Geology

The Jib is a typical pyrometasomatic magnetite deposit in the typical setting. The geology is illustrated by Figure 39, a plan of the shoreline, and Figure 41, which is a longitudinal vertical section on the western fringes of the orebodies, and by Figure 40, two vertical cross-sections. The stratified succession includes Karmutsen Formation and Kunga Formation massive grey limestone and flaggy black limestone members. All these rocks have characteristics normal for the units as described on pages 50 to 61. The Karmutsen Formation is formed of massive amygdaloidal basalt flows that are fairly well chloritized. Since sills found within the limestone are very similar to these basalts, doubt may occur regarding correlation of specific areas of this type of rock. The grey limestone is shown by the drilling to have a total thickness of about 775 feet. Only the basal 100 feet of the flaggy black limestone is encountered on the showings or in the drill-holes. Although collections from the massive limestone are indeterminate, the palaeontological control of one horizon of these rocks is precise, for collections on the property from two localities 20 feet above the base of the flaggy black limestone indicate an Upper Karnian age probably correlatable with the Tropites welleri zone (see p. 60). Both limestone units are bleached and recrystallized in part. The massive grey limestone has a pronounced bedding cleavage in the main bay, whereas the flaggy limestone exhibits boudinage of the more massive beds at the northern outcrop area. The stratified rocks are intruded by dykes and sills and by the Burnaby Batholith. This latter body is composed chiefly of melanocratic quartz monzonite. A sheared, skarnified contact of Karmutsen greenstone and the batholith is exposed in the little bay north of the showings. Highly altered granitoid rock that was penetrated in diamond-drill hole S-7 at 871 feet may be the main body or possibly a dyke from it. The dykes and sills consist of three groups. The earliest are basaltic greenstones, in all respects very similar to the Karmutsen flows. These rocks also occur within the Kunga massive limestone throughout the area surrounding Skin|cuttle Inlet. They resemble the Karmutsen flows lithologically, and structurally are mostly quite conformable, but they also occur as dykes, can be seen to have a minor crosscutting relationship with beds, and occur in varying stratigraphic positions in different areas. They probably are penecontemporaneous with deposition of the limestone and represent the last pulse of Karmutsen volcanism. The volcanic area south of the main bay is such a sill as can be seen best in section (Fig. 41). The second group of dykes are diorite porphyries similar to ones at other major metasomatic deposits. Their relationships at the Jib are not well known, for they do not occur on the surface. They are skarnified and may be replaced by magnetite. At other properties they pre-date the main plutonic body and probably represent an early phase. The third group are late basalts to andesites that are post-ore and have a complicated relationship to the faulting, seeming largely to post-date major faulting but may pre-date late movement. Many are completely undeformed and have crudely developed columnar jointing normal to the walls. None are very large.

The structure of Skin|cuttle Inlet is relatively simple. Gently dipping panels which trend east to northeast and dip northward are cut into a mosaic pattern by steep block faults. The structure near the Jib is similar with some complications. Beds generally strike north 45 degrees east and dip from 10 degrees to at most 25 degrees northwestward. There is, however, a gentle minor anticline-syncline pair in the vicinity of the main bay with axes trending west and plunging west 10 to 20 degrees (see Fig. 39). Additional complexities are the cleavage in the grey limestone and boudinage and small recumbent folds in the flaggy limestone. The axes of recumbent folds and boudins are oriented north 65 degrees east and indicate
a net movement of the upper beds southward. The bedding cleavage may well result from the intrusion of the subjacent greenstone sill. The boudinage and recumbent folds might also result from dilation pressures on the intrusion of greenstone sills, but the orientation of axes is nearly normal to the contact of the Burnaby Batholith, so that it may well result from an outward thrust at a high level during emplacement of this body.

Three well-defined block faults near the Jib are oriented north 45 degrees east, north 75 degrees west, and north 30 degrees west. The largest is the fault oriented north 45 degrees east which apparently dropped the southeast block 1,100 feet, assuming the greenstone on the west is truly Karmutsen Formation. The other two definite faults have some strike indicating late horizontal movement, but the main stratigraphic indications are of normal movement of 50 to 150 feet with the north and the northeast blocks down. Two other important faults are believed to exist but are relatively poorly known or defined. One parallels the contact with the batholith, (around north 60 degrees west) which is highly sheared and slightly skarned on the shore. Parallel to this, minor shears occur in the greenstone. The other fault is known only from drill holes and has a similar orientation (north 55 degrees west) and may in fact be the same fault. It appears to be a steep fault that drops the northeast block 100 to 150 feet. Precise information on the relative ages of faulting is lacking. Most faults appear to be pre-ore in part (because skarn and magnetite are emplaced along the fault lines), but most have also been subject to post-ore movement, offsetting even some of the late basalt dykes.

Orebodies

Exploration has not yet fully tested the magnetic anomalies on the Jib group. Some anomalies offshore have not been drilled at all, and one of the more important has been penetrated by only one hole. Hence analysis and conclusions regarding the orebodies are preliminary.

The mineralogy of the ore and skarn is typical of the Queen Charlotte Islands pyrometasomatic deposits, with slight variations. On the whole the ore is fairly pure magnetite, but every gradation occurs to skarn with trace amounts of magnetite. Hematite occurs in some skarns in preference to magnetite. Sulphides are quite erratic and are chiefly pyrite, rarely chalcopyrite or pyrrhotite, and very rarely sphalerite. The average tenor of sulphur in ore is only 0.2 per cent; of Cu, 0.02 per cent; TiO₂, 0.08 per cent; and of P, 0.05 per cent. Skarn minerals are variably developed. Some skarns are nearly pure light-brown garnetite, and in others epidote, actinolite, pyroxene, or chlorite may be dominant but seldom without much of the other skarn minerals. Quartz and calcite are common accessory minerals but are never dominant.

The Jib has two distinct groups of orebodies—one at the base of the limestone called the underlime orebody and the other within the massive limestone but concentrated about greenstone sills. The underlime deposit is on the whole a conformable body replacing the uppermost part of the Karmutsen Formation and to a lesser extent the basal Kunga limestone. It has a crest more than 40 feet thick elongated in a north 10 degrees west orientation. At the southern part in diamond-drill hole S 23, the body is very much thicker and penetrates well up into the limestone. This may represent a vertical pipe or conduit and may connect the underlime with the upper bodies. Nearly everywhere the lower magnetite orebody is separated from
Figure 40: JIB, Vertical Sections

Legend
- Skarn, Ore
- Burnaby Batholith
- Greenstone sills
- Kanga flaggy black limestone member
- Kanga massive limestone member
- Karmutsen Formation

Scale: 50 100 200 Feet

Bearing - N. 50° E.

Bearing - N. 52° 30' E.
adjacent greenstone or limestone by a thin sheath of skarn, and in general the under-
limestone deposit is slightly less pure than the upper bodies, containing more skarn
minerals.

The upper orebodies are less regular than the underlimestone but are generally
higher grade and commonly considerably thicker. The sections show that only the
thickest sections are in continuous ore; toward the fringes they tend to fray out
into two or more bodies separated by skarn, greenstone, or limestone. Skarn is a
common transitional rock between ore and greenstone or limestone, but it does not
form such a continuous sheath or envelope as it does in the underlimestone deposit. It is
clear from the sections that the orebodies replace the greenstone sills, particularly
the contacts of the sills. Essentially one can say, no greenstone sill, no ore. Other
factors must also be important but not all are clear. The thicker sections seem to
be related areally to some of the faults, particularly the main fault through the ore
zone (north 55 degrees west).

Reserves

As a result of the 1693 drilling, the company announced reserves of 2.5 million
tons of reasonably assured ore and 1.5 million tons of possible ore. Total reserves
were estimated in a short article by the engineering staff of the company after the
1965 drilling (Western Miner, p. 97) to be 8,200,000 tons of ore grading 49.45
per cent soluble iron.

[References: Minister of Mines, B.C., Ann. Repts., 1962, pp. 13–14; 1963,
pp. 18–21; Western Miner, October, 1965, p. 97.]

Cupriferous skarn showings occur on most of the Copper Islands
Copper Islands but particularly on Skincuttle and East Copper Islands. These
(31, 32) showings have been held by located claims, sometimes as a group
by one owner, sometimes separately. At present they are held
as follows: Skincuttle Island, part of Jib “B” group; George Island, Sandy Nos.
1 to 4; East Copper Island, Elma group—five claims. These showings were
discovered first by Francis Poole in 1862–63 and rediscovered by A. Heino in 1900.
The Skincuttle Island showings were held in 1902–07 by Law, Hamilton, and Raper
but were located later by Heino, who worked at times on all these showings and
others on Burnaby Island for more than 30 years. Most of the work was on the East
Copper Island showings, which were variously called the Red Raven, Quinitsa, or
Skincuttle Entrance. Workings include a 150-foot adit essentially at sea-level and
two shafts, one reportedly 100 feet deep with a 180-foot crosscut. By means of his
own boat, Heino made many small shipments to Tacoma, of which there is little
record, but in 1916–17 he is recorded as having shipped 55 tons of sorted ore which
contained: Silver, 23 ounces; copper, 15,725 pounds. In recent years the showings
have been repeatedly examined and a minor amount of packsack drilling has been
done on East Copper Island, but nothing further. On Skincuttle Island there are
two small shafts, one reportedly sunk by Poole. Recent work includes a magnet-
ometer survey at sea off the island by Burnaby Iron Mines Limited in 1964.

The Copper Island showings are formed entirely of the Kunga grey limestone
member and intrusive sills of amygdaloidal andesite to basalt not greatly different
from the Karmutsen flows. These rocks strike east, dip 10 to 30 degrees north, and
are cut by small steep block faults oriented chiefly either north, northwest, or
westerly. Granitic rocks do not outcrop on the islands but most likely occur at no
great distance to the north, judging by the projected contact of the Burnaby Batholith. The showings are mainly garnet-rich skarns carrying some disseminated chalcopyrites and minor magnetite and pyrite. Bornite, tennantite, and cuprite are said to occur in minute amounts, and malachite stain is common. The skarn zones follow the bedding attitudes at contacts with the sills and principally replace the volcanic rocks. Some of the disseminated chalcopyrite extends into adjacent unskarnified limestone. The skarn zones can be traced hundreds of feet horizontally along strike but are rarely as thick as 10 feet. In addition to the disseminated mineralization in the bedded garnet skarn, there are small chalcopyrite veinlets transecting the bedding in and near skarns and quartz veins with traces of chalcopyrite in some of the block faults.


This property is on the lower part of the creek just east of Harriet Lucky Seven Harbour that is the main source of water for the Jedway mill. (34) It is held by Jedway Iron Ore Limited by the located claim Pipe No. 6. The Lucky Seven, also called the Dorathkalon and Producer groups, was a small shipper of hand-cobbled copper ore. This showing was probably located in 1915 by H. E. Bodine. The next year a 50-foot inclined shaft and 60-foot drift were developed and 42 tons of ore shipped, which contained: Gold, 60 ounces; silver, 218 ounces; copper, 8,336 pounds. In 1917-18 a 375-foot adit was driven and a 100-foot raise developed to the drift.

The Lucky Seven showing is a sulphide vein that in the drift averaged 18 inches wide, composed largely of the sulphides, chalcopyrite, pyrite, and pyrrhotite with traces of sphalerite. The vein is contained in Kunga black limestone member. The developments in 1917-18 did not prove up much new ore. This vein is representative of what might be called leakage-type deposits associated areally with metasomatic deposits.


The Jessie mine is the main source of ore for Jedway Iron Ore Limited and was the only producing property for Jedway until the small Adonis pit started production in September, 1964. (35, 36) It is situated on the ridge between Harriet Harbour and Ikeda Cove, about 1½ miles from the mill, concentrate storage, and dock at the entrance to Harriet Harbour. The Jessie property is held by Jedway Iron Ore Limited, a subsidiary of The Granby Mining Company Limited. Ownership is complicated. Jedway holds 61 claims by record, has three mineral leases that include four reverted Crown-granted claims (Mineral Lease 2, Adonis, Lot 1863; Mineral Lease 37, Hot Punch, Lot 1976, and Iron Duke, Lot 1977; and Mineral Lease 105, Jessie, Lot 1861), and 10 Crown-granted claims as follows: Moresby Island, Lot 78; Magnet, Lot 79; Blue Belle, Lot 80; Ajax, Lot 81; Sandwich Fraction, Lot 92; Emma, Lot 854; Della, Lot 2597; Lizzie B, Lot 2604; Cypress Queen, Lot 2607; Mattie H. Fraction, Lot 2608. In addition, Granby holds 64 recorded claims in the vicinity. Thus the property now includes a number of showings that were originally explored separately. Some of these are described separately in this report, including the Adonis (37), Magnet (44), Plunger (56), Producer (34), Reco (42), Moresby Island (46), Dingó (Blue Belle) (43), and Eagle Tree (47).
The first exploration on the property was in 1863 by Francis Poole, at a showing of magnetite, skarn, and minor sulphides on the shore just south of the dock. This is presently on the Tip No. 1 claim. It was described by Dawson (1880, pp. 54–55n) in some detail. The Jessie claim was first mentioned with one called the Harriet in the 1908 Annual Report and was described as having had considerable work done, presumably trenching and surveying. The Jessie showings are not rich in chalcopyrite, so that interest lapsed. Young and Uglow (1926, pp. 39–42) described the magnetite showing in some detail. Little further work was done until 1956, when Dr. J. M. Black, for Western Canada Steel Limited, explored the area and conducted a magnetometer survey over the showings. In 1959 Silver Standard Mines Limited acquired options on the key claims and started a drill programme which by 1960 had outlined some 2,500,000 tons of ore. In January, 1961, The Granby Mining Company Limited optioned the property, and after some additional drilling purchased it and formed Jedway Iron Ore Limited to operate the property. Production started in late summer, 1962, and the first concentrates were shipped in October, 1962. The reserves at the start of production were stated to be 4,700,000 tons, which would produce 2,570,000 tons of concentrate. The company had a contract with Sumitomo Shoji Kaisha for 2,000,000 tons of concentrate to be supplied over five years. At the start of production it was anticipated only 2,000,000 tons of ore would be mined by open-pit methods, but this was revised and a larger ultimate pit with higher stripping ratios was planned in 1964 (see Plate XVIIIb). In the same year some ore was contributed by the nearby Adonis (37) orebody, and in 1966 from the Rose (39). Preparation for underground mining was started during 1965 with production in 1966.

Production from the Jessie pit has been as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Tonnage Mined</th>
<th>Concentrate</th>
<th>Grade Iron (Per Cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Produced</td>
<td>Shipped</td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>166,430</td>
<td>87,385</td>
<td>53,515</td>
</tr>
<tr>
<td>1963</td>
<td>700,553</td>
<td>357,297</td>
<td>339,008</td>
</tr>
<tr>
<td>1964</td>
<td>587,333</td>
<td>351,852</td>
<td>363,136</td>
</tr>
<tr>
<td></td>
<td>(601,907)</td>
<td>(418,966)</td>
<td>(449,390)</td>
</tr>
<tr>
<td>1965</td>
<td>852,011</td>
<td>402,731</td>
<td>395,442</td>
</tr>
<tr>
<td>Total</td>
<td>2,412,901</td>
<td>1,264,279</td>
<td>1,217,204</td>
</tr>
</tbody>
</table>

1 Short dry tons.
2 Figures in parentheses include Adonis production.

Some 12,371,600 tons of waste was removed to the end of 1965, with an overall stripping ratio of 5:1.

Recoverable reserves as of January 1, 1966, were calculated to be 369,100 tons in the pit and 569,500 tons in one underground stope, for a total of 938,600 tons grading 35 per cent magnetic iron. An additional 962,800 tons of the same grade exists underground but is judged to be presently uneconomic.

**Geology**

The Jessie orebody is one of the standards by which other pyrometasomatic deposits in the Queen Charlotte Islands are judged. It is better known than all others because not only has it been extensively explored by drilling, but also it is the only one to have been extensively exposed by mining.
The geology is illustrated by a plan (Fig. 42) showing an early stage in the life of the pit (June, 1963) and also the 150 and 450 adits, and by a representative vertical section (Fig. 43). The stratified succession includes altered basalts of the upper part of the Karmutsen Formation and the lower part of the Kunga Formation, including all of the lower and middle limestone member and several hundred feet of the argillite member. These rocks are cut by a sequence of intrusive bodies, large and small, which, from oldest to youngest, are:

1. Greenstones and glomeroporphyry greenstones related in nature and age to the Karmutsen flows.
2. Diorite porphyry dykes, sills, and small irregular bodies.
3. Diorite to quartz diorite of the Jedway stock.
4. Rhyolite dykes.
5. Small andesitic to basaltic dykes.

The period of skarnification and mineralization separates the intrusion of the dykes, (4) and (5), from the earlier bodies.

The Karmutsen Formation is composed of greenstones that may be amygdaloidal or finely glomeroporphyritic but otherwise are fairly textureless. It is likely that the glomeroporphyritic greenstones are actually sills of related age and lithology rather than flows. Some limestone lenses are definitely present in the upper part of the greenstones. The two limestone members of the Kunga Formation are inordinately thin at the Jessie mine in comparison with nearby localities and particularly with the thicknesses present on the Copper Islands, Jib group, and southern Burnaby Island. The basal massive grey limestone member is only about 50 to 100 feet thick and the flaggy black limestone member only about 250 feet thick. In contrast, the argillite member is of normal thickness.

The diorite porphyries vary considerably in appearance because of differing colours and contrast between plagioclase phenocrysts and matrix. These differences are entirely superficial and result from slight differences in alteration and metamorphism. Most commonly the porphyries are formed of 40 to 50 per cent prominent white phenocrysts of plagioclase (zoned An\textsubscript{40±1} to 3 millimetres long) with about 5 per cent chloritized amphibole in a light- to dark-green matrix formed mainly of very fine andesine and chlorite, and minor quartz, magnetite, and sphene. The diorite porphyry dykes are truncated by the Jedway stock and do not occur in the adits below the pit. The Jedway stock is composed of fairly uniform medium-grained diorite to quartz diorite that on the average is composed of about 50 per cent of zoned andesine with sub-equal amounts of hornblende, quartz, and orthoclase (10 to 15 per cent), and some biotite and magnetite. The rocks exposed in the Jessie pit or nearby are visibly bleached in comparison with the normal quartz diorite.

Post-ore dykes in the pit are small and insignificant, but in the nearby area and in the adits below they are relatively common. Buff-coloured aphanitic rhyolites form the largest ones. These may carry 2 to 5 per cent quartz phenocrysts in a very fine spherulitic quartz and feldspar matrix. Commonly they are flow banded and may have a parallel platy cleavage. They occur near the coarse crusher and in the adits below, but are not exposed in the pit. The smaller basic dykes are either andesites or basalts, and are dark-green to grey brown-weathering finely spherulitic rocks composed of fine andesine, augite, and chlorite with sphene or leucoxene. Both dyke types are undeformed and follow large faults without being sheared but may be offset by small amounts. They appear to be of roughly equivalent age,
although in one locality basalt was observed cutting rhyolite. By the nature and relative age it appears likely that they are part of the Masset dyke swarm.

Alteration including metamorphism and metasomatism has affected all but the post-ore dykes to a considerable degree. Karmutsen flows and related sills have been subjected to complicated overlapping periods of alteration with resulting variety in effects. These rocks appear to have been subjected to an early chloritization which was followed or graded into a partial amphibolitization and then to a related sequence of skarnification and ore replacement. This, depending on intensity, ranged from complete or partial replacement by garnet, epidote, or magnetite with new actinolite, and chlorite. The fringe areas of this alteration are intensely chloritized. In addition, adjacent to the quartz diorite contact are patchy areas of contaminated diorite to granitized greenstone and nearby much calcite filled fracturing. In comparison with the greenstones, the limestones have not been much altered, although somewhat bleached and recrystallized. Very little skarn or ore replaces the limestone. On the other hand, the flaggy argillites overlying the limestones have been subjected to patchy bleaching and slight hornfelsing. In these areas, pyrite-coated fractures and replacement of laminae are relatively common. The diorite porphyry resists alteration, skarnification, and ore replacement, but all these processes have affected selected locales. The commonest alteration to the porphyries is variable chloritization of mafic minerals and matrix and intense sericitization of the feldspars. This may be accompanied by reddish fine ferrodolomitic replacement of the matrix. Replacement by garnet, epidote, or magnetite is less common than in adjacent greenstone, and as a result some dykes appear to cut the ore, although all are pre-ore. The Jedway diorite to quartz diorite below the contact has apparently been depleted in mafic minerals, and those present are intensely chloritized. A faulted tongue of diorite within the ore zone is more highly altered to a bleached talcose rock with remnant granitoid texture. A minor part of this tongue is replaced by skarn minerals and magnetite.

Structure

The Jessie orebodies are on the northern flank of a westward-trending domal anticline near its intersection by a north 40 degrees west fold and fault structure of presumably younger age. This intersection may well have been a main reason for this localization of the intrusion of the Jedway stock. The ore is primarily in the Karmutsen greenstones adjacent to and above the contact with the stock, and most of the ore lenses are conformable with bedding. The stratified rocks at the Jessie, except immediately adjacent to faults, strike within 10 degrees of east and west and dip 45 to 75 degrees north, with the average dip probably about 50 to 55 degrees. In the upper part of the pit a sharp antilimic-syncline pair was exposed. These folds either were non-stratiform or minor greenstone bodies penetrated and disrupted them in part. An irregular body of diorite porphyry partially followed the warped limestone-greenstone contact, forming a small irregular basin beneath the syncline with a stem-like conduit below. The section used (Fig. 43) does not illustrate these upper structures well.

Faults of moderate and small size are numerous in the pit area, with two major orientations: northerly with an eastward dip of 45 to 75 degrees, and north 60 to 80 degrees east with a similar range of southward dips. The northerly faults are apparently the larger and in some instances offset the easterly faults. Four important
northerly faults occur in the pit zone, numbered from east to west. No. 1 and No. 4 are the largest fault zones. Nos. 1, 3, and 4 strike north 20 degrees, 0 degrees, and 15 degrees west respectively, whereas No. 2 cuts from No. 3 to No. 4 striking about north 5 degrees east. Nos. 3 and 4 are steeper than Nos. 1 and 2, averaging about 75 degrees east in contrast to 60 degrees. Of the easterly faults, two are important—one at the north and one at the south of the pit. Judging by the variety of orientations of striiz on fault planes, fault movement is complicated. No. 1 fault zone has an apparent total of 400 feet right-hand offset. Actual movement probably combines right hand with normal movement, both of the order of 200 feet. No. 4 fault may have been subjected to movement of about the same amount, but No. 2, No. 3, and the easterly faults have likely been subjected to less movement.

Orebodies

The orebodies occur in a zone essentially concordant with bedding that includes several bands of magnetite ore separated by skarn, chloritic greenstone, or diorite porphyry. In general there are three bands of ore—the upper one about 100 to 120 feet below the Kunga contact and about 20 feet thick, the main or intermediate band about 20 to 40 feet below and about 40 to 80 feet thick, and a lower band some 80 to 100 feet below the main band and 20 to 25 feet thick. The bands maintain their character over 800 feet of dip and strike length but tend to coalesce at the upper elevations in the vicinity of the basin-like mass of diorite porphyry and limestone. Skarn does not form a complete sheath about the individual bands but is common as a transition from magnetite ore to chloritic greenstone. The ore bands as they reach a major fault zone, No. 1 or the southern east-west fault in particular, follow up the fault zones. Indeed, the uppermost exposures of ore all resembled dykes following the faults. As stripping progressed, these enlarged downward and then diverged into the bedding attitudes. There is little evidence to suggest that the ore replaces limestone beds in the Upper Karmutsen, although some limestone beds do exist. The ore and skarn in general contain many remnants that in all respects resemble altered greenstone.


Adonis

The Adonis orebody is on the Adonis Crown-granted claim, Lot 1865, and extends onto the Sweet Pea Crown-granted claim, Lot 68. The showings are between Harriet Harbour and Ikeda Cove from about 500 to 600 feet elevation on the Ikeda side of the ridge. They are about half-way between the Jessie and Lily mines. The Adonis claim is held by mineral lease by Jedway Iron Ore Limited, but the Sweet Pea is held by Falconbridge Nickel Mines Limited, and any ore mined on it will be on a royalty basis to that company.

The Adonis magnetite showing was probably discovered about 1906-08, although there is little record of the early history. Silver Standard Mines Limited in 1959 and 1960 carried out the first extensive prospecting by reconnaissance magnetometer survey and then drilled 13 EX holes totalling 1,081 feet on it. Later
Jedway mapped it in detail in 1964 and drilled nine AX holes totalling 1,668 feet. This work proved the presence of a small orebody. A mile of road was built to connect with the Jessie system, and a pit prepared for production which began in September, 1964. In that year 106,674 tons of ore was produced. In 1965 additional drilling totalling 1,094 feet in five AX holes in line across the extension of the ore showing in the pit face proved up another 137,000 tons of ore that has a reasonable stripping ratio. It occurs in a westerly trending zone that extends onto the Sweet Pea claim.

**Geology**

The Adonis deposit is another pyrometasomatic magnetite deposit that occurs in the normal setting. The ore lies at the lower contact of limestone and Karmutsen greenstones. The limestone may be a lens in the top of the Karmutsen Formation rather than the Kunga Formation, because it is apparently overlain by some greenstones and is structurally below the Kunga limestone at the adjacent Jessie pit. Alternatively it may be a down-faulted repetition of the Kunga-Karmutsen contact. The limestone is about 100 feet thick and strikes about north 75 degrees east and dips 45 degrees north through most of the drilled section but flattens to the north. The lower contact is complicated by a sill-like body of diorite porphyry and minor diorite, and the orebody. The ore appears largely to replace greenstone but also definitely replaces some limestone and may replace diorite porphyry. The latter is in part altered to skarn. Post-ore sugary-textured green andesite sills are common. The ore is contained in a small block bounded by steep faults about 180 feet apart trending about north 65 degrees east. Fault movement appears to have been chiefly horizontal but may also have dropped the contained block. The faults are pre-ore, for narrow ore lenses occur along them. Two linear magnetic anomalies with orientations similar to these faults occur on the Adonis claim—one on the projection of the southern of the two faults and the other 500 feet to the south near the boundary of the claim.


**Lily**

The Lily copper mine is located three-quarters of a mile west of the head of Ikeda Cove and has four portals between 264 and 594 feet elevation. The Lily claim, Lot 66, is the centre of a large group of claims including 20 Crown-granted claims, 3 mineral leases of former Crown-granted claims, and 10 located claims, all held by Falconbridge Nickel Mines Limited. This group includes the Rose, Lot 1871 (see p. 206), Sweet Pea, Lot 68 (see p. 202), Sadie, Lot 2610, and Spade Flush, Lot 2612 (see Thunder, p. 211).

The Lily showings were discovered about 1900 by A. Ikeda or members of his fishing company, who prospected the area as a result of finding chalcopyrite float on the beach. The fishing company developed and shipped the easily mined ore, with production starting in 1906. By 1909 the easy mining was finished, and grade and tonnage dropped. A new company, Ikeda Mines Limited, was formed in Vancouver, and a programme of exploration and development started which included 2,520 feet of diamond drilling. Claims were surveyed in 1911 and Crown granted in 1912. Mining was renewed in 1915 and continued until 1920. The production figures are as follows:
There was little interest in the mine or the area from 1920 until 1943, when St. Eugene Mining Corporation bought the Crown-granted claims still valid and later obtained mineral leases on the others or staked located claims so that most of the original block was again held. Exploration of the Lily property was delayed until 1956, when it was examined and sampled in detail. Work in the succeeding years was generally minor, except in 1964, when seven AX holes totalling 1,774 feet were drilled.

<table>
<thead>
<tr>
<th>Year</th>
<th>Tonnage Mined</th>
<th>Gold (Oz.)</th>
<th>Silver (Oz.)</th>
<th>Copper (Lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1906</td>
<td>4</td>
<td>2</td>
<td>76</td>
<td>1,293</td>
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<td>671</td>
<td>165</td>
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<td>693</td>
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<td>1909</td>
<td>4,260</td>
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<tr>
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<td>355</td>
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<td>1915</td>
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<td>135</td>
<td>1,977</td>
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<td>153</td>
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<td>58</td>
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<td>14,780</td>
<td>1,046</td>
<td>27,732</td>
<td>1,265,581</td>
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Fig. 44. Plan and elevation, Lily mine.
Mine development consists of four adits; three are close together with portals at 264, 308, and 324 feet elevation respectively, and the No. 1 or upper adit is at 594 feet (see Fig. 44). The main entry is the lowest or No. 3 adit. It is 660 feet long, and two stopes, a winze, and sublevel are developed from it. One stope on No. 1 shoot is near the portal, connects with the other lower levels, and opens to the surface. The other stope starts about 550 feet from the portal and extends a maximum of 50 feet up dip. A 110-foot winze inclined at 45 degrees with a 138-foot sublevel crosscut to the east is developed 260 feet from the portal. All adits are blocked and entry can only be gained through the open stopes, and the writer has not done this so that the following account of the geology is dependent almost entirely on the references.

**Geology**

The Lily mine is in the top of the Karmutsen Formation. Limestone exposed in the main workings is most likely one of the lenses in the top of this formation rather than Kunga limestone, although the limestone at the No. 1 adit is clearly Kunga Formation. The rocks locally strike about north 50 degrees east and dip about 35 degrees east, which is somewhat discordant to the expected attitude related to the domal anticline from Harriet Harbour to Ikeda Cove. Outcrop is rare in the area and the significance of this discordance is not known. The greenstone and limestone are flanked on the west by a sill-like body of fine diorite. Three sub-parallel "veins" occur, of which one has produced most of the ore from two shoots. The two veins of the main workings are in effect mineralized shear zones parallel or subparallel with bedding, with widths up to 25 feet between usually well-defined walls. These veins consist apparently of highly altered, sheared, and replaced greenstone and now are composed of chlorite, actinolite, quartz, and calcite with pyrite, chalcopyrite, magnetite, pyrrhotite, and traces of sphalerite. The sulphides occur as streaks and bands, especially at the walls, as disseminated blebs, and as larger irregular masses. Late diabase to basalt dykes cut the shears and ore without offset. The "vein" of the No. 1 adit differs in being a thin planar magnetite-rich skarn lens at the contact of Kunga and Karmutsen Formations. The drilling in 1964 shows this body continues south of the adit to the claim boundary and is responsible for a magnetic anomaly there present. The widths are all less than 10 feet and the body is copper-poor.

The main Lily orebodies are not typical copper-rich metasomatic deposits but represent an extreme variant that belongs to this group. The Lily ore is found in the typical stratigraphic locale, but the structural setting differs from surrounding typical pyrometasomatic iron-copper deposits including the No. 1 adit "vein." The Lily ore clearly replaces volcanic rocks but in a bedded shear zone and without the full array of skarn minerals, containing only actinolite, chlorite, magnetite, and pyrrhotite.

The main vein has been followed continuously in No. 3 adit for 670 feet, and in this distance two shoots of economic grade and width were mined—No. 1 shoot for about 250 feet of length and No. 2 for 140 feet. No. 1 shoot was mined over 110 feet of dip length and was developed by the winze over another 110 feet. No. 2 shoot was only partially mined up dip for 50 feet. This vein shear strikes on the average north 10 degrees east and dips east 35 degrees in No. 2 shoot and 45 degrees in No. 1 shoot. No. 31 shoot is a separate subparallel vein about 40 feet in the hangingwall of No. 1 shoot. It was narrow (1 to 3 feet) but high grade and
Fig. 45. Rose, vertical section.
was stoped over 140 feet of length. The "vein" in No. 1 adit is most likely a separate structure, although its attitude is similar.

Developed reserves are small, about 25,000 tons of 1.5 to 2 per cent copper with some gold and silver.


The Rose, a Crown-granted claim, Lot 1871, is on the ridge between Ikeda Cove and Collison Bay. The showings extend from near the ridge-top down the northwestern slope and just over the boundary onto the adjacent claims, Elva Nos. 3 and 4 and Maple. All claims are part of a large block held by Falconbridge Nickel Mines Limited, but the showings were drilled in 1965 by Jedway Iron Ore Limited and will be mined by them on a royalty basis. A road will be built to connect with the one to the Adonis, and the ore will be trucked 2 1/2 miles to the coarse crusher at the bottom of the Jessie pit.

The showings were discovered by A. Ikeda and Company some time during the period 1901-06 when they were prospecting in the vicinity of their Lily showings. Some stripping and prospecting ensued, but the magnetite bodies found were copper-poor and so were largely ignored. The Rose showings were described by Roberston and Young as the Chrysanthemum Group. Falconbridge (St. Eugene Mining Corporation) acquired the Lily and other claims in the mid-40's and did some packsack drilling in 1956 on the Rose. Silver Standard Mines Limited carried out a magnetometer survey in 1959. The Granby Mining Company Limited mapped the showings in detail in 1962, and Jedway Iron Ore Limited drilled 37 short holes totalling 4,610 feet in 1965.

Geology

The Rose is situated at the eastern end of a domal anticline adjacent to the Collison Bay stock. Outcrop in the vicinity is relatively scarce and much of what exists is of magnetite ore. The showings are contained in greenstones, with minor limestone lenses at the top of the Karmutsen Formation. The main Kunga limestone outcrops along the ridge to the northeast and southwest within about 500 feet of the showings, and should have occurred at only slight additional elevation above the present slope. The normal Karmutsen basaltic greenstones are cut by a sequence of small intrusions, most of which appear to be sills: firstly, diabase and glomeroporphyritic diabase most likely related to the flows; secondly, fine diorite porphyry; and, thirdly, medium-grained diorite. All the foregoing rocks may be skarnified and replaced by magnetite and in addition are highly chloritized. The metamorphism and metasomatism have obscured original lithologies and relationships to a considerable degree, so that distinguishing between diabase and diorite porphyry in particular is difficult. Post-ore intrusives are insignificant but include small andesite and felsite dykes.

The structure is not fully revealed, but apparently bedding strikes about north 35 degrees east and dips about 20 to 30 degrees northwestward, so that beds are essentially parallel with the slope. Pre-ore intrusive bodies, skarn bands, and orebodies generally have the same attitude. Faulting does not appear important and may be limited to small steep faults parallel to the strike, judging by the continuity of the magnetic anomalies described below.
Surface mapping (as shown by Young and Uglow and by Granby) reveals three parallel bands of scattered outcrops of magnetite over an area some 550 by 400 feet. Magnetometer anomalies connect the scatter outcrop into rather continuous bands. The sections (Fig. 45) show these anomaly bands do not result from dyke-like orebodies but from gently dipping lenses. Anomalies occur at the thicker sections and at outcrop areas. The ore and the skarn can replace any of the units except the small andesite and felsite dykes. Quite clearly porphyry and diorite are chloritized and skarned, and it is reasonably certain some of the ore replaces these rocks. Remnants of limestone on the fringes of some ore indicate this too may be replaced; however, most of the ore replaces greenstone, judged by its envelope and remnants within.

The ore varies widely in grade and sulphide content, but copper is generally quite low. Drill holes by Falconbridge adjacent to R9N13 (section N, Fig. 45) assayed over 35 feet: Iron, 66 per cent; sulphur, 0.34 per cent. A second hole drilled into the hill at 45 degrees from the same location over 37 feet assayed: Iron, 61.9 per cent; sulphur, 2.8 per cent. The average grade of magnetic iron is probably over 40 per cent and sulphur content about 1 per cent. Sufficient reserves have been outlined to warrant development, so that the drilling programme was not completed. Thus reserves are not accurately known. Drilling on rows J, L, N, and P have developed about 561,000 tons of 40 per cent magnetite iron ore with a low stripping ratio. Total reserves of twice this amount may be recoverable at a much higher stripping ratio.


The property consists of one Crown-granted claim, Lot 82, held by McMillin interests. The showings are one-quarter mile southwest of the south end of Harriet Harbour. It was discovered about 1906 and explored by a small inclined shaft and several hundred feet of diamond drilling in 1908. Since then the only significant work was done in 1956, when Silver Standard Mines Limited drilled several short packsack holes totalling about 400 feet. The deposit is a pyrometasomatic replacement of fractured Karmutsen greenstone at the contact of the Jedway stock. A small body of magnetite with some garnet and containing pyrite and chalcopyrite as veinlets trends westward from the contact and dips north about 40 degrees. The body is some 80 feet long and 4 to 8 feet wide on the surface and runs about 1.5 per cent copper.

[References: Minister of Mines, B.C., Ann. Repts., 1907, p. 67; 1929, p. 60.]

The property consists of one Crown-granted claim, Lot 80, held by Jedway Iron Ore Limited. It has commonly been called the Dingo (see Young and Uglow), although this is actually a separate showing and claim. The showing is south of Harriet Harbour at about 800 feet elevation and between the Magnet and the Moresby Island. The showing is a small pipe-like lens of magnetite with minor garnet striking northwest and dipping nearly vertically at a contact between limestone, possibly the Kunga, and Karmutsen greenstone. The main lens on the surface is about 40 feet long and 5 to 15 feet wide. In 1960 Silver Standard drilled seven EX holes totalling 554 feet and estimated reserves of 15,000 tons.
The Magnet showing is about three-quarters of a mile south of Harriet Harbour at about 1,450 to 1,600 feet elevation. The magnetite outcrop was discovered about 1906 by or for J. S. McMillin and originally called Iron Mountain. Some stripping was carried out and a 22-foot adit driven about 1908, otherwise little further work was done until Silver Standard Mines Limited optioned the property in 1956. In the fall of 1959, 22 EX holes, totalling 1,531 feet, were drilled. The Magnet claim is Crown-granted Lot 79, and is currently held by Jedway Iron Ore Limited as a result of part of the agreement between The Granby Mining Company Limited and Silver Standard Mines Limited.

Geology

The Magnet is a fairly typical example of one variety of pyrometasomatic magnetite deposit in the normal setting in which little skarn is developed beyond the ore. It is a lensoid body of magnetite and garnetite that appears to replace volcanic rocks and possibly limestone at the top of the Karmutsen Formation near the Jedway stock. The enveloping rocks are greenstones and pillow greenstones, but a lens of limestone occurs near the showings and the main Kunga grey limestone member outcrops within a few hundred feet to the north. The pillow greenstones locally strike north and dip 20 to 35 degrees westward, and the flaggy Kunga limestone to the north has a similar attitude. Fine diorite porphyry dykes are common in the Kunga flaggy limestone member, and the Jedway diorite and quartz diorite outcrop within 600 feet to the east. A moderately small-sized regional fault striking about north 55 degrees west projects to the vicinity of the Magnet orebody and may either cut it off down dip or, if pre-ore, may have been the locus of mineralization.

The surface showing is a continuous body 360 feet long and 40 to 80 feet wide with an average true thickness of about 20 feet. Drilling shows the greatest dip length to be 180 feet. The outcrop traces northwestward down the hill from the highest outcrop at about 1,600 feet. The small adit is at 1,450 feet elevation at the bottom of the natural exposure. The body is composed of massive magnetite with included pods of garnetite and some remnants of slightly epidotized volcanic rocks. Sulphide minerals are fairly rare, are concentrated along the western margin, and include pyrite, chalcopyrite, and traces of sphalerite. Some of the magnetite is reported to be lodestone. The grade of much of the exposed body is about 60 per cent iron (soluble iron) as magnetite. The diamond drilling established reserves of about 160,000 tons.


The Copper Queen showings are nearly a mile south of Harriet Harbour on either side of a small steep creek at about 950 feet elevation. The Crown-granted claim, Lot 77, is a key claim of a group including the Dingo, Lot 187, Eagle Tree, Lot 2600, Reco, Lot 82, and Modoc, Lot 83, that has been called the McMillin group. The Copper Queen has been held continuously since about 1906 by J. S. McMillin or his family. This claim was one of the first of the group to be located and has received a major share of the exploration. In 1907 and 1908 stripping, several small adits, and one long adit were started and a tram-line was cut out to the beach. In 1909 the long adit reached its target, but the results were disappointing, and the property received little more attention until 1954, when R. E. Legg drilled some short holes. The latest exploration was in 1956, when Silver Standard Mines Limited drilled nine EX holes totalling 1,222 feet.
The Copper Queen is a copper-rich pyrometasomatic deposit in the top of the Karmutsen Formation at the contact of the Jedway stock. The Karmutsen is metamorphosed to a partially amphibolitized greenstone. It appears to strike north 50 degrees east and dip about 30 degrees northward. Limestone is exposed in the creek above the showings. The Jedway stock is locally a mafic-rich quartz diorite, and has a fairly regular roof just below an elevation of 900 feet.

The workings consist of a 375-foot adit driven due south in the quartz diorite at an elevation of about 850 feet, three short adits in the surface showings, and two open cuts. Two adits are in the west bank of the creek and one in the east. Only the lowest on the west is open to the face. One open cut is at the quartz diorite contact in the west bank, the other above the adit in the east bank.

The showings are minor lenses of magnetite with chalcopyrite at the contact and a more important bedded horizon of lenses some 50 feet above the contact in the surface exposures. The main lens exposed is in the west bank and is continuous for about 40 feet on dip and 25 feet along strike in the adits and up to 10 feet thick. The margin of this lens appears to be exposed in the east bank. The long adit reaches under these showings and is almost entirely in quartz diorite, although there is some amphibolitized greenstone with disseminated magnetite near the face. The surface showing consists of massive magnetite with much chalcopyrite as streaks, blebs, and discrete veinlets cutting magnetite, and locally averages from 1 to 4 per cent copper. Pyrite, garnet, and actinolite are locally important, and malachite is present. At the fringes of the ore lens, vuggy quartz-pyrite-magnetite veinlets occur. The showings are cut by unaltered green pyritic andesite dykes trending north-south.

Diamond drilling results are not known in detail to the writer. Holes were drilled from two main positions, both near the creek, one below the showings and one just above. The holes were drilled to the south and west chiefly at angles from —20 to —60 degrees. The rocks encountered were mostly amphibolitized greenstone and quartz diorite with some feldspar porphyry and felsite dykes. Little additional ore was found.

This property, Crown-granted claim Lot 78, is held by Jedway Iron Ore Limited as one of its large group of claims. It was originally discovered by J. S. McMillin or associates about 1903–06. The showings are 1 mile south of Harriet Harbour at about 750 feet elevation northeast of the Copper Queen. They consist of a small compact body of magnetite and a zone of disseminated chalcopyrite in a lightly skarned flat-lying lens of limestone at the southern contact of the Jedway stock. The lens occurs on a spur with quartz diorite below and greenstone above, so it seems to be part of the Karmutsen Formation. The limestone is variably altered, ranging from slightly recrystallized to marbleized to skarnified with replacement by garnet, epidote, and actinolite. Disseminated chalcopyrite occurs on the surface in an area about 190 feet long and up to 30 feet wide exposed by old pits and trenches. In 1956 Silver Standard Mines Limited drilled two packsack holes totalling 100 feet through this zone. One hole dipping east at —52 degrees ended in diorite at 75 feet. Chip samples of surface showings averaged slightly over 1 per cent copper with about 1 ounce of silver per ton.

Eagle Tree
(47) This property consists of one Crown-granted claim, Lot 2600, about a mile south of Harriet Harbour. It is held by the McMillin interests. The showing, at 1,000 to 1,100 feet elevation, is a linear zone over 300 feet long and as much as 20 feet wide at the contact of the Jedway quartz diorite and Karmutsen volcanics. The contact trends about north 65 degrees east and dips steeply south. At this contact, magnetite, pyrite, and chalcopyrite occur in massive and disseminated bodies. Late rhyolite dykes are common in the area. The showings exposed by six trenches on the surface are of interest only for their copper content, which runs more than 2 per cent in some trenches. An adit crosscut 90 feet below the central trench has been driven about 220 feet to and beyond the contact but shows little mineralization. In 1956 Silver Standard Mines Limited drilled 12 EX holes totalling 1,864 feet.

[Reference: Minister of Mines, B.C., Ann. Rept., 1929, p. 60.]

Ida
(48) This property is part of the Jim group of recorded claims held by Jedway Iron Ore Limited, about a mile east of the southeast end of Huston Inlet and about 1,000 feet west of the Hercules. The showing, at an elevation of about 800 feet, is a vertical dyke-like body of magnetite-rich skarn striking north 10 degrees east. The magnetite contains green garnet and calcite in variable amounts and minor sulphides. The body can be traced for nearly 200 feet and is up to 25 feet wide.


Hercules
(49) This property is part of the Jim group of recorded claims held by Jedway Iron Ore Limited. The showing is 1¼ miles east of the southeast end of Huston Inlet at an elevation of about 1,100 feet. It was discovered about 1906 by McMillin, Watson, and McEachern. The showing consists of the irregular metasomatic replacement of the contact of the Karmutsen Formation with the Carpenter quartz monzonite stock, near the base of the Kunga limestone and is up to 100 feet thick. The purity of the skarn varies widely, much being quite garnetiferous. Some cuts and two small adits expose the ore on the steep but covered slope.


Lotus
(50) This property is part of the large block of claims held by Falconbridge Nickel Mines Limited centred on the Lily mine. It was originally the Lotus Crown-granted claim, Lot 1860, but is now held by recorded claims Ikeda Nos. 7 and 8. The showings were discovered in the period 1901-06 by prospectors of A. Ikeda & Company. They are at an elevation of about 500 feet, about three-quarters of a mile south of Ikeda Cove near the Thunder. Mineralization consists of a sulphide-rich massive replacement body at the contact of Kunga and Karmutsen Formations. The mass is composed of pyrrhotite with pyrite, chalcopyrite, and arsenopyrite. It is developed by a 75-foot-long open cut and a 120-foot-long adit at 480 feet elevation. On the surface a body of some 35 by 20 feet is exposed, and in the adit about 50 feet below a thickness of 45 feet is exposed. The grade of copper is about 0.75 per cent.

The Thunder is a Crown-granted claim, Lot 2611, one-half interest held by Mrs. Sadie Thompson, of Vancouver, and the other half by the McMillin estate, of Seattle. The Thunder adit is about one-half mile southwest of Collison Bay on the ridge between this bay and Ikeda Cove. The Thunder in the past was commonly grouped with the adjacent claims, Sadie, Lot 2610, and the Spade Flush, Lot 2612, both of which are now held by Falconbridge Nickel Mines Limited, by mineral lease. One of the Thunder showings projects onto the Sadie claim. These showings were discovered in 1907 by Ike Thompson and C. T. Daykin. A 300-foot adit was driven in 1913-14 to intersect one of the showings and some surface stripping was done. Recent exploration has mainly involved examination and magnetometer surveying, first by Falconbridge Nickel Mines Limited and then by The Granby Mining Company Limited and Jedway Iron Ore Limited.

Geology

The geology of the Thunder, Sadie, and Spade Flush was rather fully described by Young and Uglow, 1926, pages 44 to 47, and relatively little new work has been done and will not be described as fully here. However, the showings described as being on the Sadie or Spade Flush are almost entirely on the Thunder, although one of the ore zones does project onto the Sadie.

The claim is heavily mantled with overburden and timber. The isolated outcrops include numerous rock types, many of which are dykes. It is clear, however, that the country rock over most of the Thunder claim is Karmutsen greenstone, and this is true in the adit. On the Sadie claim across a gully to the south and on the ridge-top along the western part of the Thunder claim, Kunga grey limestone outcrops. Intrusive rocks on the surface and in the adit include diorite and post-ore banded felsite or rhyolite and basalt dykes. The limestone strikes about north 30 degrees east and dips gently westward. Most of the dykes, including the diorite, have a similar strike (north 10 to 50 degrees east) but dip 60 to 80 degrees eastward.

The adit has its portal near the east corner of the claim at 620 feet elevation and is driven north 62 degrees west for 320 feet. At 250 feet an irregular 70-foot drift follows a shear and orebody to the north, and at 270 feet an irregular crosscut bears to the west for 100 feet. The adit is entirely in greenstones, except for the diorite, felsite, and basalt dykes, which occur at fairly regular intervals of about 30 feet. Besides the main north-northeasterly shear, followed by the drift, there are two northerly shears (north 10 degrees west and north 25 degrees west — both dip 65 degrees eastward). A 25-foot banded rhyolite dyke striking north 30 degrees east on reaching one of the northerly shears turns and follows it north. The ore zone of magnetite, calcite, and chalcopyrite is about 12 feet wide in the drift and is followed for 80 feet. At the south end it grades sharply into garnet skarn. The shear on the east or hangingwall carried much pyrite and chalcopyrite.

Three general ore zones occur on the Thunder and extend slightly onto the neighbouring claims. Near the southwest corner at about 1,000 feet elevation a zone 500 feet long by up to 100 feet wide contains scattered exposures of magnetite, garnetite, or a mixture. A general magnetic anomaly surrounds the scattered exposures. Skarn and magnetite appear to replace Kunga limestone at the Karmut-
sen contact, to strike parallel to the rocks (north 30 degrees east), and to dip gently westward. The ores' true thickness is not known. Above the adit at about 800 feet elevation a lens of skarn and magnetite occurs, striking north 35 degrees east, that is 210 feet long and up to 20 feet wide. This projects downward to the ore lens in the adit and thus dips 64 degrees west. The third zone is at about 1,000 feet elevation on the upper slopes and about 500 feet northwest of the adit showing and near the northwest boundary of the Thunder. Within this zone there are two distinct bodies, one an equant-shaped body up to 100 feet long, and nearby a dyke-like body at least 200 feet long and 10 to 20 feet wide is oriented north 35 degrees east.

The Thunder orebodies include two general types, tabular bodies conformable with stratification and dyke-like to pipe-like bodies nearly normal to stratification. All of the zones and bodies are composed of mixtures in varying degree of magnetite and garnet-rich skarn. In certain localities, pyrite and chalcopyrite form significant concentrations. Much additional work would need to be done to properly assess the possible iron-ore reserves of the Thunder and the value of the chalcopyrite. High garnet and sulphide content makes doubtful the possible recovery of a magnetite concentrate of sufficiently high grade and purity to satisfy present-day contracts.


**Meal Ticket and Maple Leaf** (59) (53) These two separate properties are similar and adjacent, about one-half mile south of Collison Bay. Although they have been covered by recorded claims in recent years, they have received little new work. Both were discovered about 1906. They both consist of dyke-like sulphide-rich masses of magnetite, pyrrhotite, pyrite, and chalcopyrite that are of interest for their copper content. They appear to be metasomatic replacements along steep northerly striking fault or fracture zones within the Karmutsen Formation. The Meal Ticket has been followed about 200 feet on the surface, is up to 8 feet wide, and is intersected by a 33-foot adit. The Maple Leaf had considerable development by the Collison Bay Mining Company. Three adits were driven; the upper at 500 feet is 15 feet long, the central at 350 feet elevation has a 100-foot crosscut, 100-foot drift, and 80-foot winze; and the lower is 50 feet long but did not reach the ore. Both bodies had copper contents of the order of 1 to 2 per cent.

[References: Minister of Mines, B.C., Ann. Repts., 1907, p. 65; 1909, p. 81; 1918, pp. 44–45; 1923, p. 44.]

**Oceanic and Wireless** (54) (55) These two properties are similar and adjacent or possibly even the same. They are on the shore at the west entrance to Collison Bay. Discovery occurred about 1906 by the Daykin brothers. The ore is copper-rich bedded replacement of a thin interlava limestone in the Karmutsen Formation. The bed strikes north 25 degrees east and dips 45 to 50 degrees northwest and is up to 4 feet thick. A 50-foot adit was driven chiefly in 1911 on the Wireless at sea-level. Sorted chalcopyrite ore, totalling 15 tons and containing 1,178 pounds of copper and 7 ounces of silver, was shipped from the Oceanic in 1913. In 1916, 17 tons was shipped from the Wireless, containing 795 pounds of copper, 14 ounces of gold, and 12 ounces of silver.

[References: Minister of Mines, B.C., Ann. Repts., 1910, p. 84; 1911, p. 74; 1913, p. 103; 1918, p. 44.]
This property is part of the large group of claims held by Jedway Iron Ore Limited and The Granby Mining Company Limited, specifically the Plunger 1 to 4 held by Granby. It seems likely these showings were originally called the Ivan in 1913. They are 1 mile east of the southeast end of Huston Inlet and scattered on the south side of the valley from about 300 to 850 feet. There are two principal showings: one at about 550 feet elevation is a blob-like body some 50 by 30 feet on the surface, composed of magnetite and garnet; the other, between 700 and 825 feet elevation, is a planar deposit some 500 feet long and 25 feet or less wide, composed of skarn with magnetite, pyrite, and chalcopyrite. The upper deposit apparently is a replacement of a northwest-trending shear zone and is of interest primarily for copper content. A number of pits dating from the early exploration expose the mineralization. A small adit of similar age below the showings fails to reach the mineralization.

The showings are all very near the contact of the Carpenter quartz monzonite stock, and the lower magnetite deposit is actually a local flatish contact. Most of the replacement is of metamorphosed Karmutsen greenstones, some of granitic rock. Post-ore rhyolite and basalt dykes are common in the area. In 1962 Jedway did 150 feet of packsack drilling on the property.


This property is close to the shore at the east entrance to Poole Inlet on Burnaby Island. It consists of a group of 29 recorded claims, the Flo group, held by Merriam International Mines Ltd. The showings consist of an area reportedly 150 by 100 feet of magnetite replacing Kunga limestone near a large north-trending fault and several small areas nearby that are chalcopyrite-rich. During 1964 the company drilled 500 feet of EX holes in the vicinity.


This property is part of a group of located claims held by The Granby Mining Company Limited. The showings are about 1 mile east of the southeast end of Huston Inlet at about 300 feet elevation. The showings consist of a dyke-like replacement body of sulphide-rich skarn, of interest primarily for its copper content. The body is exposed for about 80 feet and is up to 20 feet wide, although the copper-rich portion is narrower. Grades of the order of 2.7 per cent copper across 10 feet are reported (Ann. Rept., 1918). It strikes north 60 degrees west and dips steeply east. A similar showing occurs several hundred feet to the south along strike. The body occurs near the contact of the Carpenter quartz monzonite but is seemingly entirely within that body. Silver Standard Mines Limited drilled one short packsack hole in February, 1960, which intersected 20 feet of magnetite with 5 feet containing 0.85 per cent copper.

A2. Massive to Disseminated Sulphide Deposits

This property, which is held by 18 recorded claims, is on Courte Antimony Riley Creek, which flows into Rennell Sound. It reportedly was known during World War I but received no more attention until staked by V. Courte in 1942, after which it received some examinations but little work. The showings are at about 500 feet elevation in the bottom of a steep south-flowing tributary. The country rocks are either highly altered porphyritic andesites of the Yakoun Formation or altered diorites, or the former cut by dykes of the latter. The main creek follows an east-west crush zone, and by the showings a short way up the side creek there is a stockwork of quartz stringers with occasional veinlets up to 8 inches wide. Stibnite with some chalcopyrite and galena and some precious metals is erratically distributed in the quartz veinlets.

This property includes the whole of the Swede Peninsula near Lockeport. It is held by 20 recorded claims, the D group, in the name of King Stevenson Gas & Oil Company. The showings were discovered about 1907 by Larsen, Pearson, and Rodgers. In the next few years many open cuts were dug and three small adits were driven. Since then only extensive examinations and minor packsack diamond drilling have been done. Nearby properties, originally separate, the Last Chance and Jones group, are now included with the Swede.

The Swede Peninsula is formed of massive amygdaloidal greenstones of the upper part of the Karmutsen Formation overlain by massive and thin-bedded members of the Kunga Formation. The limestone forms an irregular syncline plunging northwestward at about 25 degrees and faulted off at the west (see geological map). The peninsula appears to be bounded by block faults. The northeast fault parallel with Anna Inlet is a large one, with either the south block dropped relative to the north or a large right-hand component of movement.

There are three small adits on the northwest side of the peninsula and an old open cut on the southeast near the outlet of the main creek. Two adits are about 80 feet above sea-level and the same distance apart. The western is about 150 feet long, and the other 80 feet. The third adit is at about 450 feet elevation and is 55 feet long. All are driven southeastward. In addition, there are a number of open cuts. The rocks exposed are similar Karmutsen amygdaloidal greenstones with some coarser diabasic dykes. All have been chloritized and slightly epidotized and contain minor prehnite and pumpellyite.

Traces of mineralization in the form of chalcopyrite in amygdules and hairline fractures can be found at many localities throughout the peninsula, but only near the adits on the northwest and to a lesser degree near the old open cut on the southeast side has there been found any concentration of even submarginal economic interest. The mineralization is highly erratic and no obvious control is apparent, with the possible exception that highly vesicular flows seem to contain better than normal concentrations. Most of the rocks are fairly highly fractured, but only in certain areas do these fractures contain films of chalcopyrite. In the northwestern adit a chip sample in the south wall from 15 to 25 feet from the portal of the best grade observed ran copper, 2.49 per cent; silver, 0.3 ounce per ton. Ten feet near the face of the southwest adit ran copper, 1.32 per cent; silver, trace. These assays are about 10 times those of two taken to indicate average grade in this vicinity.
Much additional work would need to be done to find if there are any economic concentrations at the Swede group.


This property consisted of a large number of recorded claims, most of which have been allowed to lapse. The original two claims are on the cove west of Section Cove on northwestern Burnaby Island. They are held by Mr. Johnson and associates, of Sandspit, and were optioned by Silver Standard Mines Limited and Jedway Iron Ore Limited jointly, who carried out an extensive exploration programme from January to May in 1963. Geological, magnetometer, electromagnetic, and soil surveys were conducted, as well as 1,857 feet of packsack drilling.

The area is geologically complex because it is within the belt of braided faults of the Louscoone Inlet-Rennell Sound fault zone. Argillites of the Kunga Formation have been intruded by small heterogeneous diorite stocks and later gabbro dykes and plugs and cut by the north-northwesterly faults. The initial showing is in the bottom of the westernmost north-flowing creek about 600 feet from the shore in an area of few exposures. An outcrop about 18 feet in diameter consists of gabbro mineralized with pyrrhotite, chalcopyrite, and bravoite with minor nickeliferous minerals. The showings contained about 1 per cent nickel and 1 per cent copper. The mineralization proved to be very local, although another mineralized gabbro body was found several hundred feet south.


A3. Gold Veins

This property is covered by two Crown-granted claims, the Southeast, Lot 1302, and the Beaconfield, Lot 1303, registered in the name of Emil Valley. The property was first recorded in 1910 and most extensively explored from 1919 to 1936, during which period it had a small production. It has also been called the Skidegate and Skidegate-Sunrise. The showings are about 1 mile north of Skidegate village, just beyond the reserve. Workings include a 100-foot shaft, from which there are two drift levels, one 125 feet long at 50 feet and another 350 feet long at 100 feet. A stope extends from just below the upper level to the surface. Another 65-foot shaft occurs to the southeast on the Skidegate reservation. Production from 1919 to 1936 is recorded as 505 tons containing 41 ounces of gold, 27 ounces of silver, 259 pounds of copper, and 665 pounds of lead. The country rocks are slightly hornfelsed andesitic agglomerates of the Yakoun Formation. The showings consist of one principal quartz vein some 1,000 feet long and 2 to 20 feet wide which contained sparse sulphide minerals with some concentrations of galena, pyrite, sphalerite, and chalcopyrite. The vein follows a fault zone which strikes northwest and dips steeply southwest.

This property is held by three Crown-granted claims, Lots 1222, 1223, and 1224, owned by the Stevens brothers, of Skidegate. The showings were discovered in 1907, underground development started in 1910, and by 1913 some 1,800 feet of drift and crosscut and 280 feet of winze and shaft had been completed. This development is mainly from a portal at about 300 feet above sea-level and one-half mile from the bay east of McLellan Island in Cumshewa Inlet. The main adit bears north 75 degrees east for 365 feet where it branches. The southern branch (Go East) continues on a similar bearing for some 190 feet to a winze and raise, beyond which it is caved. The northern branch (Homestake) continues on a bearing of north 40 degrees east for 85 feet, where it is caved. Many hundreds of feet of workings lay beyond the cave on the Go East drift. A 117-foot drift on the Homestake vein is 65 feet above the main workings.

The workings are in hornfelsic argillite and greywacke and some agglomerates of the Yakoun Formation cut by basic and acidic dykes. The workings essentially follow steep fault zones that have stringer systems and silicified breccias at intervals along them. Whatever may have been the case, sulphide minerals are sparse in the available workings. Original descriptions mention much galena and sphalerite in addition to pyrite and good gold values in the galena. Three samples of better-looking vein material taken by the writer ran only trace in gold and less than an ounce per ton in silver.


This property was the first lode mine in British Columbia, being the site of the exploration in 1852 by Captain Mitchell for the Hudson's Bay Company. It is on the west side of Una Point, named after the Hudson's Bay Company's brig. The value of the original production is in doubt, variously being reported as $5,000 to $75,000. Since then investigation and exploitation have been attempted many times. Between 1907 and 1933, under John McLellan, 172 tons of ore containing 154 ounces of gold and 30 ounces of silver was mined. Production in 1939 under D. F. Kidd is not recorded but was reportedly 15 tons, which contained 150 ounces of gold.

The workings include three adits and a shaft from the surface to the lower adit. The lower adit, which has a portal just above high sea-level, is a 200-foot-long drift slightly curved with an average strike of north 35 degrees east. The middle adit has a 25-foot crosscut that strikes north 50 degrees west to a 60-foot drift. The upper adit is a 40-foot drift. The shaft is 35 feet from surface to lower adit and reportedly continues for 38 feet below to a 10-foot crosscut and 70-foot drift. An open stope exists from the lower to the upper adit levels. The mine is contained in pillow lava facies of the Karmutsen Formation. There is minor silicification and chloritization of the walls with some growth of pumpellyite. The mine development follows a minor fault zone containing a frayed stringer vein system that strikes on the average north 37 degrees east at the top and below splits into two systems north 45 degrees east and north 27 degrees east. Dips are either side of vertical. The veinlets themselves are only a few inches wide but may be contained in a crush zone up to 3 feet wide with numerous strands. The veinlets are composed of quartz and calcite with minor pyrite and apparently fine free gold. At present no ore is visible. The best assay obtained from stringers in the lower adit was as follows: Gold, 0.25
ounce per ton; silver, 0.1 ounce per ton, over 2 feet near the south end of the open stopes.

[References: Minister of Mines, B.C., Ann. Repts., 1909, pp. 76-77; 1918, pp. 41-44; 1932, pp. 41-44.]

**Blue Mule**

This property has been held by recorded claims much of the time by the Stevens family, of Skidegate. It has also been called the Kootenay, Rupert, and Haida gold mines. It is three-quarters of a mile north of the east end of the south arm of Kootenay Inlet. It was discovered in 1919 by Jones, Wiggs, and McRae, of Queen Charlotte and Skidegate, and received most exploration about 1931 and 1932. The workings consist of a series of open cuts. Massive greenstones of the Upper Karmutsen Formation which strike easterly and dip about 40 degrees south form the country rock. In these rocks a reticulate quartz vein system is developed, which strikes northeast and dips steeply southeast. Individual veins have been traced 100 to 400 feet and are 6 inches to 5 feet wide. Five veins occur within 350 feet across strike. The vein walls are slightly silicified and chloritized but otherwise unaltered. The veins are composed mostly of quartz with sparse sulphides, pyrite, and chalcopyrite with some fine free gold. Values reported by Mandy (Ann. Rept., 1932) range from 0.2 to 0.6 ounce per ton.


**Ellen**

This property has been held by recorded claims and recently was included in a large group, the Bud group, covering much of Shuttle Island. The property is near sea-level on the northern part of Shuttle Island in Darwin Sound. It was discovered about 1918 and developed over the next three years. Workings include a 100-foot crosscut and 25-foot drift with but 30 feet of backs. In 1919, 50 tons was produced, yielding 18 ounces of gold. The country rocks are greenstone and intercalated limestone and argillites of the Lower Karmutsen Formation. Two small intersecting veins, 8 inches wide or less, were the source of the ore. These or other small veins are considered the probable source of the placer gold recovered on the shores of Shuttle Island.


**A4. Manganese Veins**

**Shag Rock**

This property of 17 recorded claims is 25 miles west of Masset on the east side of Klashwun Point near Shag Rock. It was discovered by J. Pauloski in 1955 and is now held by Naden Harbour Manganese Ltd.

Rock is exposed in the area only along the wide tidal zone, and the showings are on the shore. Basaltic lavas of the Masset Formation and porphyritic andesite sills of Cape Knox type here strike north to northeast and dip 15 to 20 degrees eastward. The lavas are cut by a north-trending fault, on the east of which the lavas are underlain by dark-grey shale and buff calcareous shale to sandstone of about 75 feet thickness. The affiliation of these rocks is
unknown, but they resemble Skidegate Formation to some degree. The fault strikes north 15 degrees east, subparallel to the shore, and dips about 80 degrees eastward. It is filled with 5 to 15 feet of volcanic fault breccia that is cemented by variable amounts of manganite. Fragments in the breccia are angular and as much as 2 feet across, although commonly the large fragments are only 6 to 8 inches across. Fragments range downward in size from these dimensions to a few millimetres; still smaller sizes were not seen. Veinlets of manganite also extend into the volcanic rocks of the west wall of the fault.

The fault and the showings are exposed along the shore for about 550 feet from the beach near the Indian reservation northward to where the shore trends sharply to the west. The fault is a large regional structure, but the breccia filling is quite lensoid. The best showings appear to be in the northern third of the exposure. Large hand specimens may be taken that contain as much as 50 per cent manganese. At the northern end, where the breccia outcrops boldly like a dyke, one of the higher-grade lenses, about 8 feet high by 50 feet long by 5 feet wide, is estimated to contain between 20 and 30 per cent manganese. Falconbridge Nickel Mines Limited, during May, 1965, took out bulk samples of the order of 150 to 200 tons of fresh material and drilled 254 feet in two packsack diamond-drill holes. The positions of the holes did not provide conclusive results. One hole may have penetrated the fault zone; the other hole intersected it at a narrow locality, although the breccia lens adjacent on the surface is large.

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