

TERRITORY OF ALASKA, DEPARTMENT OF MINES,
JUNEAU, ALASKA.

SUMMARY REPORT
OF
MINING INVESTIGATIONS AND ITINERARY IN
THE ILIAMNA AND INISKIN BAY DISTRICTS
ILIAMNA PRECINCT,
ALASKA

May 20 to June 10
1941

By
J. C. Roehm
Associate Mining Engineer

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SUMMARY REPORT OF MINING INVESTIGATIONS AND ITINERARY
IN THE ILLIAMNA AND INISKIN BAY DISTRICTS,
ILLIAMNA PRECINCT, ALASKA
May 20 to June 10, 1941

By J. C. Roehm.

May 20 to 27. En route Juneau to Iliamna Bay via Seward
and Seldovia.

May 28-30. A deposit of magnetite iron was reported
located on the west entrance to Iliamna Bay. The location was
examined and the deposit was found to exist, beginning in a bluff
on the beach, locally known as Turtle Reef, 300 yards due west of
A. C. Point. The latter is indicated on most U.S.G.S. charts and
marks the west entrance to the bay.

Iliamna Bay is one of many of the small shallow bays which
are numerous and make up the south shore of the Alaska Peninsula.
The cause of the structural conditions that exist is not definitely
known. These conditions originally produced the breaks that are
apparent and caused the erosion of steep-walled valleys, now nearly
filled to tide level with silt and fine clay, the latter produced
by glaciation. The general direction of the bay is north and west
and cuts across the general northeast strike of the formations.
This bay shows a continuous cross-section from the hornblende granite,
which makes the central core of the Peninsula in this section,
through the wide and extensive contact zone of mostly altered tuffs
with thin bands of buff and blue limestone. Acid porphyry dikes
are numerous and irregularly distributed in the altered tuffs and
are most numerous in zones along the limestone tuff contacts. The
limestone strata and the tuffs were subject to considerable heat
and metamorphic pressure and have in most places developed a fine
to coarse crystalline texture. While the various limestone strata
are included in the general contact zone, which ranges from 2 to 3
miles in width, minor contact zones have developed along the lime-
stone and tuff contacts. These are erratic and vary in width and
degree of contact metamorphism, which is more or less developed by
the abundance of acid granitic dikes. Small and irregular contact
metamorphic deposits of high temperature were formed. Garnet and
numerous lime-silicate minerals are abundant in these zones and
contain more or less iron and copper widely scattered and unevenly
distributed. Iron is most abundant in the sulphide form of pyrite
and pyrrhotite, with some minor segregations of magnetite and surface
oxidation of limonite and a little hematite. Small amounts of nickel
were reported associated with the pyrrhotite and is suspected and

to be determined in samples taken for assay. Copper occurs more sparsely than iron and is widely scattered with the predominant sulphide, chalcopyrite, associated both with the iron sulphides and magnetite. Malachite was commonly noted in small amounts mainly as stains on the surface in the lime-tuff contact zones and highly scattered in the tuffs associated in and near the acid dikes.

The deposit that appears at Turtle Reef is one of the most pronounced of the minor contact zones. It begins at the water's edge and continues up the face of an almost vertical bluff nearly 100 feet in height. It has a width of 30 feet. Thence it continues in a southwesterly direction up the steep slope of the mountain which rises abruptly from the sea. This zone is traceable along the south slope of the range to where it again meets the shore on the east side of Bruin Bay to the southwest.

Green-colored volcanic tuffs are found on the footwall of this limestone stratum. They contain various light pinkish acid dikes which have in turn fractured the tuffs and have in part developed the irregular garnetiferous zone on the footwall of limestone. The metallic minerals are irregularly distributed in the small seams and joints in the tuffs, in disseminations in the tuffs, in the dikes and in minor segregations of contact-metamorphic origin in the garnetiferous zones. The limestone stratum ranges from 50 to 75 feet across and dips, as does the entire contact zone, to the south-east. It is crystalline in texture and away from the garnet zone is nearly devoid of metallic minerals.

The mineralization consists of the metallic minerals, named in order of abundance, pyrite, pyrrhotite, magnetite, chalcocite. The gangue minerals are garnet, various lime carbonates and silicates, chlorites, epidote, quartz and other rock minerals more or less altered, which make up the general composition of the tuffs and dikes. Due to the variable amounts and the disseminated and erratic distribution of the metallic minerals, the deposit is of no immediate economic importance.

Diamond Head is a high bluff point, which marks the north entrance to Cottonwood Bay off Iliamna Bay at a point nearly half way from the entrance to the head on the west shore. Here another stratum of limestone cuts across the point and is interbedded in the greenstone tuffs. Along both walls of this stratum pink irregular porphyry dikes occur, in which irregular seams and bunches of quartz are found, mostly in the greenstone tuffs, but in places they penetrate the limestone. These veins and stringers lack regularity, and they are only slightly mineralized, mainly with pyrite and small amounts of chalcopyrite and pyrrhotite. Low gold values were reported from these veins.*

*U.S.G.S. Bull. 485, "A Geologic Reconnaissance of the Iliamna Region."

May 31 - June 4. Cassiterite was reported found during the early prospecting days of this area on the west side of Iniskin Bay on Cabin Creek. The writer made an extensive investigation of the vicinity locally known as Cabin Creek and the west shore of Iniskin Bay. Cabin Creek is situated half way between the entrance of Iniskin Bay and its head on the west side. The geology is in part favorable for the occurrence of tin, and consists of interbedded limestone strata in green to gray volcanic tuffs with numerous light colored acid porphyry dikes, some approaching pegmatite and in close association with a hornblende granite under high temperature conditions. Particularly does this condition exist in the upper section of Cabin Creek which cuts into the basin formed along the main granite contact. The main contact extends across the Iliamna-Iniskin Peninsula in a northeasterly and southwesterly direction. Along this contact small black tourmaline segregations were noted in the granite. However, after an extensive search along this contact and investigating several of the limestone strata, together with close examination of the concentrates of the creek, no definitely identified cassiterite was found. Further testing of several of the various concentrates and minerals that sometimes resemble cassiterite, such as garnets, and pinkish gray lime silicates, is necessary before any positive statement can be made. A heavy brown to gray rock mineral was found along two lime strata contacts, associated with pyrite, magnetite, chalcopyrite, garnet and other lime silicates, which has the appearance of cassiterite. This particular rock association was also noted in the creek concentrates. It has not been identified.

The west shore of Iniskin Bay contains further limestone strata within the tuffaceous zone with the granite and tuff contact situated 2 miles from the head of the bay and two miles north of the mouth of Cabin Creek. The tuffs contain numerous granitic acid dikes and are most numerous in a zone 1,000 feet wide paralleling the granite contact. This zone is highly fractured and contains innumerable small seams and small disseminations of chalcopyrite with pyrite. Solfataric action has recently occurred in this fractured contact zone and within the granite mass bordering the contact cold water containing sodium carbonate and with an odor of sulphur dioxide was noted flowing onto the beach in this vicinity.

On the right limit of Cabin Creek, $3\frac{1}{2}$ miles upstream from its mouth, a band of light buff and blue limestone was found in contact with light colored porphyry dikes in the greenstone tuffs. At an elevation of 2,100 feet a wide zone of mineralization follows along the footwall of the limestone stratum. This zone appears to be highly oxidized as it outcrops along the steep slopes. It is

of metamorphic origin and shows a disseminated mineralization containing pyrite, magnetite, chalcopyrite, pyrrhotite, limonite and hematite and copper carbonates in minor amounts. These minerals are disseminated in a complex of contact metamorphic minerals such as garnet, epidote, quartz, and numerous lime silicates and carbonates. A light pink feldspar is the prevailing mineral of the acid dikes and it is contained in this contact mineralized zone. No tin minerals were identified, however, some are still to be further tested. Both iron and copper are sparsely disseminated and not in sufficient amounts to be considered of economic importance.

Another mineralized zone similar in appearance and containing the same conditions of contact metamorphic complex occurs at the head of the first tributary of Cabin Creek on the south side at an elevation of 2,000 feet. Again a limestone stratum was found interbedded and in contact with greenstone tuffs and the acid dikes.

Along the bed of Cabin Creek beginning 2 miles upstream granite, showing contact phases, outcrops along the creek bed. This shows the general geology of the greater portion of the tuffs and interbedded limestones to be underlain with granite which appears to be associated and genetically related to the main hornblende granite which makes up the higher ranges of the mainland and the heart of the Alaska Range. It underlies the tuffs and limestones at approximately sea level, or below as one follows the prevailing dip to the south. This gives the tuffs and limestones a wide zone of contact, which is from both general and detailed observations much the same. The enclosed limestone strata vary in thickness, but are narrow bands in comparison to the tuffs. All limestone strata which were examined were found in themselves to be unfavorable for the replacement of metallic minerals. This is accounted for by the fact that they are crystalline in texture caused by metamorphism and they had attained this state prior to the later mineralizing solutions. The greenstone tuffs are also unfavorable for ore deposits due to lack of structure and poor parent rocks. There is evidence of considerable hot water action having taken place after the main granite intrusion and of later and recent solfataric action. This action appears to have been widely distributed and the chemical contents of the hot waters were either lacking in valuable metals or they escaped at the surface. Further, all evidence of the existing mineralization points to a condition of high temperatures and pressures.

June 5-6. En route to Iliamna Village via Iliamna Bay road.

June 6-8. Investigation of Silver Bell and Dutton copper properties.

The Wm. Duryea silver-lead property, called the Silver Bell, is situated alongside the Dutton copper property, 14 miles due west of Cottonwood Bay and 6 miles southwesterly of Iliamna village. From Cottonwood Bay an old road leads to the properties. Both road and the trail, the latter from Iliamna Village, are difficult to follow due to an abundant new growth of vegetation.

Descriptions of both properties are contained in U.S.G.S. Bull. 485, "A Geologic Reconnaissance of the Iliamna Region" by G. C. Martin and F. J. Katz, which was made during development activities on these properties. Since the above reports were made, the properties have remained idle.

The greater portion of the surface showings were covered with snow, which also prevented access to the various short tunnels. The latter are situated in steep ravines which represent the various fault zones. However, a cross-section of the formations in which the showings occur was obtainable. This shows the limestone in which the Silver Bell showings occur to be either a down faulted block or a portion of a syncline of an extensive preexisting mass. Due to this condition the possibility of the existence of orebodies in the limestone would appear to be limited.

The Dutton copper showings are extensive on the surface, traceable over a distance of 4,000 feet and confined mainly to the greenstone tuffs bordering the hornblende granite to the north. The showings consist of small seams, minor replacements and disseminations in the tuffs and porphyry dikes bordering the granite.

The Duryea silver showings are confined to an area within the limestone block which contains some shales and small andesitic porphyry dikes. The small amount of ore that has been found, is contained in the limestone along the walls of the dikes. The amount appears to be limited to very small lenses. These are extensively distributed and are so small in size that they are not of economic importance.

The area, which contains these properties, represents a lowered faulted block of limestone and tuffs extending between granite masses to the north and south. The sediments with some top shales and tuffs represent the bottom of a large syncline, which has a slight plunge along the strike to the southwest. This faulted block is over 4,000 feet in length and ranges from 2,500 to 3,000 feet in width. A cross-section, northwest to southeast, shows a hornblende granite to the north. In contact with the granite is a garnetiferous zone containing garnetite and epidote. This zone

ranges from a few feet to 30 feet in width. This contact zone is mineralized mainly with contact minerals and contains scattered amounts of chalcopyrite, pyrite and pyrrhotite.

In contact with this narrow zone is a band of close-folded greenstone tufts which has an outcrop width between 500 and 600 feet. These tufts, due to the pressure applied during the folding, have been severely fractured and sheared. The shear zones strike in a northeast-southwest direction, while the fracture zones occur nearly at right angles to the shears. At the intersections of the fracture and shear zones the most intense mineralization occurs, as seams and disseminations. The metallic minerals noted were pyrite, chalcopyrite and pyrrhotite. A small amount of nickel was reported in the ore by W. Duryea. These intersection zones are very low grade and the ore shipped by the Dutton Mining Company during the years of operation was hand sorted.

Next on contact with the tufts is a band of bluish to buff colored limestone. This band is partly crystalline and dry and contains various lime silicates. Metallic sulphides in the limestone are sparse.

Next to the blue to buff limestone is a thicker band of gray limestone. This band contains the andesitic porphyry dikes which radiate out from a small stock or sill which strikes parallel to the stratum of limestone. The Silver Bell claim group is contained in the gray limestone stratum.

Next to the gray limestone is a thin stratum of bluish limestone into which a few of the andesitic porphyry dikes penetrate. Along these dikes in the limestone stratum small amounts of manganese oxides were noted. These were very low grade and in very small amounts. Calcareous shales of uneven thickness and occurring as eroded remnants were noted on top of the blue limestone stratum.

Further to the south toward the valley of Silver Creek the valley drops off into nearly vertical bluffs, which again show the gray limestone, blue and buff limestone with granite on the south side of Silver Creek to the south.

The Silver Bell group of claims is located alongside the claims of the Dutton Copper property on the south side. They consist of ten lode claims which extend in a southwesterly-northeasterly direction, the prevailing strike of the sediments. This group is owned by Wm. Duryea of Cottonwood Bay. Development consists of three short tunnels, one 16-foot shaft and numerous opencuts. All were inaccessible due to snow, with the exception of a few opencuts.

The following information was given by Wm. Duryea:

No. 1 tunnel is located on the War Eagle claim at an elevation of 1,400 feet. It has a length of 100 feet, and was driven through calcareous shale at the portal into the contact of shale and blue limestone. Eight feet of marcasite was cut on the contact.

The Silver Bell tunnel is situated on the Silver Bell claim in a canyon of a small tributary of Silver Creek. It has a length of 300 feet with two crosscuts, 30 and 45 feet, respectively. These crosscuts cut into andesitic porphyry and small bunches of a high grade silver-lead ore was encountered on the contact with the gray limestone.

The oversight tunnel is situated on the Oversight claim and is now caved. It had a reported length of 100 feet in gray limestone. A few quartz stringers were encountered which gave returns up to \$13 in gold (old price).

The 16-foot shaft is located on the Ida G. claim and was sunk on the contact of gray limestone and the andesitic porphyry. Small amounts of chalcopyrite and lead carbonates were noted on the dump.

The best showing on the property was in a surface cut across the contact of gray limestone and porphyry. This originally showed from 2 to 3 inches of massive galena which, according to Duryea, gave assay returns of 160 ounces of silver to the ton and contained 40 per cent lead.

The development on the property of the Dutton Mining and Development Company consists of two tunnels, one shaft and numerous opencuts. These workings are distributed along a zone of alteration and contact metamorphism that is within the tuffs and contact zone. This zone ranges from 50 to 200 feet in width and can be traced for three claim lengths. This zone strikes N. 70° E. and dips to the south.

The Cold Spring claim tunnel has a reported length of 44 feet and crosscuts the contact zone, ending in the hornblende granite. Assays of samples taken by Duryea during the driving of the tunnel carried 4 percent copper and one-half of one per cent nickel.

The Eagle claim tunnel is at an elevation of 1630 feet and has a reported length of 165 feet, with a 25-foot winze and two short drifts. The tunnel crosscuts the contact zone and the drifts are in opposite directions off the crosscut.

During the operations of this company 22 tons of ore was hand sorted and shipped to the Tacoma Smelter. The first ten tons were reported as totalling \$19 per ton in gold, silver and copper. The values were reported at .1.60 per ton in gold, and two ounces of silver. Three tons of the ore was taken from an open-cut above the tunnel at an elevation of 1670 feet. This cut is 8 X 10 feet and 12 feet deep. The cut shows a zone of fracturing which strikes NW.-SE. and cuts across the contact zone at nearly a right angle. The ore, mainly chalcopyrite with pyrite and pyrrhotite, occurs in the fractures and other small segregations and is disseminated in the green schisted tuffs.

The shaft is located on the Alta claim at an elevation of 1750 feet. The depth was reported to be 55 feet and is nearly vertical. It is on the contact of limestone and schisted tuff. Sulphides occur in bands in the tuffs with some quartz next to the limestone contact. Chalcopyrite, pyrite with small amounts of molybdenite noted on the dump pieces. This was the only occurrence of molybdenite noted on the property. Duryea reported values up to \$44 per ton in gold and copper were obtained from this shaft.

June 9-10. Visited Millett group of copper claims.

The Millett group of copper claims extends in a north-westerly direction from the north shore of Iliamna Lake at a point 22 miles west of Iliamna Village and 12 miles east of Severson's Road House. The group is owned by O. S. Millett.

The development on this property consists of thirty open-cuts and two shafts beginning 600 feet north of the north shore of Iliamna Lake and following along a greenstone dike in limestone with a general strike of N. 15° W. for a distance of 3,000 feet. A sketch map was made of the entire developments, with topography and individual sketches of each cut, and the geological features encountered.

This greenstone dike, which looks much like an altered diabase, ranges from 20 to 50 feet in width and is enclosed in buff, gray and dark limestone. This dike has been fractured with the fractures parallel to the strike and a vertical dip. The dike rock is a dark greenish basic intrusive which has been altered and mineralized. It weathers to a deep brown color. The lower section near the shore of Iliamna Lake is capped with recent zeolitic lavas. The sheared or fractured zone of the dike contains the greater portion of the mineralization.

The most northerly cuts show a low grade ore body in the limestone alongside the dike, which splits, one branch making off into the limestone and the other following the wall of the dike.

March 14, 1949

Memo:

One copy of each of the two maps of
the MILLETT PROPERTY by J.C. Roehm - 1941
were given to Frank Rutledge.

Map of Kasna Creek property in same area
cannot be found. Rutledge has print from which
he will have tracing made for us.

EDS

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ILIAMNA AND INISKIN BAY DISTRICT, ILIAMNA PRECINCT, ALASKA
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A deposit of magnetite iron was reported located on the west entrance to Iliamna Bay. The location was examined and the deposit was found to exist, beginning in a bluff on the beach, locally known as Turtle Reef, 300 yards due west of A. C. Point. The latter is indicated on most U.S.G.S. charts and marks the west entrance to the bay.

Iliamna Bay is one of many of the small shallow bays which are numerous and make up the south shore of the Alaska Peninsula. The cause of the structural conditions that exist is not definitely known. These conditions originally produced the breaks that are apparent and caused the erosion of steep-walled valleys, now nearly filled to tide level with silt and fine clay, the latter produced by glaciation. The general direction of the bay is north and west and cuts across the general northeast strike of the formations. This bay shows a continuous cross-section from the hornblende granite, which makes the central core of the Peninsula in this section, through the wide and extensive contact zone of mostly altered tuffs with thin bands of buff and blue limestone. Acid porphyry dikes are numerous and irregularly distributed in the altered tuffs and are most numerous in zones along the limestone tuff contacts. The limestone strata and the tuffs were subject to considerable heat and metamorphic pressure and have in most places developed a fine to coarse crystalline texture. While the various limestone strata are included in the general contact zone, which ranges from 2 to 3 miles in width, minor contact zones have developed along the limestone and tuff contacts. These are erratic and vary in width and degree of contact metamorphism, which is more or less developed by the abundance of acid granitic dikes. Small and irregular contact metamorphic deposits of high temperature were formed. Garnet and numerous lime-silicate minerals are abundant in these zones and contain more or less iron and copper widely scattered and unevenly distributed. Iron is most abundant in the sulphide form of pyrite and pyrrhotite, with some minor segregations of magnetite and surface oxidation of limonite and a little hematite. Small amounts of nickel were reported associated with the pyrrhotite and is suspected and to be determined in samples taken for assay. Copper occurs more sparsely than iron and is widely scattered with the predominant sulphide, chalcopyrite, associated both with the iron sulphides and magnetite. Malachite was commonly noted in small amounts mainly as stains on the surface in the lime-tuff contact zones and highly scattered in the tuffs associated in and near the acid dikes.

The deposit that appears at Turtle Reef is one of the most pronounced of the minor contact zones. It begins at the water's edge and continues up the face of an almost vertical bluff nearly 100 feet in height. It has a width of 30 feet. Thence it continues in a south-westerly direction up the steep slope of the mountain which rises abruptly from the sea. This zone is traceable along the south slope of the range to where it again meets the shore on the east side of Bruin Bay to the southwest.

Green-colored volcanic tuffs are found on the footwall of this limestone stratum. They contain various light pinkish acid dikes which have in turn fractured the tuffs and have in part developed the irregular garnetiferous zone on the footwall of limestone. The metallic minerals are irregularly distributed in the small seams and joints in the tuffs, in disseminations in the tuffs, in the dikes and in minor segregations of contact-metamorphic origin in the garnetiferous zones. The limestone stratum ranges from 50 to 75 feet across and dips, as does the entire contact zone, to the southeast. It is crystalline in texture and away from the garnet zone is nearly devoid of metallic minerals.

The mineralization consists of the metallic minerals, named in order of abundance, pyrite, pyrrhotite, magnetite, chalcopyrite, with minor amounts of limonite, hematite, malachite, bornite and chalcocite. The gangue minerals are garnet, various lime carbonates and silicates, chlorites, epidote, quartz and other rock minerals more or less altered, which make up the general composition of the tuffs and dikes. Due to the variable amounts and the disseminated and erratic distribution of the metallic minerals, the deposit is of no immediate economic importance.

Diamond Head is a high bluff point, which marks the north entrance to Cottonwood Bay off Iliamna Bay at a point nearly half way from the entrance to the head on the west shore. Here another stratum of limestone cuts across the point and is interbedded in the greenstone tuffs. Along both walls of this stratum pink irregular porphyry dikes occur, in which irregular seams and bunches of quartz are found, mostly in the greenstone tuffs, but in places they penetrate the limestone. These veins and stringers lack regularity, and they are only slightly mineralized, mainly with pyrite and small amounts of chalcopyrite and pyrrhotite. Low gold values were reported from these veins.*

Cassiterite was reported found during the early prospecting days of this area on the west side of Iniskin Bay on Cabin Creek. The writer made an extensive investigation of the vicinity locally known as Cabin Creek and the west shore of Iniskin Bay. Cabin Creek is situated half

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The west shore of Iniskin Bay contains further limestone strata within the tuffaceous zone with the granite and tuff contact situated 2 miles from the head of the bay and two miles north of the mouth of Cabin Creek. The tuffs contain numerous granitic acid dikes and are most numerous in a zone 1,000 feet wide paralleling the granite contact. This zone is highly fractured and contains innumerable small seams and small disseminations of chalcopyrite with pyrite. Solfataric action has recently occurred in this fractured contact zone and within the granite mass bordering the contact cold water containing sodium carbonate and with an odor of sulphur dioxide was noted flowing onto the beach in this vicinity.

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Descriptions of both properties are contained in U.S.G.S. Bull. 485, "A geologic Reconnaissance of the Iliamna Region" by G. C. Martin and F. J. Katz, which was made during development activities on these properties. Since the above reports were made, the properties have remained idle.

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The Dutton copper showings are extensive on the surface, traceable over a distance of 4,000 feet and confined mainly to the greenstone tuffs bordering the hornblende granite to the north. The showings consist of small seams, minor replacements and disseminations in the tuffs and porphyry dikes bordering the granite.

The Duryea silver showings are confined to an area within the limestone block which contains some shales and small andesitic porphyry dikes. The small amount of ore that has been found, is contained in the limestone along the walls of the dikes. The amount appears to be limited to very small lenses. These are extensively distributed and are so small in size that they are not of economic importance.

The area, which contains these properties, represents a lowered faulted block of limestone and tuffs extending between granite masses to the north and south. The sediments with some top shales and tuffs represent the bottom of a large syncline, which has a slight plunge along the strike to the southwest. This faulted block is over 4,000 feet in length and ranges from 2,500 to 3,000 feet in width. A cross-section, northwest to southeast, shows a hornblende granite to the north. In contact with the granite is a garnetiferous zone containing garnetite and epidote. This zone ranges from a few feet to 30 feet in width. This contact zone is mineralized mainly with contact minerals and contains scattered amounts of chalcopyrite, pyrite and pyrrhotite.

In contact with this narrow zone is a band of closefolded greenstone tuffs which has an outcrop width between 500 and 600 feet. These tuffs, due to the pressure applied during the folding, have been severely fractured and sheared. The shear zones strike in a northeast-southwest direction, while the fracture zones occur nearly at right

angles to the shears. At the intersections of the fracture and shear zones the most intense mineralization occurs, as seams and disseminations. The metallic minerals noted were pyrite, chalcopyrite and pyrrhotite. A small amount of nickel was reported in the ore by Wm. Duryea. These intersection zones are very low grade and the ore shipped by the Dutton Mining Company during the years of operation was hand sorted.

Next on contact with the tuffs is a band of bluish to buff colored limestone. This band is partly crystalline and dry and contains various lime silicates. Metallic sulphides in the limestone are sparse.

Next to the blue to buff limestone is a thicker band of gray limestone. This band contains the andesitic porphyry dikes which radiate out from a small stock or sill which strikes parallel to the stratum of limestone. The Silver Bell claim group is contained in the gray limestone stratum.

Next to the gray limestone is a thin stratum of bluish limestone into which a few of the andesitic porphyry dikes penetrate. Along these dikes in the limestone stratum small amounts of manganese oxides were noted. These were very low grade and in very small amounts. Calcareous shales of uneven thickness and occurring as eroded remnants were noted on top of the blue limestone stratum.

Further to the south toward the valley of Silver Creek the valley drops off into nearly vertical bluffs, which again show the gray limestone, blue and buff limestone with granite on the south side of Silver Creek to the south.

The Silver Bell group of claims is located alongside the claims of the Dutton Copper property on the south side. They consist of ten

lode claims which extend in a southwesterly-northeasterly direction, the prevailing strike of the sediments. This group is owned by Wm. Duryea of Cottonwood Bay. Development consists of three short tunnels, one 16-foot shaft and numerous opencuts. All were inaccessible due to snow, with the exception of a few opencuts.

The following information was given by Wm. Duryea:

No. 1 tunnel is located on the War Eagle claim at an elevation of 1,400 feet. It has a length of 100 feet, and was driven through calcareous shale at the portal into the contact of shale and blue limestone. Eight feet of marcasite was cut on the contact.

The Silver Bell tunnel is situated on the Silver Bell claim in a canyon of a small tributary of Silver Creek. It has a length of 300 feet with two crosscuts, 36 and 45 feet, respectively. These crosscuts cut into andesitic porphyry and small bunches of a high grade silver-lead ore was encountered on the contact with the gray limestone.

The oversight tunnel is situated on the Oversight claim and is now caved. It had a reported length of 100 feet in gray limestone. A few quartz stringers were encountered which gave returns up to \$13 in gold (old price).

The 16-foot shaft is located on the Ida G. claim and was sunk on the contact of gray limestone and the andesitic porphyry. Small amounts of chalcopyrite and lead carbonates were noted on the dump.

The best showing on the property was in a surface cut across the contact of gray limestone and porphyry. This originally showed from 2 to 3 inches of massive galena which, according to Duryea, gave assay returns of 160 ounces of silver to the ton and contained 40 per cent lead.

The development on the property of the Dutton Mining and Development Company consists of two tunnels, one shaft and numerous opencuts. These workings are distributed along a zone of alteration and contact metamorphism that is within the tuffs and contact zone. This zone ranges from 50 to 200 feet in width and can be traced for three claim lengths. This zone strikes N. 70° E. and dips to the south.

The Cold Spring claim tunnel has a reported length of 44 feet and crosscuts the contact zone, ending in the hornblende granite. Assays of samples taken by Duryea during the driving of the tunnel carried 4 per cent copper and one-half of one per cent nickel.

The Eagle claim tunnel is at an elevation of 1630 feet and has a reported length of 165 feet, with a 25-foot winze and two short drifts. The tunnel crosscuts the contact zone and the drifts are in opposite directions off the crosscut.

During the operations of this company 22 tons of ore was hand sorted and shipped to the Tacoma Smelter. The first ten tons were reported as totalling \$19 per ton in gold, silver and copper. The values were reported at \$1.60 per ton in gold, and two ounces of silver. Three tons of the ore was taken from an open-cut above the tunnel at an elevation of 1670 feet. This cut is 8x10 feet and 12 feet deep. The cut shows a zone of fracturing which strikes NW.-SE. and cuts across the contact zone at nearly a right angle. The ore, mainly chalcopyrite with pyrite and pyrrhotite, occurs in the fractures and other small segregations and is disseminated in the green schisted tuffs.

The shaft is located on the Alta claim at an elevation of 1750 feet. The depth was reported to be 55 feet and is nearly vertical.

It is on the contact of limestone and schisted tuff. Sulphides occur in bands in the tuffs with some quartz next to the limestone contact. Chalcopyrite, pyrite with small amounts of molybdenite were noted in the dump pieces. This was the only occurrence of molybdenite noted on the property. Duryea reported values up to \$44 per ton in gold and copper were obtained from this shaft.