour and it appeared to be devoid of life. A small creek crossed the tailings and flowed from the southeast to the north through the tailings into the pond. There was evidence that surface water flows across the tailings are greater at different times of the year, as the creek channel was significantly larger than the observed small creek warranted.

The tailings were observed to be orange/brown in colour where they had been exposed by surface water flow. The remainder of the exposed tailings were grey-brown and appeared to be a coarse sand-like material. The orange tailings formed a hard layer at approximately 5cm below the surface which was not possible to penetrate with a hand trowel.

Three samples were previously collected in 2011, the results are contained in Appendix II. The samples were collected along the length of the tailings exposure and assayed 16.9% Fe, 24.2% Fe and 25.3% Fe.

The oxidized tailings were predominantly composed of sand sized particles (64% to 78% 0.063mm to 2.0mm) while the surface tailings cover consisted of silt (58% 4µm to 0.063mm. Both had elevated concentrations of arsenic, chromium, cobalt, copper, iron, manganese and selenium. Concentrations of arsenic, copper, cobalt and selenium exceed the SCR IL standards. The tailings were also subjected to shake flask extraction procedure which identified aluminum, nickel and zinc as potentially mobile metals.

Based on the observations made on Site, it appears that the ore was crushed and deposited in a slurry in an excavated basin. Coarse tails were deposited within the confines of the basin while slimes were carried down gradient and formed a delta in Canyon Lake. The oxidized tailings solids constitute a brittle, hardpan ferricrete. Surface flow across the tailings channel has a pH of 2.29 and conductivity of 8 mS/cm. The pH in the adjacent pond is 3.73 with a conductivity of 288 µS/cm.

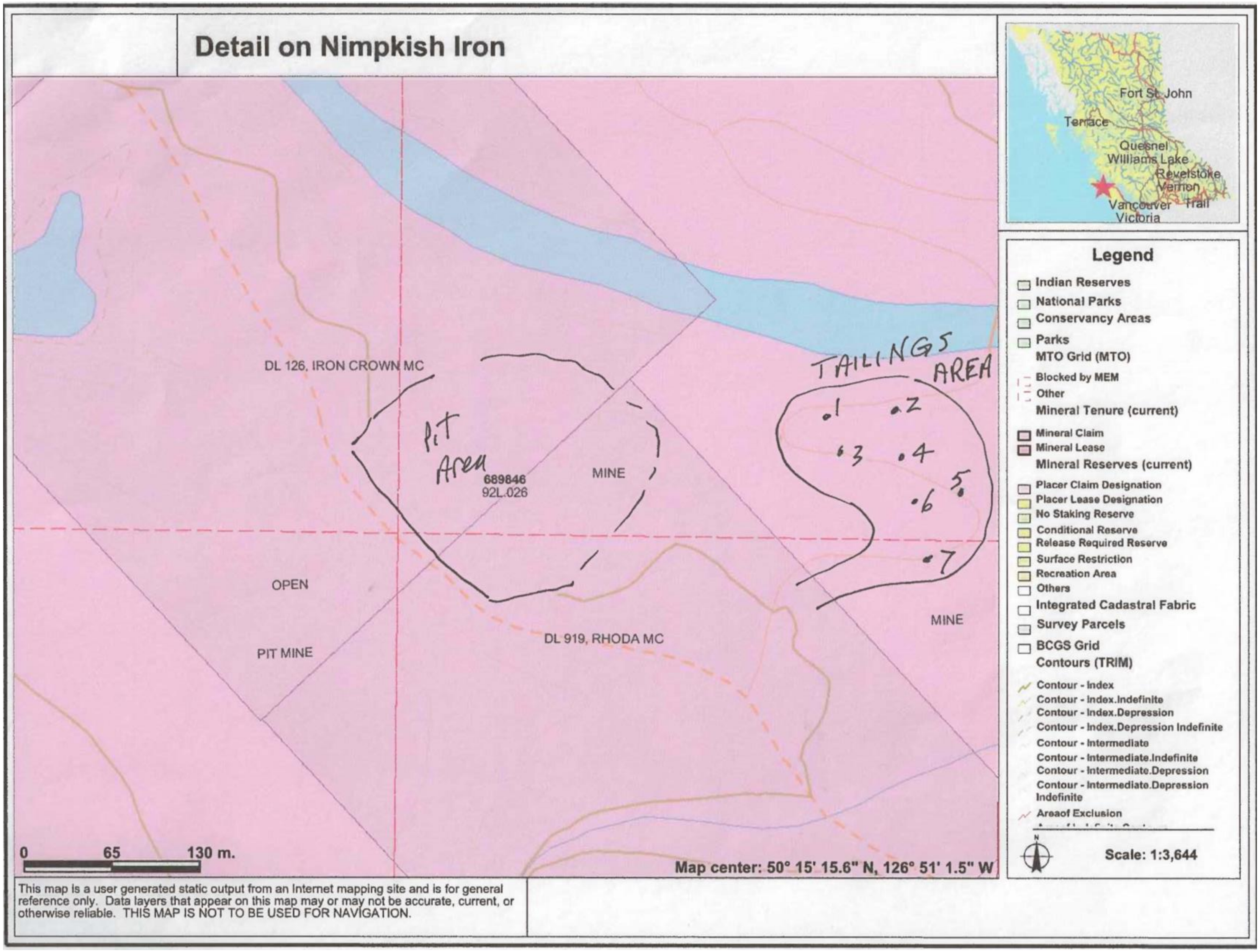
9.1 Previous Geology, Prospecting and Sampling

Samples were collected in the coarse tailings area south of the “road” pit with the following results:

Sample	Location	Amount Processed	Pan Con’s	% Magnetite
M1	9 U 653721 5569119	4000	210	5.25
M2	9 U 653648 5569155	4000	176	4.39
M3	9 U 653691 5569079	4000	300	7.50
M4	9 U 653655 5569097	4000	285	7.12
M5	9 U 653636 5569003	4000	150	3.75
M6	9 U 653561 5568998	4000	200	5
M7	9 U 653470 5569095	Store for further testing		
			Average	5.50 Fe_3O_4

Panned 4 litres of screened (3/8 minus) down to very heavy concentrate. Still some pieces of Magnetite in the oversize so further testing is necessary to come up with a true figure.

Figure 9 Sample Locations



10.0 INTERPRETATION AND CONCLUSIONS

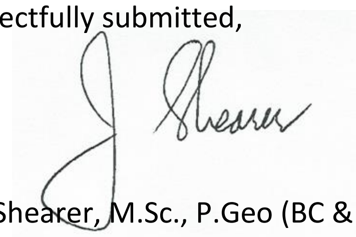
The current re-evaluation of the property has identified the potential for magnetite mineralization within the previously mined pit and also in waste dumps and tailings. Current geochemical and geological theory predicts that gold mineralization in gold skarns is concentrated near the skarns outer limits (away from the higher temperature copper-iron zone).

Samples collected within the fine tailings area gave an iron content up to 25.3% Fe. These results are a rough approximation.

Several other skarn zones were noted to occur on the property by the present work.

A series of samples were collected from the final Canyon Lake tailings area shipped to China and a series of metallurgical tests completed. Test results suggest (1) gravity does not appear to be an effective recovery method and probably not worth pursuing; (2) based on the information provided in the report, flotation tests should be the preferred approach for the Nimpkish tailings – optimization tests can be done to improve the recovery and upgrade the concentrate to be saleable (>20% Cu); and (3) an ICP scan on the material as well as a mineralogy report would be helpful.

Respectfully submitted,



J. T. Shearer, M.Sc., P.Geo (BC & Ontario)

11.0 RECOMMENDATIONS

11.1

1) A thirty day program of excavator stripping and power washing is recommended for the area east of the massive Iron Crown Pit.
2) The new surface exposures should be sampled in detail, and drill sites prepared.
3) Reconnaissance geochemistry should be carried out for iron mineralization across the property, with detail in the vicinity of the known skarn mineralization.

11.2 Estimate Cost of Future Work

The following detailed exploration budget is for the continued exploration of the Nimpkish Property, as detailed in recommendations in this report:

Phase One

Mobilization	$ 11,000.00
Excavator, 30 days @ $1,000/day	$30,000.00
Geologist, 40 days @ $700/day	$28,000.00
Assistants, 2 x 40 days @ $400/day	$32,000.00
Accommodation, 4 x 40 days x $100/day	$16,000.00
Vehicles – 4x4, 2 x 40 days x $110/day	$8,800.00
Supplies	$4,000.00
Equipment Rental, pumps, field equipment, etc.	$4,000.00
Assays, Rocks	$8,000.00
Assays, Soils, 400 @ $32/ea.	$16,800.00
Geophysics, 45 km mag, 5 km IP, incl. report	$40,000.00
Report, Word Processing and Reproduction	$10,000.00
Office, Telephone	$2,000.00
	$210,600.00
Contingency	$15,000.00
Subtotal	$225,600.00
HST 12%	$27,072.00
TOTAL	**$ 252,672 .00**

12.0 REFERENCES

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14.0 STATEMENT OF QUALIFICATIONS

I, J. T. (Jo) Shearer, M.Sc.., P.Geo., of Unit 5 – 2330 Tyner St., Port Coquitlam, B.C. V3C 2Z1 do hereby certify that:

I am an independent consulting geologist and principal of Homegold Resources Ltd.

This Certificate applies to the Technical Report titled: METALLURGICAL ASSESSMENT REPORT on the NIMPKISH IRON PROJECT, NANAIMO MINING DIVISION, Prepared for Homegold Resources Ltd.., Port Coquitlam, B.C., Prepared by myself, J. T. SHEARER, M.Sc., P.Geo., Consulting Geologist, #5-2330 Tyner St., Port Coquitlam, B.C., V3C 2Z1 dated November 21, 2014.

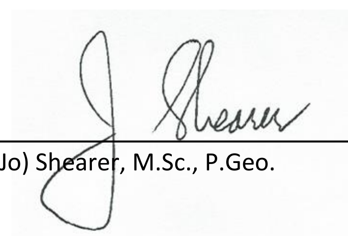
My academic qualifications are as follows: Bachelor of Science, (B.Sc.) in Honours Geology from the University of British Columbia, 1973, Associate of the Royal School of Mines (ARSM) from the Imperial College of Science and Technology in London, England in 1977 in Mineral Exploration, and Master of Science (M.Sc.) in Geology from the University of London, UK, 1977

I am a Member in good standing of the Association of Professional Engineers and Geoscientists in the Province of British Columbia (APEGBC) Canada, Member No.19279 and a Fellow of the Geological Association of Canada, (Fellow No. F439)

I have been professionally active in the mining industry continuously for over 40 years since initial graduation from university and have worked on several skarn iron properties (Iron mike, Zeballos, Caledonia, etc.)

I inspected the Nimpkish Iron Property most recently between March 25, 2014 and July 3, 2014.

Signed and dated in Vancouver B.C.



November 21, 2014
Date

J.T. (Jo) Shearer, M.Sc., P.Geo.

APPENDIX I

STATEMENT OF COSTS

November 21, 2014

APPENDIX I

Nimpkish Iron Project
Statement of Costs

Magnetometer, Geology, Travel and Report

Wages		Without HST
J. T. Shearer, M.Sc., P.Geo., Geologist		
2 days @ $700/day, March 25 & July 3, 2014		$ 1,400.00
Richard Li, 3 days @ $400/day, March 25 & July 3 & 4, 2014		1,200.00
Chang Fu dong, 4 days @ $500/day, March 25 & July 3, 4, 5, 2014		2,000.00
	Wages Sub-total	$ 4,600.00
Expenses		
Truck 1, Rental, fully equipped 4x4, 2 days @ $110/day		220.00
Truck 2, Rental, fully equipped 4x4, 4 days @ $110/day		440.00
Fuel, 1,600km		620.00
Hotel, 2 nights, 2 people		375.00
Meals		210.00
D&B Excavating, B. Howich @ $350/day, March 25, 2014		350.00
Guojun Zhao, 3 days @ $500/day, July 3, 4, 5, 2014		1,500.00
Metallurgy Report + Tests (see attached report)		12,000.00
Shipping to China		680.00
Report Preparation		700.00
Word Processing and Reproduction		350.00
	Expenses Sub-total	$ 17.445.00
	Grand Total	**$ 22,045.00**

Event	# 5530156
Work Filed	$21,500.00
PAC	$9,102.51
Total	$30,602.51
Filed	November 9, 2014

Event	# 5531421
Work Filed	$525.00
PAC	$202.35
Total	$730.35
Filed	November 20, 2014

APPENDIX II

SAMPLE DESCRIPTIONS

(Refer to Geological and Prospecting Assessment Report on the Nimpkish Iron Project, for Homegold Resources Ltd., January 30, 2011 by J. T. Shearer)

November 21, 2014

SAMPLE DESCRIPTIONS

All the tailings samples (1-3) were observed to be orange/brown in colour where they had been exposed by surface water flow. The remainder of the exposed tailings were grey-brown and appeared to be a coarse sand-like material. The orange tailings formed a hard layer at approximately 5cm below the surface which was not possible to penetrate with a hand trowel.

2014 Samples:

#1	50°15’30”N 126°51’00”W	89m
#2	50°15’28”N 126°50’57”W	92m
#3	50°15’26”N 126°50’52”W	96m

Tailings samples in 2011 were collected in the same locaton as the 2014 samples

The tailings samples were predominantly composed of sand sized particles (64% to 78% 0.063mm to 2.0mm) while the surface tailings cover consisted of silt (58% 4µm to 0.063mm. Both had elevated concentrations of arsenic, chromium, cobalt, copper, iron, manganese and selenium. Concentrations of arsenic, copper, cobalt and selenium exceed the SCR IL standards.

Sample	Location	Amount Processed	Pan Con’s	% Magnesium
M1	9 U 653721 5569119	4000	210	5.25
M2	9 U 653648 5569155	4000	176	4.39
M3	9 U 653691 5569079	4000	300	7.50
M4	9 U 653655 5569097	4000	285	7.12
M5	9 U 653636 5569003	4000	150	3.75
M6	9 U 653561 5568998	4000	200	5
M7	9 U 653470 5569095	Store for further testing		
			Average	5.50166667

Panned 4 litres of screened (3/8 minus) down to very heavy concentrate. Still some pieces of Magnetite in the oversize so further testing is necessary to come up with a true figure.

All samples are from material that has been crushed to two inch minus. Most material is less than one inch in diameter. In all samples the majority of rock has been reduced to less than 3/8ths of an inch, say 60 to 70%. It should also be noted that some of the rocks may be of a more sedimentary/metamorphic origin.

M1—Fine to med grained volcanic, green to dark black. Minor dirty limestone with some garnet. 2% to 5% Magnetite left in oversize (+3/8ths)

M2 – green to black fine grained volcanic, mostly black and some are more medium grained. Minor limestone and possibly quartz. Some rounded river gravel in sample as well.

M3 – Mostly mafic fine to medium grained volcanic with very minor pyrrhotite. Some garnetiferous limestone as well as white limestone. 2% magnetite in oversize. Also a higher volume of oversize in proportion to other samples, say 60% oversize in this sample compared to 30 to 40% in all other samples.

M4 – 70% mafic fine grained volcanic and 30% felsic limestone and possibly Quartz in this sample. No magnetite in oversized (+3/8ths of an inch)

M5 –Mostly mafic (90%) and heavy black, minor green and browns volcanics. Some minor limestone and quartz. Up to 5% magnetite in oversize.

M6 – Fine grained dark volcanics. Possibly dark sedimentary metamorphic rocks. Some white limestone as well as dirty with garnets, and a small percentage of Epidote may be present.

APPENDIX III

METALLURGY REPORT

by Ganzhou Nonferrous Research Institute

September 2014 (Translation)

November 21, 2014

温哥华宁普基什铁矿尾矿综合回收探索试验报告

Exploratory Research Report on the Comprehensive Recovery of Iron Ore Tailings of Nimpkish Vancouver

赣 州 有 色 冶 金 研 究 所

2014 年 9 月

Ganzhou Nonferrous Metallurgy Research Institute

2014, September

一、情况介绍

根据宁普基什铁矿项目开发利用分析报告阐述：

1、关于矿山概况:该矿山交通便利、水源充沛，本身又是经过开采的矿山，要恢复生产可能会容易些。

2、关于资源情况:相关部门经过现场考察，其废石和尾矿量相对准确。至于采矿坑的深部及周边是否存在铁矿资源应通过进一步地勘查工作予以确认，可能性是存在的。

3、关于开发利用情况:该矿山主要回收的有价元素为铁、硫、铜，伴生元素为钴、银、铟、镓，这四种金属应通过冶金方法回收（选矿只是富集，回收）。铁矿石主要成分是黄铁矿，磁铁矿占总铁量的27%左右。对该矿山主要的有价元素和伴生元素的价值及计算方法是准确的，关键问题在于选矿技术指标是否能达到我们的预期。

4、关于选矿技术:从《宁普基什铁矿项目开发利用》的资料显示，该矿山应该是做为铁矿开采的，铜、硫及其伴生金属都没有回收。从取样化验的结果表明，铁、铜、硫及其伴生元素均有一定的含量，有相应的回收价值，问题是这些尾矿资源已经在矿山堆放的时间过了半个多世纪，在这半个多世纪中，这部分资源经风吹、日晒、雨淋等等自然环境的影响，矿石性质肯定会发生变化，如：风化、氧化、流失等等，这些因素也势必会给选矿带来新的难度。开发利用这些矿产资源，能取得什么样的技术指标并获得什么样的经济利益，针对该矿石的选矿实验是必须的。至于选矿工艺流程，破碎磨矿是必不可少的。而回收矿石中的有价金属矿物，采用单一的浮选、磁选、重选方法，还是采用联合的选矿工艺，需要通过实验来确定。

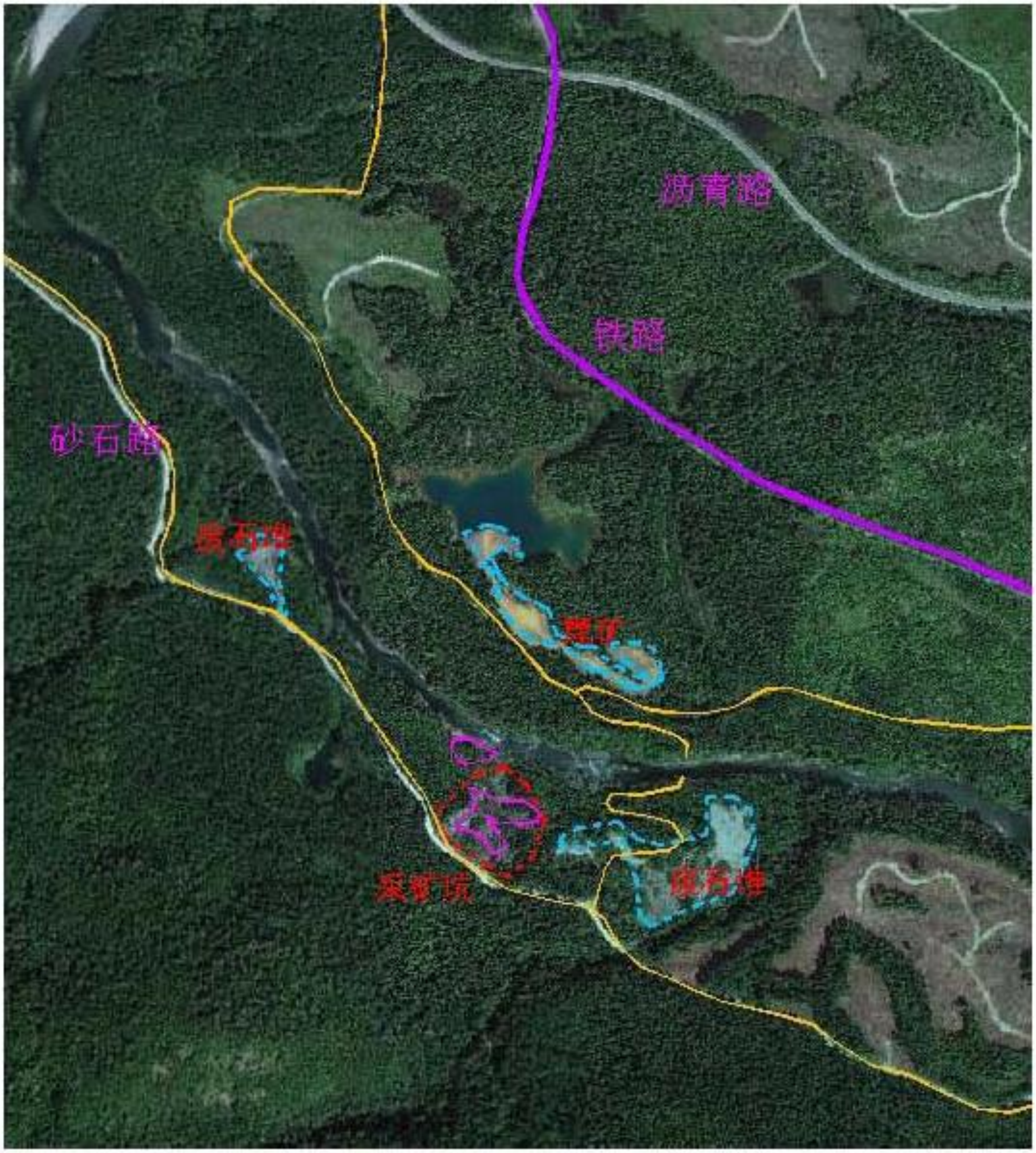
关于宁普基什铁矿尾砂中有价金属矿物回收的选矿探索试验，矿样的代表性很重要。关于宁普基什铁矿尾砂的处理，当地对环保的要求比较严格，在选矿流程中如果涉及到浮选工艺，项目的审批恐怕难于获得通过。针对这一客观存在的问题，贵公司提出采用重选预先富集，然后再进行分离的方案。采用重选方法回收宁普基什铁矿尾砂中的有价金属矿物，且流程简单，投资小。但最终能达到什么样的选矿回收技术指标，决定因数是矿石性质、回收矿物的含量和与矿石性质相适应的选矿工艺。从专业的角度结合当地的环保要求，通过实验推荐的选矿工艺流程和获得的选矿回收指标来进行选矿厂的设计是可靠的。退一步来说，即使是选矿的效果很差，那也能警示我们对项目的投资需要慎重考虑。

一. Introduction

Following content are based on the analysis report of the development and utilization of Nimpkish assorted iron ore project.

1. The general condition of the mine: it has convenient transportation and abundant water. Since it has been exploited, it would be easier to restore production.

2. The state of resources: According to the field investigation conducted by relevant departments, the amount of waste rock and tailings is relatively accurate. Whether there are any


沥青路
铁路
砂石路
废石堆
采矿坑
废石堆

iron ore resources in the deep mining pit and surroundings should be confirmed by further exploration, and it is possible.

3. The development and utilization condition: The mine mainly recovers following valuable elements: iron, sulfur, copper, with cobalt and silver, indium, gallium being the associated elements which should be recovered by metallurgical method (because ore dressing could only beneficiate and recycle the elements). The main ingredients of Iron ore are pyrite, and magnetite accounts for about 27% of the total iron content. Actually the value evaluation method and calculation method of the valuable elements and associated elements adopted by the mine are accurate, and the key question is whether the ore dressing technical indicators can meet our expectations.

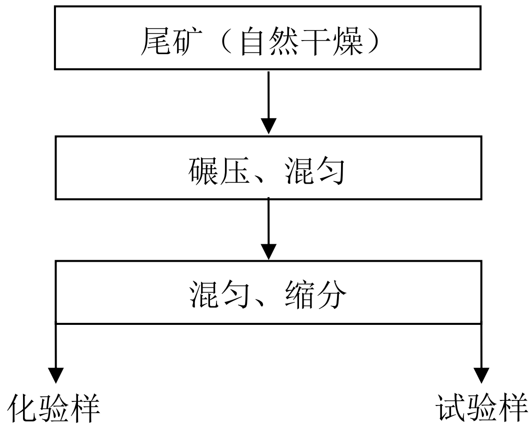
4. Mineral processing technology: According to " The Development and Utilization of Nimpkish Iron Ore Project ", the mine exploits iron mining only, and copper, sulphur and other associated metals have not been recycled. The sampling test results show that there are certain iron, copper, sulphur and other associated elements content in the mine with corresponding recovery value. However, since the mine tailings resources have stacked there more than half a century, part of the ore properties have been changed under the influence of natural environment such as: wind, sun and rain. At the same time, the weathering, oxidation, erosion, of the ore will also bring new difficulty to processing. In order to develop and utilize the mineral resources, it is necessary to do the ore dressing experiment to know about the technical indicators and economic interests. As for ore dressing process flow, the broken grinding is necessary. And the dressing process should be decided through experiments to recover the valuable metal minerals in the ore, whether using single flotation, magnetic separation and gravity separation method, or a combination of ore dressing process.

For the experiment, the representative core sample is very important. Because of the local strict requirement of environmental protection, it is difficult to get the project through, if it involves flotation technology in the beneficiation process. Therefore, your company proposes the scheme of adopting gravity separation process, with preconcentration first and separation second. If we adopt gravity separation process to recycle the valuable metal minerals in the iron ore tailing, the process would be simple and requires small investment. But in the end what kind of dressing recovery technology index can achieve, it depends on the ore properties, recycling mineral content and the ore dressing process corresponding to the ore properties. From the professional perspective and to fulfill the local environmental protection requirements, it is reliable to design the dressing mill according to the mineral processing flow and ore dressing recovery index recommended by the experiment. If the mineral processing effect is not good, it reminds us of careful consideration on the project investment.

二、试料加工

试料收到日期为 2014 年 7 月 28 日。

1、试料加工流程见图一。



图一　试料加工流程

2、化验结果

1#试料（约 3Kg），含：Cu　0.19%,　Co　0.015%,　S 5.20 %,　Fe　14,17%.

2#试料（约 7Kg），含：Cu　0.16%,　Co　0.014%,　S 6.31 %,　Fe　16,66%.

从化验结果可以看出，1#、2#样品中 Cu、Co、S、Fe 的含量相差不大。由于单个试料量少，粒度组成基本一致，为此，将这二个试料全部混合为一个综合试料。

综合试料化验结果；含：Cu　0.169%,　Co　0.0143%,　S 6.13 %,　Fe　16,66%.

3、综合试料筛析结果（见表 1）

表 1　综合试料筛析结果%

粒度（mm）	+1	-1～+0. 5	-0. 5～+0. 25	-0. 25+0. 074	-0.074	合计
产率（%）	10．67	20．50	31．80	30．96	6．07	100．00

二．Sample processing

Samples are received on July 28, 2014.

1. Sample processing flow as shown in figure 1

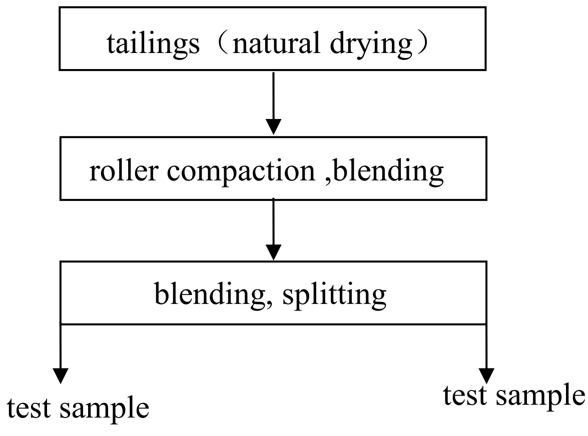


Figure 1　sample processing flow

样 1
样 2
Fe 24.2%
Cu 0.22%

2. Test result

1#sample（about 3Kg），contains：Cu 0.19%,　Co 0.015%,　S5.20%,　Fe 14,17%.

2#sample（about 7Kg），contains：Cu 0.16%,　Co 0.014%,　S6.31%,　Fe 16,66%.

The test results show that the contents of Cu, Co, S and Fe in1 # and 2 # samples are almost the same. Because of the limited content of single sample and the similar composition of the two samples, the two samples are mixed as a composite sample.

The test results of composite sample show that the sample contains Cu 0.169%,　Co 0.0143%,　S 6.13 %,　Fe 16,66%.

3. Sieve analysis results of the composite sample（See table 1）

Table 1　Sieve analysis results of the composite sample %

Particle size（mm）	+1	-1～+0.5	-0.5～+0.25	-0.25+0.074	-0.074	合计
production rate（%）	10．67	20．50	31．80	30．96	6．07	100．00

三、选矿探索试验

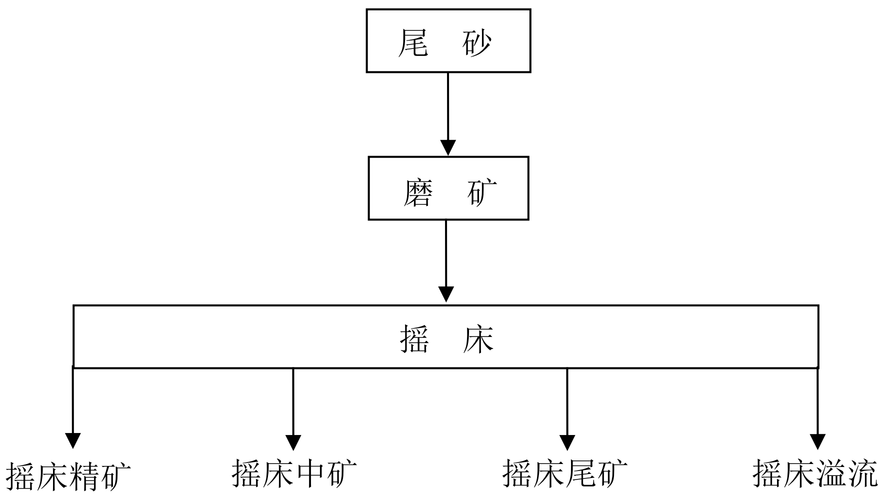
根据宁普基什铁矿项目开发利用分析报告中介绍的情况和要求，对该尾砂中的有价金属矿物采用重选工艺进行探索试验。

摇床选别具有富集比高，操作简单等点，特别是对矿物间比重差大且已经单体解离的细粒矿物的回收效果显著。

离心机选别同样具有富集比高，操作简单等优点，特别是对矿物间比重差大且已经单体解离的细粒矿物和细泥的回收效果显著。为此，选矿探索试验以这二种设备为主开展工作。

1、摇床试验

试验流程见图二、试验结果见表 2。



图二　摇床试验流程

表 2　摇床试验结果%

产　品	产　率	品　　位			回　　收　　率		
		Cu	Co	S	Cu	Co	S
摇床精矿	12．00	0．49	0．058		31．90	50．59	
摇床中矿	32．00	0．20	0．009		34．73	20．93	
摇床尾矿	26．00	0．075	0．0048		10．58	9．07	
摇床溢流	30．00	0．14	0．0089		22．79	19．41	
合计	100．00	0．18	0．0138		100．00	100．00	

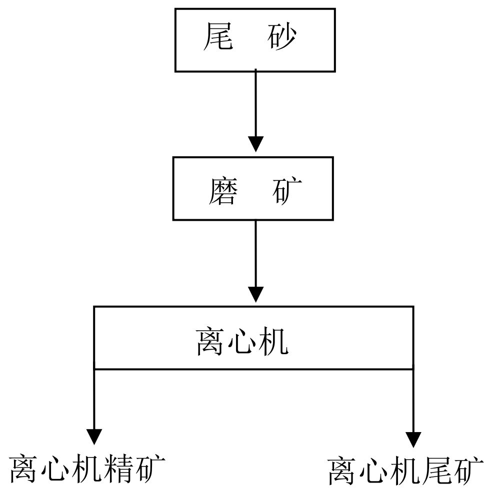
2、离心机试验

试验流程见图三、试验结果见表 3。

表 3　离心机试验结果%

产　品	产　率	品　　位		回　　收　　率	
		Cu	Co	Cu	Co
离心机精矿	38.35	0.24	0.028	51.61	61.29
离心机尾矿	61.65	0.14	0.011	48.39	38.71
合计	100.00	0.18	0.018	100.00	100.00

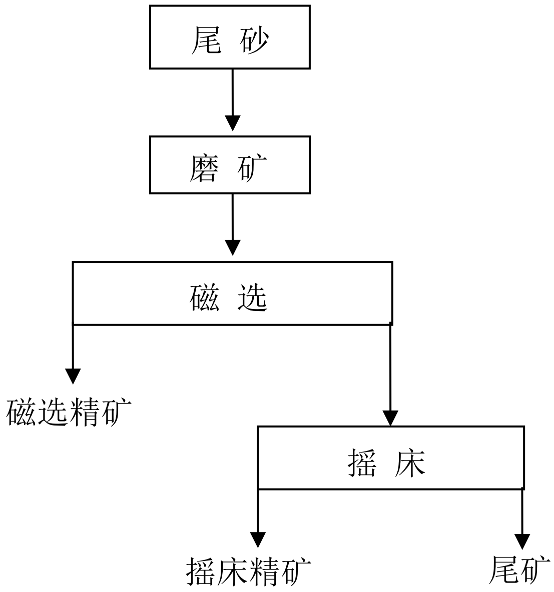
从表 2、表 3 的摇床和离心机试验结果可以看出，采用重选方法从宁普基什铁矿尾砂中回收有价金属矿物（铜和钴）的效果不佳。



图三　　离心机试验流程

3、 磁选—摇床试验

试验流程见图四、试验结果见表 4。



图四　磁选---摇床试验流程

表 4　磁选—摇床试验结果

产 品	产 率	品 位		回 收 率	
		Cu	Co	Cu	Co
磁选精矿	6.91	0.07	0.0077	2.11	5.49
摇床精矿	29.79	0.50	0.018	64.83	55.32
尾矿	63.30	0.12	0.006	33.06	39.19
合计	100.00	0.23	0.010	100.00	100.00

从表 4 结果可以看出，尾砂经磨矿---磁选，在磁选精矿产品中铜和钴的回收率分别为 2.11%、5.49%。磁选尾矿进入摇床选别，所得摇床精矿中铜的富集比约为 2，回收率 64.83%，摇床尾矿中铜的损失约占摇床精矿的 1/2。而钴矿物在磁选---摇床中无富集效果。

三．Mineral processing experiment

According to the introduced situation and requirements of "The Development and Utilization of Nimpkish Iron Ore Project ", gravity separation process was carried out to recycle the valuable metal minerals in the iron ore tailings in the exploring experiment.

Shaking table has the advantages of high beneficiation effect and simple operation, and especially has remarkable recycling effect on the fine grained minerals which have separated from other minerals with different specific gravity.

Centrifuge also has the advantages of high beneficiation effect and simple operation, and especially has remarkable recycling effect on the fine grained minerals and fine mineral mud which have separated from other minerals with different specific gravity. Therefore, the experiment gives priority to these two equipments.

1. Shaking table test

Test process as shown in figure 2, test results as shown in table 2。

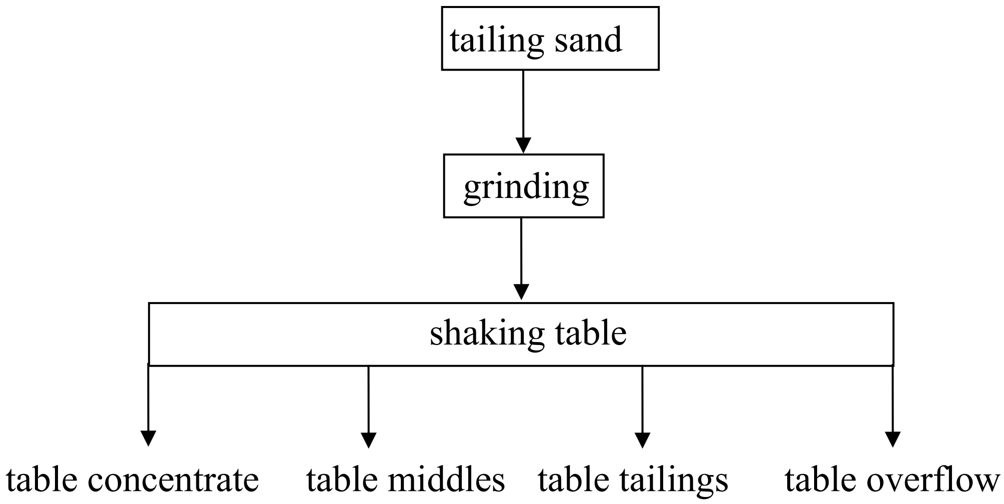


Figure 2 shaking table test process

Table 2 shaking table test results%

products	production rate	Grade			Recovery		
		Cu	Co	S	Cu	Co	S
table concentrate	12. 00	0. 49	0. 058		31. 90	50. 59	
table middles	32. 00	0. 20	0. 009		34. 73	20. 93	
table tailings	26. 00	0. 075	0. 0048		10. 58	9. 07	
table overflow	30. 00	0. 14	0. 0089		22. 79	19. 41	
Total	100. 00	0. 18	0. 0138		100. 00	100. 00	

2. centrifuge tests

Test process as shown in figure 3, test results as shown in table 3。

Table 3 centrifuge test results %

products	production rate	Grade		Recovery	
		Cu	Co	Cu	Co
centrifuge concentrate	38.35	0.24	0.028	51.61	61.29
centrifuge tailings	61.65	0.14	0.011	48.39	38.71
total	100.00	0.18	0.018	100.00	100.00

The test results of the shaking table and the centrifuge in table 2 and table 3 show that it is not effective to recycle the valuable metal minerals(copper and cobalt) from Nimpkish iron ore tailing by adopting gravity separation process.

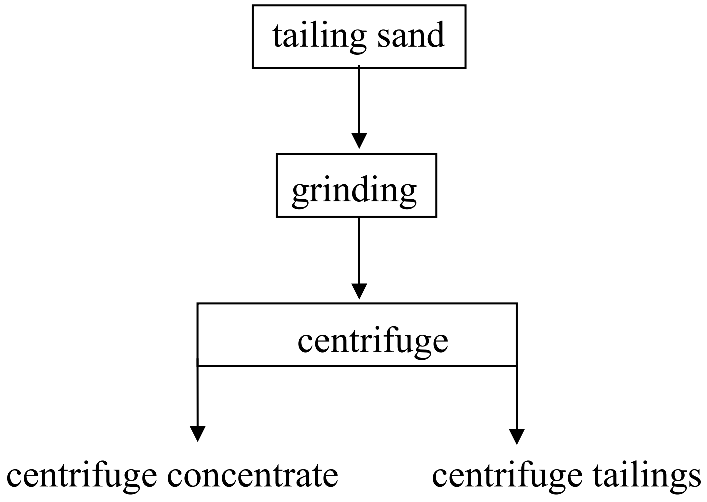


Figure 3 centrifuge test process

3. magnetic separation - shaking table test

Test process as shown in figure 4, test results as shown in table 4.

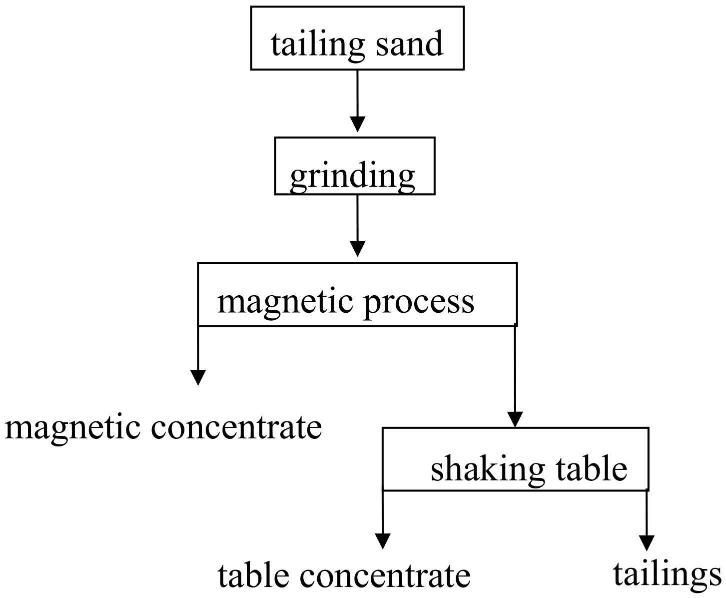


Figure 4 magnetic separation - shaking table test

Table 4 magnetic separation - shaking table test

products	production rate	Grade		Recovery	
		Cu	Co	Cu	Co
magnetic concentrate	6.91	0.07	0.0077	2.11	5.49
table concentrate	29.79	0.50	0.018	64.83	55.32
tailings	63.30	0.12	0.006	33.06	39.19
total	100.00	0.23	0.010	100.00	100.00

The test results of table 4 shows that the recovery rate of copper and cobalt in the magnetic concentrate products are 2.11% and 5.49% respectively after the grinding - magnetic separation of tailing sands. The tailings of magnetic separation are put into the shaking table, and the enrichment of copper in the ore concentrate after the shaking table process is approximately 2. So the recovery rate is 64.83%, and the copper losses of table tailings accounts for about 1/2 of the shaking table concentrates. And cobalt mineral in magnetic separation - table has no enrichment effect.

4. 浮选试验

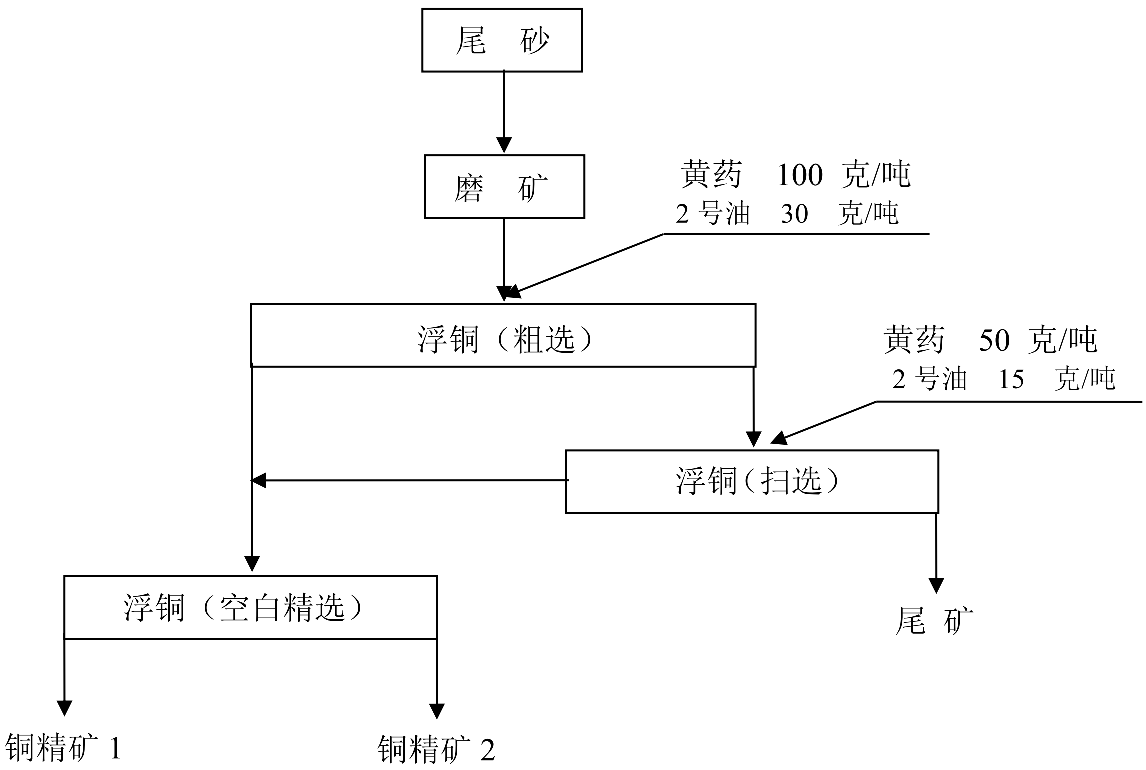
宁普基什铁矿尾矿主要回收的有价元素为铁、硫、铜，伴生元素为钴、银、铟、镓等。而铜、硫多以硫化物形式呈现，钴、银、铟、镓则伴生其中。对硫化矿物的回收，在选矿工艺中绝大多数采用浮选法。

浮选是选别细粒嵌布的矿石，特别是选别有色金属、稀有金属、非金属矿和可溶性盐类等的一种主要的方法。在大多数矿石可选性研究中，浮选试验是必不可少的一项内容。

浮选，它适应范围广，且浮选的药剂种类多。尤其是复杂难选的多金属矿，采用重选工艺、磁选工艺无法获得较好技术指标的情况下，采用全浮选工艺，部分浮选工艺，或采用选矿和冶金联合处理工艺，可使产品的质量技术指标或回收技术指标得到改善和提高。

根据《宁普基什铁矿项目开发利用》的资料显示，该矿山应该是做为铁矿开采的，铜、硫及其伴生金属都没有回收。贵公司提出采用重选预先富集，然后再进行分离的方案。从摇床、离心机、磁选---摇床探索试验结果可以看出，采用重选、磁选---重选工艺来回收宁普基什铁矿尾砂中有价金属矿物无法获得预期效果。为此，采用浮选工艺进行了探索试验。

试验流程见图五，试验区结果见表 5。



图五 浮选试验流程

表 5 浮选试验结果%

产品	产率	品位		回收率	
		Cu	Co	Cu	Co
铜精矿 1	3.92	2.75	0.24	60.71	47.67
铜精矿 2	2.14	1.46	0.061	17.60	6.88
铜精矿小计	6.06	2.29	0.17	78.31	54.55
尾矿	93.94	0.041	0.0088	21.69	45.45
合计	100.00	0.18	0.019	100.00	100.00

从表 5 结果可以看出，采用浮选工艺回收宁普基什铁矿尾砂中的铜钴等金属矿物是行之有效的，浮选探索试验表明，一次粗选即可获得含 Cu2.29%，回收率 78.31%，含 Co0.17%，回收率 54.55%的技术指标。

4. The flotation test

The valuable elements mainly recovered from the Nimpkish iron ore tailings are iron, sulfur, copper, and associated elements are cobalt and silver, indium, gallium and so on. While copper and sulphur mainly present in the form of sulfide, cobalt, silver, indium and gallium are associated with. The flotation method is often adopted to recycle the sulfide minerals.

Flotation test is to process the fine grained disseminated ore, which is a main method adopted especially to process non-ferrous metals, rare metals, non-metallic mineral and soluble salts. In most ore washability study, flotation test is one of the essential contents.

Flotation is often adopted widely, and has various reagents. Especially when the polymetallic complex is processed, and the gravity separation process and the magnetic separation process cannot get good technical indicators, to adopt all flotation process, part flotation process, or mineral processing and metallurgy combined treatment process can improve the quality technical index or the recovery technical index of the product.

According to " The Development and Utilization of Nimpkish Iron Ore Project ", the mine exploits iron mining only, and copper, sulphur and other associated metals have not been recycled. Your company proposes the scheme of adopting gravity separation process, with preconcentration first and separation second. The results of shaking table test, centrifuge test, magnetic separation - shaking table test show that no desired effect can be got if the gravity separation and magnetic - gravity separation technologies are adopted to recover the valuable metal minerals from the Nimpkish iron ore tailing sand. Therefore, the flotation technology is used for exploring experiments.

Test process as shown in figure 5, test results as shown in table 5.

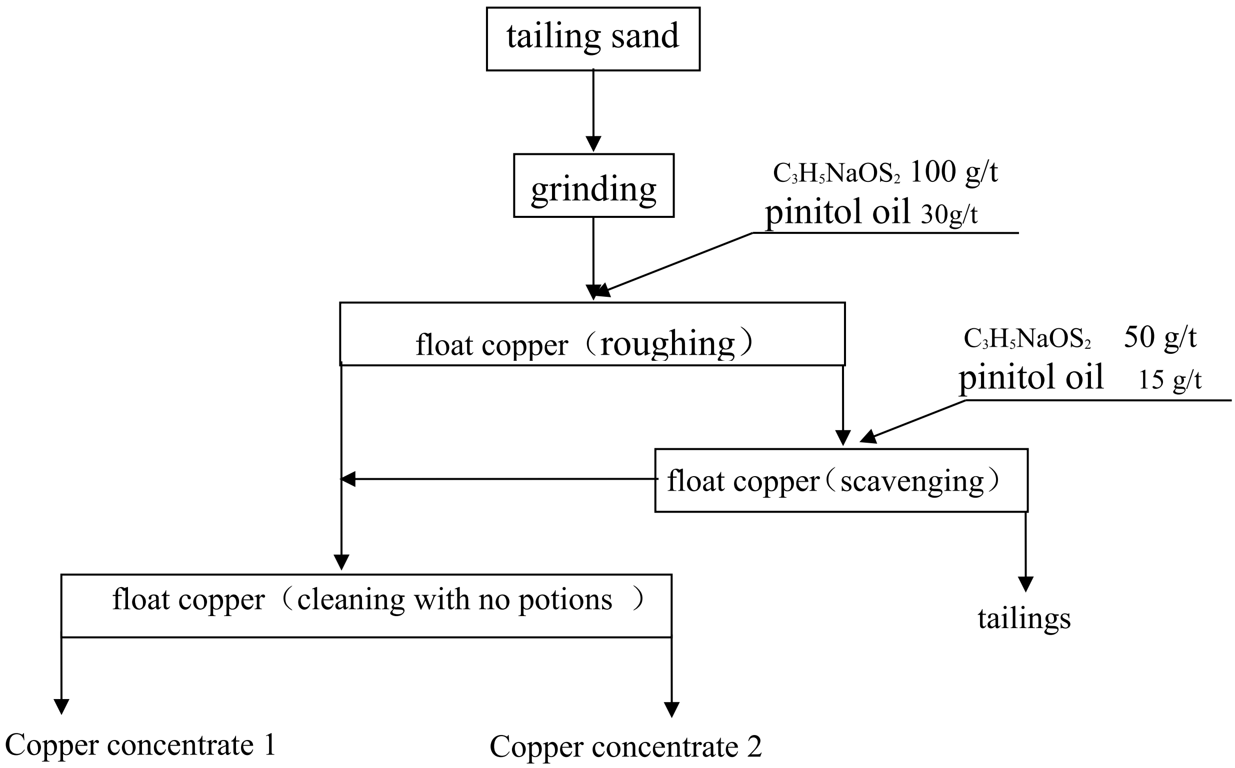


Figure 5 Flotation test process

Table 5 The flotation test results %

products	production rate	Grade		Recovery	
		Cu	Co	Cu	Co
Copper concentrate 1	3.92	2.75	0.24	60.71	47.67
Copper concentrate 2	2.14	1.46	0.061	17.60	6.88
Copper concentrate subtotal	6.06	2.29	0.17	78.31	54.55
tailings	93.94	0.041	0.0088	21.69	45.45
total	100.00	0.18	0.019	100.00	100.00

The table 5 results show that it is effective to adopt flotation technology to recover copper and cobalt and other metallic minerals from the Nimpkish Iron Ore tailing sands. The flotation experiment shows that one time roughing can obtain Cu2.29 % with the recovery rate being 78.31%, and Co0.17 % with the recovery rate being 54.55%.

四、小结

1，宁普基什铁矿尾砂中：

1#试料含：Cu　0.19%,　Co　0.015%,　S 5.20 %,　Fe　14,17%.

2#试料含：Cu　0.16%,　Co　0.014%,　S 6.31 %,　Fe　16,66%.

从化验结果可以看出，1#、2#样品中 Cu、Co、S、Fe 的含量相差不大。由于单个试料量少，粒度组成基本一致，为此，将这二个试料全部混合为一个综合试料。

综合试料化验结果；含：Cu 0.169%,　Co 0.0143%,　S 6.13%,　Fe　16,66%。铁、铜、硫及其伴生元素均有一定的含量，有相应的回收价值。

2、这些尾矿资源已经在矿山堆放的时间过了半个多世纪，在这半个多世纪中，这部分资源经风吹、日晒、雨淋等等自然环境的影响，矿石性质肯定会发生变化，如：风化、氧化、流失等等，这些因素也势必会给选矿带来新的难度。

3、综合试料筛析结果表明，+0.25mm 以上粒级产率占 60%以上，加上受到铁矿物氧化作用产生结块，入选之前必须进行磨矿。

4、采用重选、重选---磁选方法从宁普基什铁矿尾砂中回收有价金属矿物（铜和钴）的效果不佳。

5、采用浮选工艺，选择价格便宜，来源广，易于生产并且是国内外硫化矿应用最广泛的一类捕收剂（黄药）和起泡剂（松醇油也通称为二号油）来回收宁普基什铁矿尾砂中回收有价金属矿物（铜和钴）是可行的、有效的。一次粗选即可获得含 Cu2.29%，回收率 78.31%，含 Co0.17%，回收率 54.55%的技术指标。

6、宁普基什铁矿尾砂中回收有价金属矿物的探索试验采用的浮选工艺和药剂制度是可行、有效的。针对宁普基什铁矿尾砂资源现状，为了使这部分有价金属元素得到充分、有效利用，为了确保选择的选矿工艺流程符合该矿石性质，建议对该矿石中铜、钴的综合回收作选矿流程试验。根据选矿流程试验提供的流程结构和技术数据进行选厂设计以保证今后能正常生产。

设备投资：

按日处理350吨矿石估算（价格：人民币）

作业	设备名称型号规格	台数	功率（KW）		单价（万元）	金额（万元）
			单机	合计		
磨矿	Φ1500×3000 球磨机	1	95	95	50	50
分级	Φ1200 沉没式螺旋分级机	1	7.5	7.5	20	20
加药搅拌	Φ1500 搅拌桶	1	3.0	3.0	2.0	2.0
浮铜粗选	XJK1.1　5A 浮选机	4	5.5	22	1.3	5.2
浮铜扫选	XJK1.1　5A 浮选机	1	5.5	22	1.3	5.2
浮铜精选	XJK1.1　5A 浮选机	4	2.2	8.8	0.8	3.2
其他设备						50.0
合计				158.3		150.0

注：设备不含备用设备，以上数字仅供参考。

四．Summary

1. The Nimpkish Iron Ore tailing sands:

1#sample contains：Cu　0.19%,　Co　0.015%,　S　%,　Fe　14,17%.

2#sample contains：Cu　0.16%,　Co　0.014%,　S　%,　Fe　16,66%.

The test results show that the contents of Cu, Co, S and Fe in1 # and 2 # samples are almost the same. Because of the limited content of single sample and the similar composition of the two samples, the two samples are mixed as a composite sample.

The test results of composite sample show that the sample contains Cu　0.169%,　Co 0.0143%,　S　%,　Fe　16,66%. There are some Iron, copper, sulphur and its associated elements in the sample, which have corresponding recovery value.

2. Since the mine tailings resources have stacked there more than half a century, part of the ore properties have been changed under the influence of natural environment such as: wind, sun and rain. At the same time, the weathering, oxidation, erosion, of the ore will also bring new difficulty to processing.

3. The sieve analysis results of the composite sample show that since the production rate of particle size + 0.25 mm is more than 60%, and the oxidation of iron ore produces agglomerates, grinding must be conducted before the separation process.

4. It is not effective to adopt the gravity separation and magnetic - gravity separation technologies to recover the valuable metal minerals (copper and cobalt) from the Nimpkish iron ore tailing sand.

5. It is feasible and effective to use collector ($C_3H_5NaOS_2$) and frother (pinitol oil also known as the no. 2 oil) to recover valuable minerals (copper and cobalt) from the Nimpkish Iron Ore tailing sands through flotation. Because collector ($C_3H_5NaOS_2$) and frother (pinitol oil) are cheap, easy to get or produce, and they are most widely used at sulfide ores home and abroad. One time roughing can obtain Cu2.29 % with the recovery rate being 78.31%, and Co0.17 % with the recovery rate being 54.55%.

6. It is feasible and effective to adopt flotation technology and reagent regime to recover valuable minerals (copper and cobalt) from the Nimpkish Iron Ore tailing sands. According to current situation of Nimpkish iron ore tailing sand, in order to make full use of the valuable minerals and ensure the selection of ore dressing process conforms to the ore properties, we suggest to make beneficiation process test to recover copper and cobalt from the mine comprehensively. The mill plant design will be done based on the process structure and technical data provided by the beneficiation process test to ensure the normal production in the future.

Investment in equipment:

The estimation is made based on daily processing 350 tons of ore (price: RMB)

Production	The device name, model ,specifications	Number	Power（KW）		Unit price (ten thousand yuan)	Total amount (ten thousand yuan)
			Single machine	total		
grinding	Φ1500×3000 ball mill	1	95	95	50	50
classification	Φ1200submerged spiral classifier	1	7.5	7.5	20	20
stir in medicine	Φ1500 mixing barrel	1	3.0	3.0	2.0	2.0
float copper roughing	XJK1.1 5A flotation machine	4	5.5	22	1.3	5.2
float copper scavenging	XJK1.1 5A flotation machine	1	5.5	22	1.3	5.2
float copper cleaning	XJK1.1 5A flotation machine	4	2.2	8.8	0.8	3.2
Other equipment						50.0
total				158.3		150.0

Note: the device contains no backup device, the above figures are for reference only.

五、浮选药剂的基本成分、性质和用途

浮选药剂选择的是国内外硫化矿应用最广泛的一类捕收剂（黄药）和起泡剂（松醇油也通称为二号油）。

1，黄药的基本成分、性质和用途

黄药是醇与氢氧化钠作用生成醇钠，再加入二硫化碳而成。为淡黄色粉状颗粒，具

蒜臭味，易溶于水，易氧化，遇酸、受热易分解。黄药与多种金属离子作用，形成难溶性的黄原酸盐，这是黄药能作为捕收剂的主要原因。黄药主要用于：（1）浮选有色金属硫化矿。（2）浮选自然金属。（3）浮选经硫化作用后的有色金属氧化矿。

五、The basic composition, properties and uses of flotation reagents

The flotation reagents we choose are collector ($C_3H_5NaOS_2$) and frother (pinitol oil) which are most widely used at sulfide ores home and abroad.

1. The basic composition, properties and uses of $C_3H_5NaOS_2$

Alcohol and sodium hydroxide generate alcohol sodium which generate $C_3H_5NaOS_2$ after adding carbon disulfide. $C_3H_5NaOS_2$ is a kind of light yellow powder particles with garlic smell, which is easily soluble in water, easy to oxidize, and decomposes when meet acid, or be heated. When $C_3H_5NaOS_2$ reacts with various metal ions, they generate xanthate salt which is difficult to solubilize, which is the main reason for $C_3H_5NaOS_2$ to be used as a collector. The main uses of $C_3H_5NaOS_2$ are: (1) to flotate non-ferrous metal sulfide ore.（2）to flotate natural metal. (3) to flotate non-ferrous metal oxide ore after sulfuration.

2，二号油的基本成分、性质和用途

2. The basic composition, properties and uses of No.2 oil

二号油是由松醇油水合而成的有机化合物。呈黄棕色油状透明液体，用于浮选作起泡剂。

No.2 oil are organic compounds by terpineol hydration into. A yellowish brown oily transparent liquid, used as the foaming agent for flotation.

黄药，二号油价格便宜，来源广，易于生产。

黄药价格：13 元/Kg， 二号油价格： 8.0 元/Kg。

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赣州有色冶金研究所简介：赣州有色冶金研究所隶属于江西钨业集团公司，是全国最早的八个有色金属研究院所之一，具有 60 多年的历史。当时是以钨的选矿和分析检测为主的。在钨、锡、稀土和多金属矿回收方面具有较强实力。有自主知识产权的高梯度强磁选机、离心机等系列产品，钨、稀土产品的分析检测是国家级认可的商品检测实验室。还有采矿、冶金、稀土新材料、自动化、环保检测等专业实验室。