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R. I. 3958 OCTOBER 1946

UNITED STATES
DEPARTMENT OF THE INTERIOR
J. A. KRUG, SECRETARY

BUREAU OF MINES
R. R. SAYERS, DIRECTOR

REPORT OF INVESTIGATIONS

EXPLORATION OF THE MOHAWK ZINC PROSPECT

PIMA COUNTY, ARIZ.

BY

P. S. HAURY

R. I. 3958,
October 1946.

REPORT OF INVESTIGATIONS

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

EXPLORATION OF THE MOHAWK ZINC PROSPECT, PIMA COUNTY, ARIZ.[1]

By P. S. Haury[2]

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ILLUSTRATIONS

INTRODUCTION

Preliminary examinations of the Mohawk zinc prospect were made by John M. Price and the author in July, August, and September 1943. Considerable quantities of oxidized lead and zinc minerals were found in old shallow workings along two faults - one an overthrust fault with Paleozoic limestone in the hanging wall overlying Cretaceous shale and arkose in the footwall of the fault, and the other a bedding fault in the Paleozoic limestone.

1/ The Bureau of Mines will welcome reprinting of this paper provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 3958."

2/ Mining engineer, Bureau of Mines.

The chances appeared good for finding important lead-zinc sulfide ore bodies at 200 to 300 feet beneath the surface, so exploration in three steps by the Bureau was recommended:

1. Surveying, mapping, and character sampling of the outcrops with topographic and geologic mapping of the immediately surrounding area.

2. Preliminary drilling of four test holes, aggregating about 1,500 feet, to locate the top of a possible sulfide ore zone and determine the thickness and intensity of the sulfide mineralization.

3. Contingent upon favorable results of the second step, diamond drilling of about 6,300 feet of additional hole to explore the sulfide ore bodies.

The outcrops were surveyed and sampled, a topographic map was made of the area, and the geology was mapped. A project was set up for preliminary drilling of step 2 in the fiscal year 1944-45. An access road to the drill sites was built in April 1945. Diamond drilling was started on April 28 and completed on September 25, 1945, under the supervision of the Bureau of Mines. The exploratory work is covered in this report.

ACKNOWLEDGMENTS

In its program of exploration of mineral deposits, the Bureau of Mines has as its primary objective the more effective utilization of our mineral resources to the end that they make the greatest possible contribution to national security and economy. It is the policy of the Bureau to publish the facts developed by each exploratory project as soon as practicable after its conclusion. The Mining Branch, Lowell B. Moon, chief, conducts preliminary examinations, performs the actual exploratory work, and prepares the final report. The Metallurgical Branch, R. G. Knickerbocker, chief, analyzes samples and performs beneficiation tests. Both these branches are under the supervision of Dr. R. S. Dean, assistant director.

With respect to this report, special acknowledgment is due Dr. Eldred D. Wilson of the Arizona Bureau of Mines, for his mapping and interpretation of the geology of the area, whose maps are used in the report. Acknowledgment is also made to L. G. Marshall, Robert M. Grantham, and George W. Huseman, engineers of the Bureau of Mines who were associated with the author in various phases of the project work. Acknowledgment is likewise made to Thomas C. Denton, acting chief, Tucson Division, Mining Branch, and W. R. Storms, acting chief, Tucson Division, Mining Branch, for their aid and direction.

LOCATION AND ACCESSIBILITY

The Mohawk zinc prospect is in sec. 36, T. 18 S., R. 19 W., and sec. 1, T. 19 S., R. 16 W., Pima County, Ariz., on the east flank of the Santa Rita Mountains. It is reached most conveniently from Tucson, by driving 24 miles east on U. S. Highway 80 to Mountain View station, then 13 miles south on State Highway 83, the Sonoita road, then turning right onto the Rosemont road and following this 5 miles up a wash past the Rosemont ranger station to the

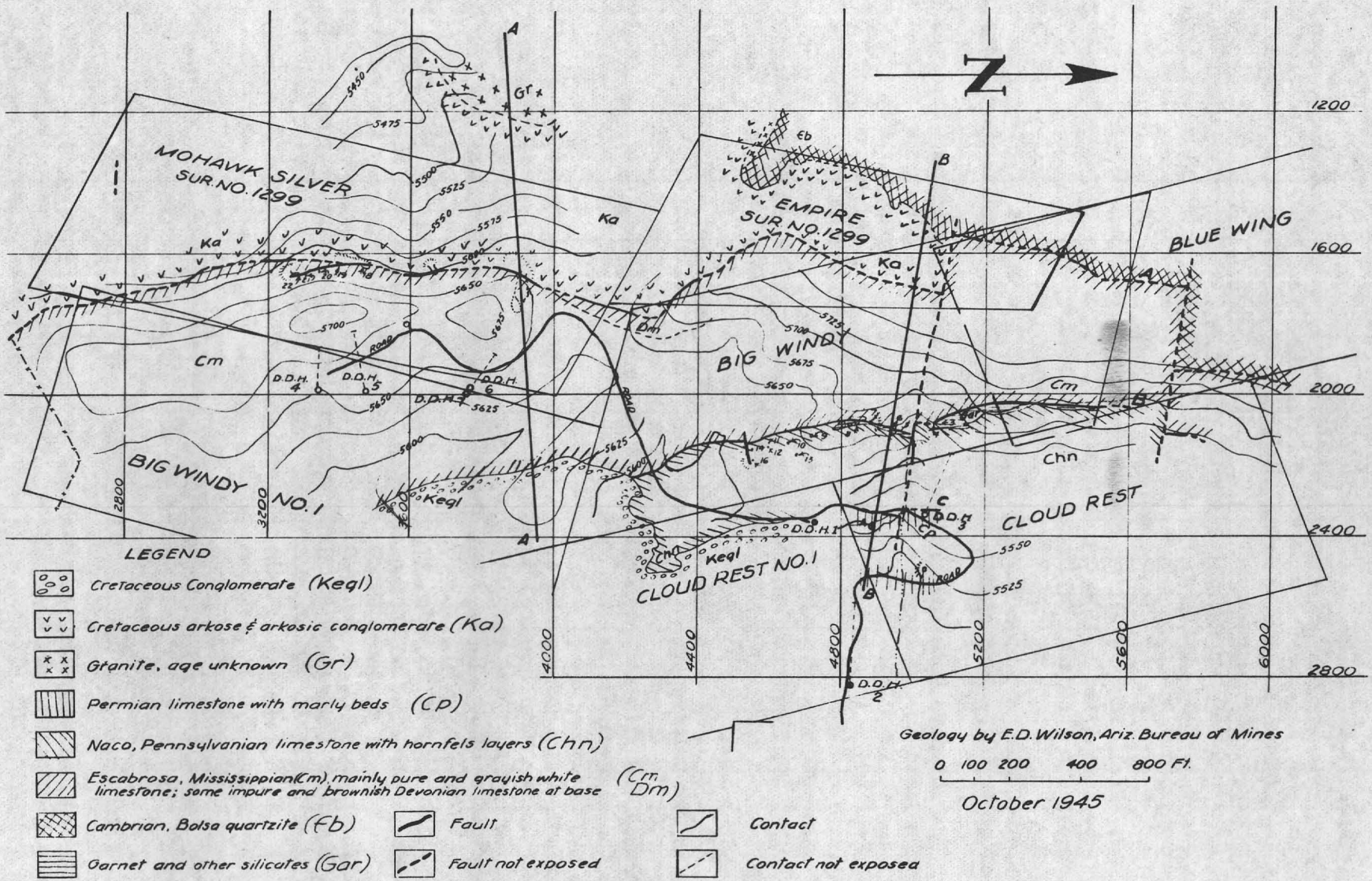


Figure 1. - Topographic and geologic map of Mohawk zinc prospect, Pima County, Ariz.

third turn-off left, and there taking the left road 3.15 miles to the Mohawk zinc prospect. An alternate route is to go 27 miles south on U. S. Highway 89, thence turn left at Continental onto the Box Canyon road and follow this road 16 miles east, thence turn north onto the Barrel Canyon road. On this road go 0.7 mile to a track that turns left onto a ridge, thence 1.25 miles north along the ridge, over a small pass, and join the Mohawk zinc road at the foot of a mountain grade, 0.5 mile from the prospect.

OWNERSHIP

The explored ground is embraced in six lode mining claims - the Mohawk Silver and the Empire, which are patented, and four unpatented claims, the Big Windy, the Big Windy No. 1, the Cloud Rest, and the Cloud Rest No. 1 (fig. 1). The two patented claims are owned by Frederick Lewisohn, the estate of Adolph Lewisohn, and the estate of Leonard Lewisohn. The four unpatented claims are part of the Golden Gate group owned by the estate of Mrs. U. S. Grant, II.

PHYSICAL FEATURES

These claims lie at altitudes of 5,450 to about 5,800 feet. They are west of a front range of hills. A steep-sided canyon was cut through these hills along a zone of cross faulting near the north end of the prospect. The access road to the claims was graded on the south side of this canyon.

The north and east exposures have a fairly thick cover of brush with some small trees of oak, juniper, cypress, and pinon pine. The south and west exposures are rather bare.

HISTORY

All these claims were located in the 1880's or 1890's. Shallow work was done in search of silver ores along the outcrops on the Mohawk Silver and Big Windy claims by the early prospectors. A lessee sank an inclined shaft in 1916 near the north end of the Mohawk zinc claim for more than 130 feet and stoped oxidized zinc ore for short lengths north and south of the shaft.

According to a report, he shipped eight carloads of 44-percent zinc ore to Coffeeville, Kans. This ore was packed 0.5 mile on burros to the end of the truck road.

GEOLOGY

The area is underlain by Paleozoic and Cretaceous sedimentary rocks that dip east. The succession of formations in the northern part of the area, from west to east, is Cambrian Bolsa quartzite, Devonian Martin limestone, and Mississippian Escabrosa limestone, Pennsylvanian Naco limestone, and Permian limestone and marl (fig. 1).

In the south two-thirds of the area, the Paleozoic limestones lie on Cretaceous arkose along an overthrust fault (A), which is the dominant structural feature. The arkose is missing north of the more southerly of

two strong cross faults. There the Paleozoic limestone in the hanging wall of the fault rests on Bolsa quartzite in the footwall. Several other faults (B and C), which strike north and dip more steeply to the east than the reverse fault, cut the limestones that lie above the overthrust fault. A minor cross fault with slight mineralization was mapped, and cross shearing is notable at some places.

In the southeastern part of the area the Paleozoic limestones are overlapped by Cretaceous conglomerate composed mainly of flattened limestone and quartzite pebbles.

The principal mineralization on the Mohawk Silver claim is localized along the overthrust fault (A), and on the Big Windy claim along a steeper strike fault (B) that outcrops 300 to 500 feet east of the surface trace of the overthrust fault. The best mineralization there is in ore along the south 200 feet of a garnetized zone in the hanging wall of the fault.

EXPLORATORY WORK

After preliminary sampling and mapping had been done, the Bureau of Mines decided to do some diamond drilling in search of sulfide ore at some depth below the surface. Considerable preparatory work was needed before drilling could be started, because the truck trail from the Box Canyon road ended half a mile from the drill sites, with rugged country intervening. The work was done in three stages:

1. An access road was built, for hauling water to the drill sites, and a little bulldozer trenching was done.

2. Six inclined diamond-drill holes were sunk. Drilling amounted to 2,024 feet (595 feet with the Bureau of Mines drill, 1,429 feet on cotract).

3. Systematic sampling of the outcrops and old workings was done while drilling was in progress.

Access road. - A practicable route was found on the steep south side of the canyon that drains east. This required 0.5 mile of heavy grading and 0.25 mile of blasting. A total of 1.75 miles of road was built to connect with the Rosemont ranger station, where the crew lived. The drilling water was hauled 3.5 miles from a well at the ranger station until the well failed. Thereafter, it was hauled 5 miles from the St. Louis mine near Greaterville.

Diamond drilling. - Six inclined holes were drilled to intersect the two ore-bearing faults below the outcrops along their dips at 290 to 487 feet. The horizontal projections of the holes are shown on figure 1. Five of the holes are shown in section on figures 2 to 5. Holes 1 to 3 were drilled to prospect the fault zones below the outcrops on the Big Nindy claim; 4, 5, and 7 to prospect the main over-thrust fault (A) below the outcrops on the Mohawk Silver claim. Holes 1 and 3 were drilled by the Bureau of Mines; the other holes were contracted. Hole 6 was abandoned by the contractor at 105 feet before its objective was reached, and was replaced by hole 7.

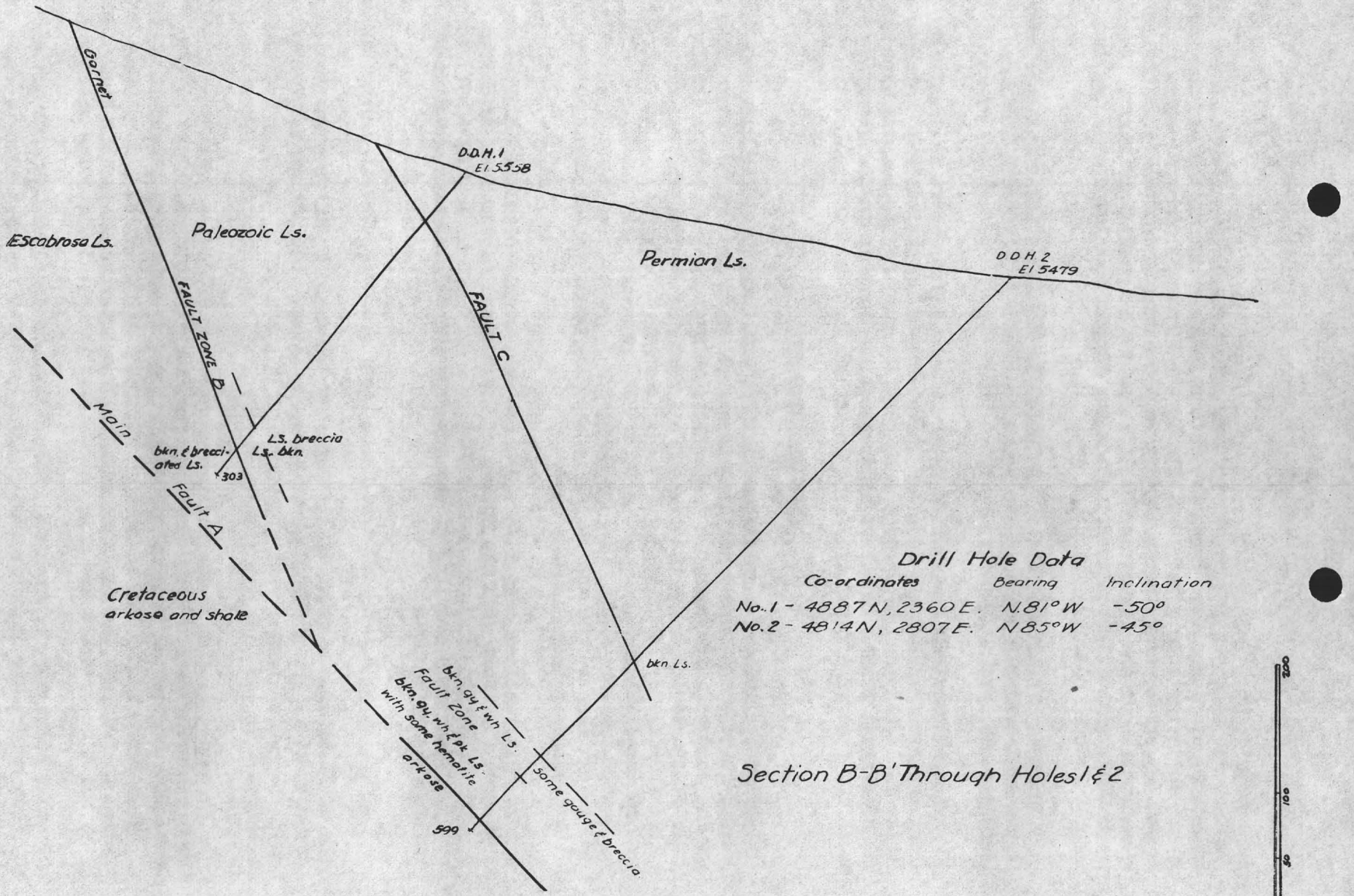


Figure 2. - Section B-B', Mohawk Zinc, Pima County, Ariz.

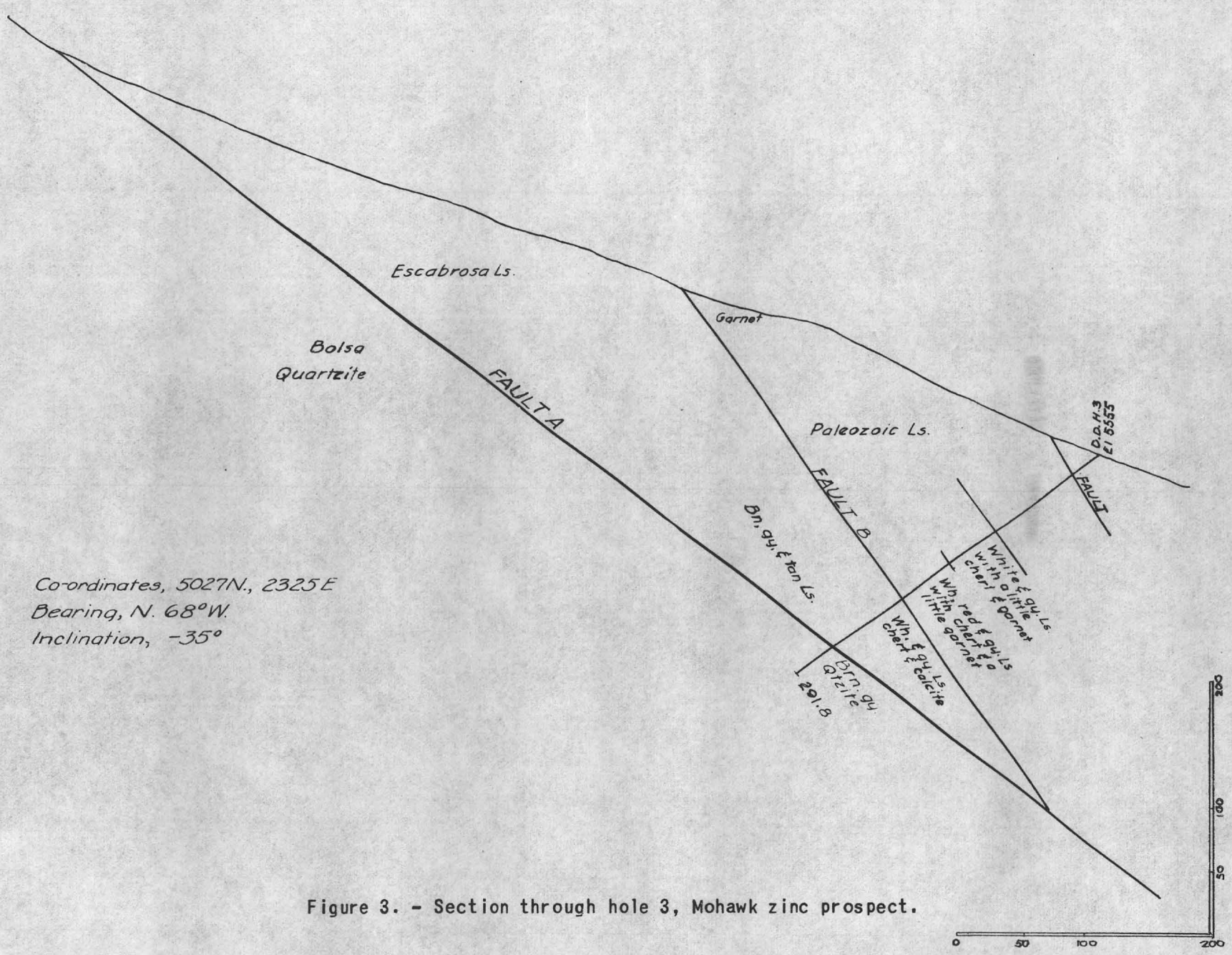


Figure 3. - Section through hole 3, Mohawk zinc prospect.

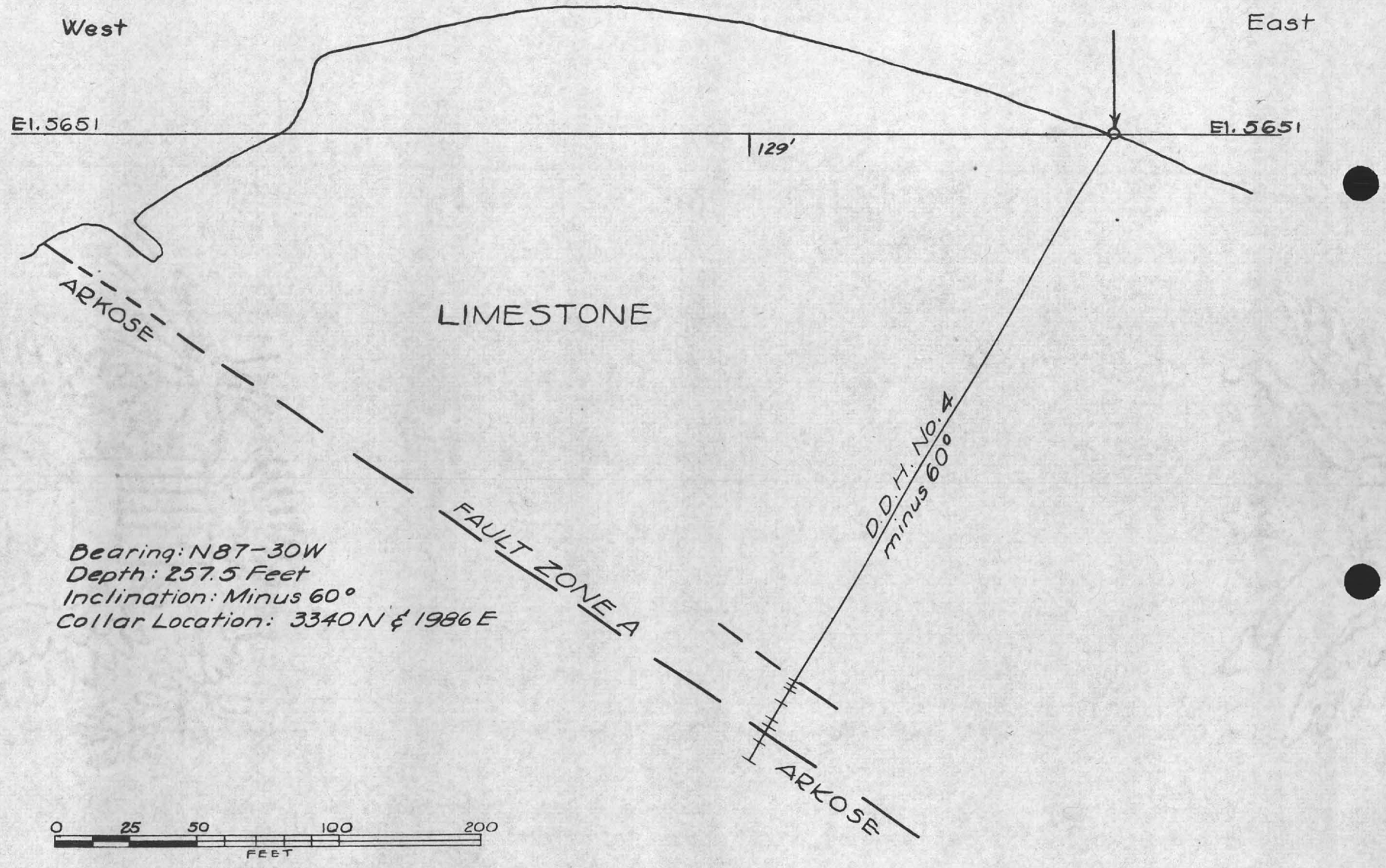


Figure 4. - Section through drill hole 4, Mohawk zinc prospect.

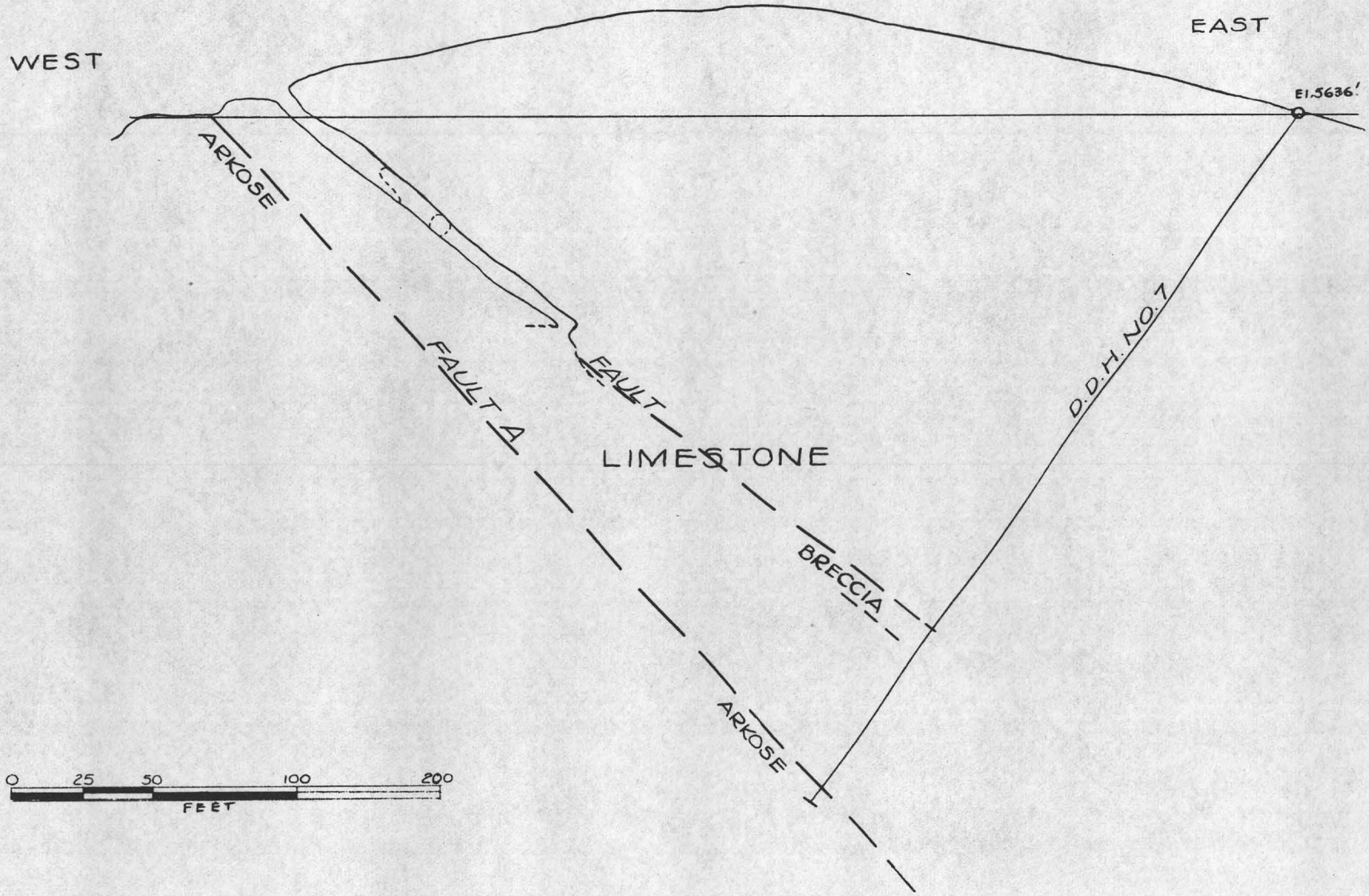


Figure 5. - Section through drill hole 7, Mohawk zinc prospect.

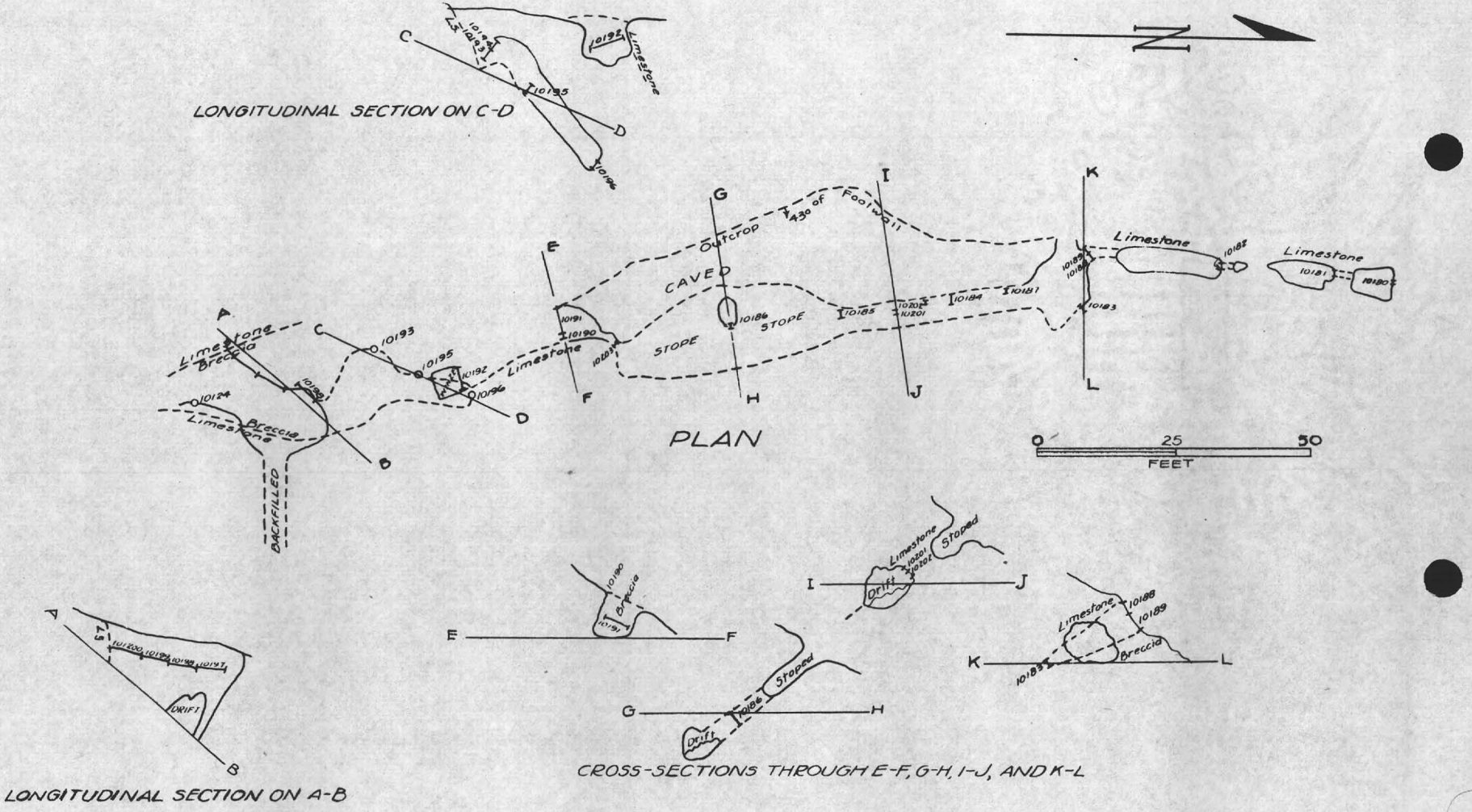


Figure 6. - Sample plat of south outcrops and old workings, Mohawk silver claim.

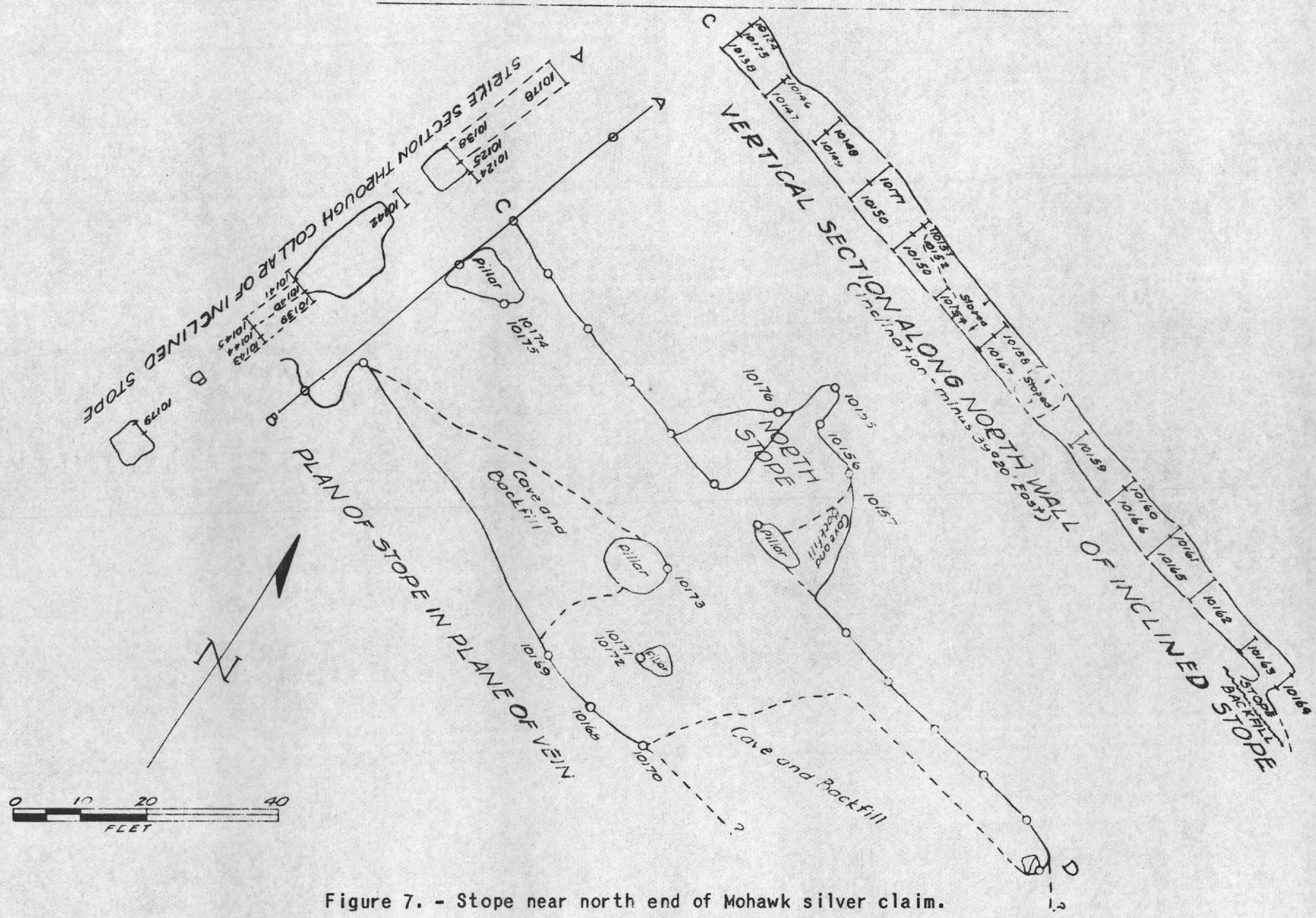


Figure 7. - Stope near north end of Mohawk silver claim.

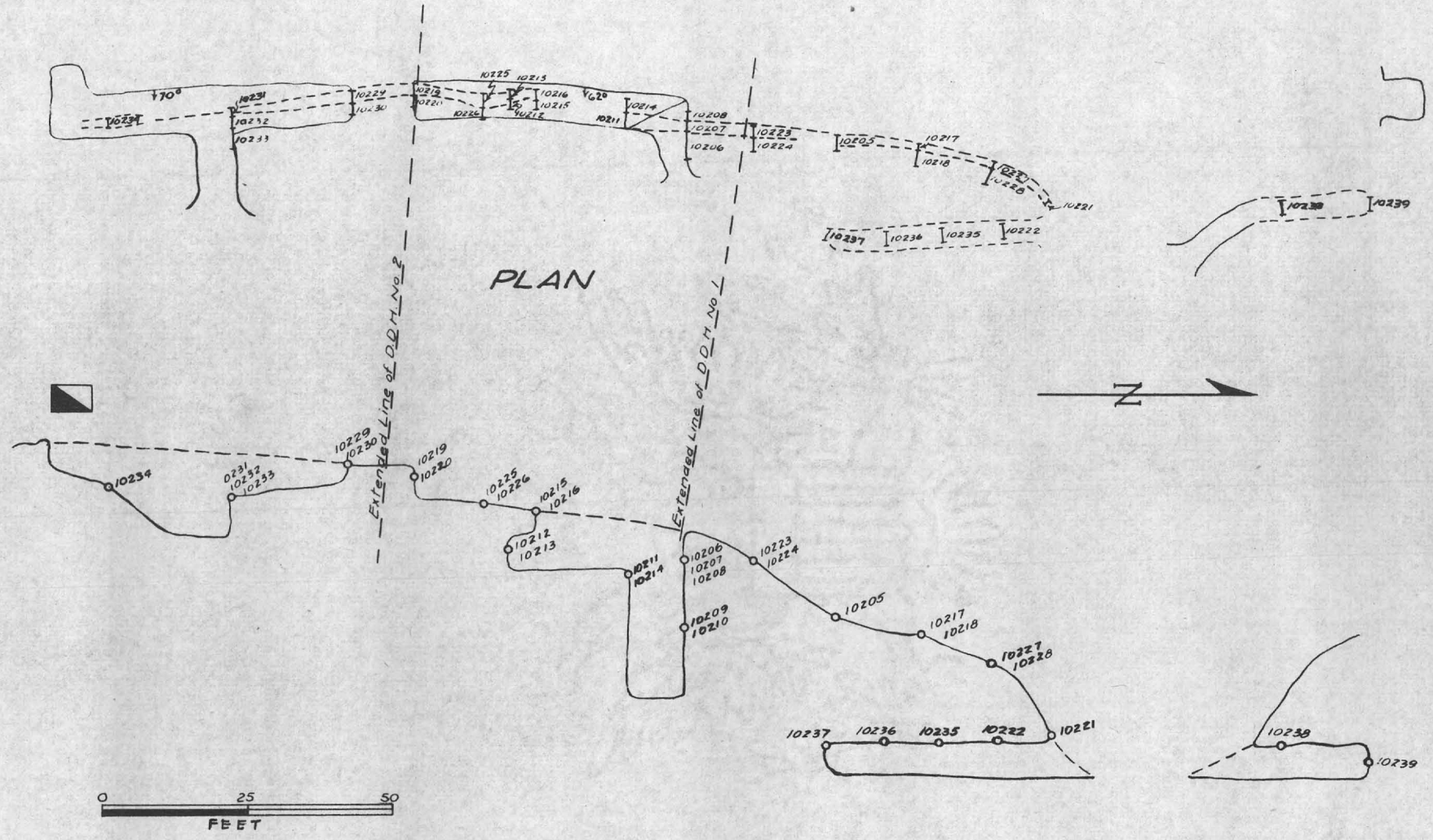


Figure 8. - North outcrops and workings on Big Windy claim.

The holes penetrated mainly limestone. There was also some marl in hole 2. The core recovery averaged about 75 percent in the more solid rock and about 30 percent in the fault breccias. Some zones penetrated by all the holes contained narrow, open fissures lined with small, calcite crystals, which made frequent cementing necessary to regain circulation of drilling water. These fissures were spaced at 1 to 3 feet through all of hole 7 below 57 feet. Hole 7 is in a belt of strong cross shearing.

None of the holes reached the water table or passed out of the oxidized zone. No appreciable lead or zinc mineralization was found in any of the holes. Numerous samples of slightly altered rock and of material from the fault zones were assayed. All contained little more than traces of lead and zinc. The outcrop is heavily garnetized in the hanging wall of fault B above holes 1 and 3, but the cores from this zone in these two holes showed only meager garnetization.

Channel sampling. - The two mineralized outcrops with shallow workings and the old stope that overlies hole 7 were systematically sampled during the progress of the drilling. The sample data are assembled in tables 1, 2, and 3. The sample locations are shown on figures 6, 7, and 8.

TABLE 1. - Data on samples from south outcrop and shallow workings along fault A, Mohawk Silver claim

Sample	Location	Thickness, ft.	Pb, percent	Zn, percent	Cu, percent	Ag. oz/t
10,180	North end, north opening ..	0.7	0.1	1.8	0.06	Tr.
10,181	North end, second opening from north	1.0	5.8	2.0	1.08	0.20
10,182	North end, third opening from north	1.0	.4	30.0	3.5	.40
10,183	On line KL, main drift	1.2	5.5	34.6	1.33	.60
10,184	Main drift, 24 feet south of KL	3.0	.7	26.6	1.25	1.25
10,185	Main drift, 44 feet south of KL	2.5	6.1	16.5	3.36	1.45
10,186	On line GH, 64 feet south of KL	2.0	25.4	1.5	3.31	4.85
10,187	Main drift, 14 feet south of KL	.7	1.0	18.4	5.57	.75
10,188	On line KL, HW side	3.0	7.8	27.0	2.42	2.85
10,189	On line KL, FW side	3.0	3.4	24.1	1.56	.35
10,190	On EF, face of drift stope 94 feet south of KL, HW side	1.0	3.1	19.2	2.96	1.60
10,191	Cu EF, face of drift stope 94 feet south of KL, FW side	5.0	1.5	8.2	.32	.60
10,192	Top hole, above face south opening	6.0	1.3	9.2	.15	.75

TABLE 1. - Data on samples from south outcrop and shallow workings along fault A, Mohawk Silver claim (Cont'd.)

Sample	Location	Thickness, ft.	Pb, percent	Zn, percent	Cu, percent	Ag, oz/t
10,193	On line CD, portal S, drift FW side	2.5	0.4	20.1	2.99	0.50
10,194	Same locations as 10,193, HW side	2.0	.8	3.4	.07	.50
10,195	On line CD in S drift, 9 feet from portal	1.5	.4	31.2	2.45	1.10
10,196	On line CD face of south drift	2.0	.3	2.3	.19	.50
10,197	On line in small south stope HW side	4.0	.5	2.4	.10	.65
10,198	On line in small south stope, below No. 10,197 .	5.0	2.2	1.8	.12	1.35
10,199	On line in small south stope, below No. 10,198 .	5.0	.3	2.2	.25	1.50
10,200	On line in small south stope, FW side	5.0	1.2	2.4	1.10	1.20
10,201	On line IJ, 35 feet south of KL, HW side	1.5	1.1	3.6	.98	.70
10,202	On line IJ, 35 feet south of KL, FW side	2.0	1.0	10.7	.47	1.25
10,203	In main drift, 85 feet south of KL	2.5	2.9	8.3	1.33	.90
10,204	At portal of south stope ..	2.5	2.9	1.5	.94	.25

TABLE 2. - Data on samples from deep stope, Mohawk Silver claim

Sample	Location	Thickness, ft.	Pb, percent	Zn, percent	Cu, percent	Ag, oz/t
10,124	North side stope at top, H.W.	1.7	0.2	23.1	0.30	0.35
10,125	North side stope at top, middle	2.2	.1-	12.6	.15	.50
10,138	North side stope at top, F.W.	3.3	.1-	.5	.02	.50
10,139	South side stope, at top, H.W.	2.5	.1-	.1-	.03	tr.
10,140	South side stope, at top, middle	2.0	.1-	36.6	.28	tr.
10,141	South side stope, at top, F.W.	2.5	.1-	5.1	.09	tr.
10,142	Pillar at top of stope, upper side	3.0	.1-	6.4	.09	0.20
10,143	10 feet south of stope at top, H.W.	1.0	.1-	1.5	.04	.15
10,144	10 feet south of stope at top, middle	2.0	.1-	5.4	.15	tr.
10,145	10 feet south of stope at top, F.W.	2.0	.1-	29.9	.25	tr.
10,146	North side stope, 10 feet down, H.W.	1.0	.1-	31.1	.62	0.10
	North side stope, 10 feet down, F.W.	3.5	.1-	.7	.02	.15
10,148	North side stope, 20 feet down, H.W.	3.0	.1-	31.2	.47	.10
10,149	North side stope, 20 feet down, F.W.	2.5	.1-	12.6	.24	.10
10,150	North side stope, 30 feet down, F.W.	4.0	.1-	.6	.01	.35
10,151	North side stope, 40 feet down, H.W.	1.0	.2	43.0	.28	tr.
10,152	North side stope, 40 feet down, middle	2.0	.2	11.2	.06	0.35
10,153	North side stope, 40 feet down, F.W.	4.0	.4	1.3	.03	.25
10,154	50 feet down in line of north side stope F.W.	2.5	.1-	12.7	.20	.10
10,155	Face of short drift in breast of stope north	5.0	.1-	1.0	.03	.25
10,156	East side of short drift in breast of stope north	1.0	.1-	25.3	.25	.15
10,157	Breast of stope north, 10 feet east of No. 10,156	3.0	.1-	24.8	.16	tr.
10,158	West side of pillar in line with north side of stope, H.W.	2.5	.1-	45.0	.39	.25
10,159	North side of stope, 80 feet down	3.0	.2	4.0	.06	.15
10,160	North side of stope, 90 feet down, H.W.	2.0	.2	2.7	.10	.10
10,161	North side of stope, 100 feet down, H.W.	2.0	.1-	32.0	.44	.15

TABLE 2. - Data on samples from deep stope, Mohawk Silver claim (Cont'd.)

Sample	Location	Thickness, ft.	Pb, percent	Zn, percent	Cu, percent	Ag, oz/t
10,162	North side of stope, 110 feet down	5.0	0.2	2.8	0.05	0.25
10,163	North side of stope, 120 feet down	3.0	.2	3.0	.02	.15
10,164	Near north side of stope, 130 feet down	3.0	.3	16.8	.09	tr.
10,165	North side stope, 100 feet down, F.W.	5.0	.4	3.1	.03	0.10
10,166	North side stope, 90 feet down, F.W.	3.5	.4	1.2	.01	tr.
10,167	West side of pillar in line of North side of stope, F.W.	3.0	.4	1.0	.04	tr.
10,168	South side of stope, 64 feet down	3.0	.3	1.5	.03	0.15
10,169	South side of stope, 54 feet down	3.0	.4	17.7	.10	tr.
10,170	South side of stope, 74 feet down	2.5	.6	2.7	.05	tr.
10,171	Southwest side of south pillar, H.W.	1.5	.3	27.1	.40	tr.
10,172	Southwest side of south pillar, F.W.	2.5	.4	36.6	.21	tr.
10,173	Northeast side of central pillar	6.0	.5	4.8	.04	tr.
10,174	East side of top pillar, H.W.	1.0	.3	28.9	.02	0.25
10,175	East side of top pillar, F.W.	3.0	.1-	.4	.02	.20
10,176	West side of stope north at short drift	2.0	.1-	30.0	.14	tr.
10,177	North side stope, 30 feet down, H.W.	4.0	.1-	.7	.01	tr.
10,178	Surface, 20 feet north of stope	4.0	.1-	.1	.02	0.15
10,179	North side small opening, 24 feet south of stope	3.0	.1-	.8	.02	tr.

TABLE 3. - Data on samples from north outcrops and shallow workings along fault B, Big Windy claim.

Sample	Location	Thickness, ft.	Pb, percent	Zn, percent	Cu, percent	Ag, oz/t
10,234	South O-cut, 10 feet north of south end (some garnet)	1.8	0.3	32.3	0.08	0.10
10,231	South O-cut, 31 feet north of south end F.W.	1.0	.3	36.3	.11	.30
10,232	South O-cut, 31 feet north of south end, middle (garnetized)	2.0	.3	25.2	.31	.60
10,233	South O-cut, 31 feet north of south end, H.W. (garnetized)	3.6	.1	1.3	.06	.20
10,229	North end south opencut, F.W. (garnetized)	2.5	.2	10.2	.17	.10
10,230	North and south opencut, H.W. (garnetized)	2.0	.1	1.7	.08	tr.
10,219	11 feet north of south O-cut, F.W. (garnetized)	2.0	.1	33.0	.30	0.30
10,220	11 feet north of south O-cut, H.W. (garnetized)	2.0	.1	8.4	.14	tr.
10,225	125 feet north of sample 10,219, F.W. (garnetized)	2.5	.1	19.8	.35	0.40
10,226	125 feet north of sample 10,219, H.W. (garnetized)	2.0	.1	5.6	.07	tr.
10,215	South end north O-cut, F.W. (garnetized)	1.5	.3	28.5	.15	tr.
10,216	South end north O-cut, H.W. (some garnet)	2.0	.1	.5	.02	tr.
10,212	South face north O-cut, H.W.	1.7	.5	27.2	.34	0.35
10,213	South face north O-cut, F.W. (Ls.)	1.6	.5	1.0	.04	tr.
10,211	South side collar of winze in north O-cut, H.W. (some garnet)	3.0	.4	31.7	.23	0.30
10,214	South side collar of winze in north O-cut, F.W. (Ls. and chert)	2.5	.5	.3	.02	tr.
10,206	North face north O-cut, H.W. (garnetized)	5.0	.3	8.3	.11	tr.
10,207	North face north O-cut, middle (garnetized)	1.5	.4	21.5	.19	0.55
10,208	North face north O-cut, F.W. (Ls.)	1.5	.7	8.2	.27	.30
10,209	North side winze in north O-cut, 9 feet down, F.W. (Ls.)	1.5	.5	45.1	.11	tr.
10,210	North side winze in north O-cut, 9 feet down, H.W. (Ls.)	2.0	.5	2.9	.09	tr.
10,223	11.5 feet north of north O-cut, F.W. (garnetized)	2.0	.1	17.0	.12	1.50

TABLE 3. - Data on samples from north outcrops and shallow workings along fault B, Big Windy claim. (Cont'd.)

Sample	Location	Thickness, ft.	Pb, percent	Zn, percent	Cu, percent	Ag, oz/t
10,224	11.5 feet north of north O-cut, H.W. (garnetized)	2.5	0.1	0.6	0.09	tr.
10,205	16 feet north of north O-cut (dk Ls. garnet)	3.0	.4	2.0	.05	0.25
10,217	40.5 feet north of north O-cut, F.W. (garnetized)	1.0	.1	24.4	.21	.40
10,218	40.5 feet north of north O-cut, H.W. (garnetized)	3.0	.1	3.4	.10	.10
10,227	53 feet north of north O-cut, F.W. (hematite and garnet)	1.0	.1	15.7	.10	.75
10,228	53 feet north of north O-cut, H.W. (garnetized)	3.0	.2	13.4	.15	.10
10,221	Back of drift south from gulch, portal	1.5	.1	31.0	.15	.30
10,222	Back of drift south from gulch, 9 feet in.	2.5	.1	30.4	.45	.30
10,235	Back of drift south from gulch, 19 feet in.	2.0	.1	3.3	.05	tr.
10,236	Back of drift south from gulch, 29 feet in.	2.5	.1	2.3	.07	0.10
10,237	Back, at face of some drift, (garnetized).....	2.5	.1	2.6	.05	.30
10,238	Back in drift north from gulch, 5 feet in.	2.5	.1	.4	.06	.10
10,239	Face of drift north from gulch	2.5	.1	.4	.10	tr.

CLAIMS AND WORKINGS OF THE NARRAGANSETT GROUP

Scale 1 inch = 200 feet

Contour interval 20 feet

1931

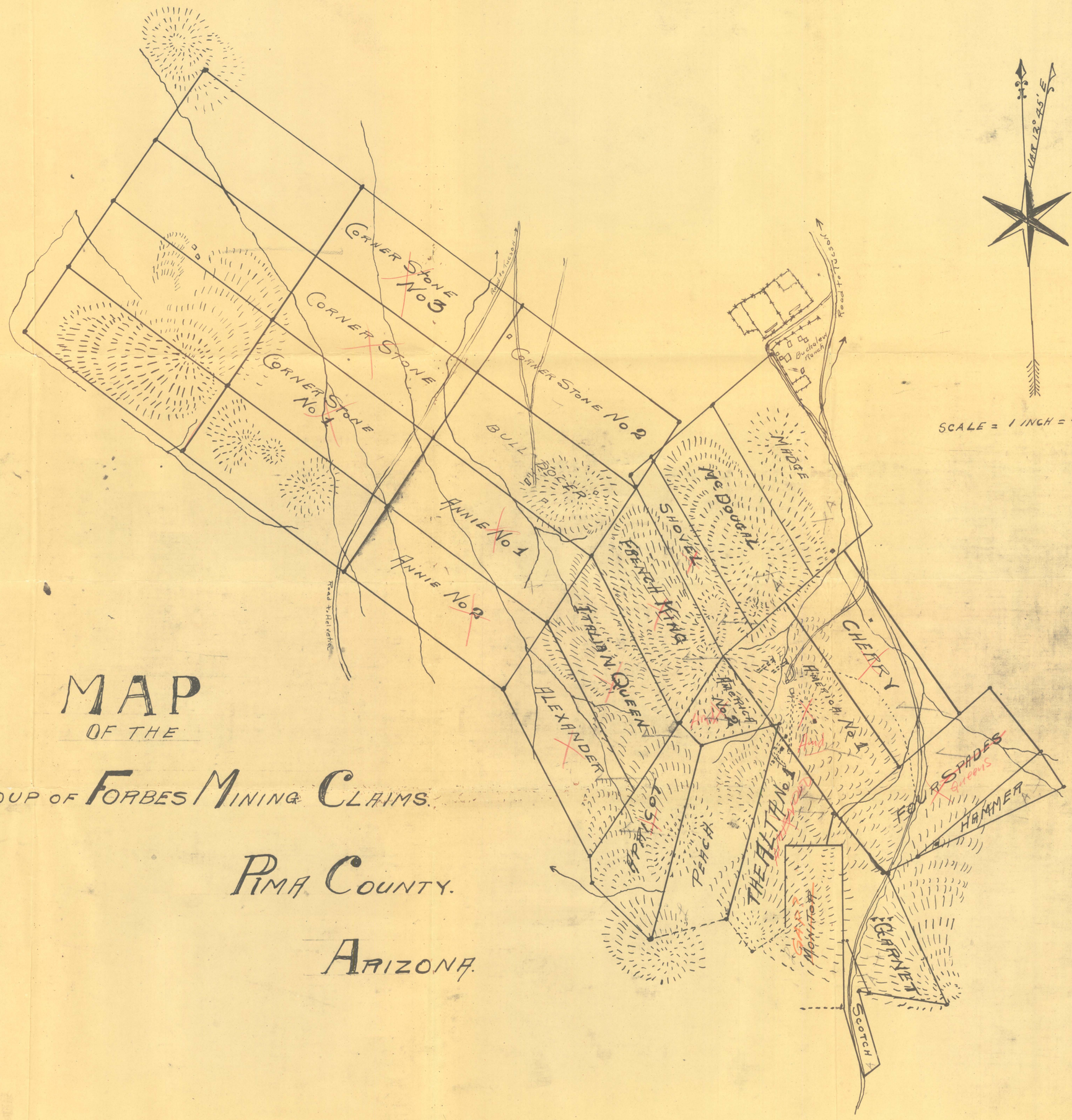
Walter Thomas

MAP
OF THE

GROUP OF FORBES MINING CLAIMS.

PIMA COUNTY.

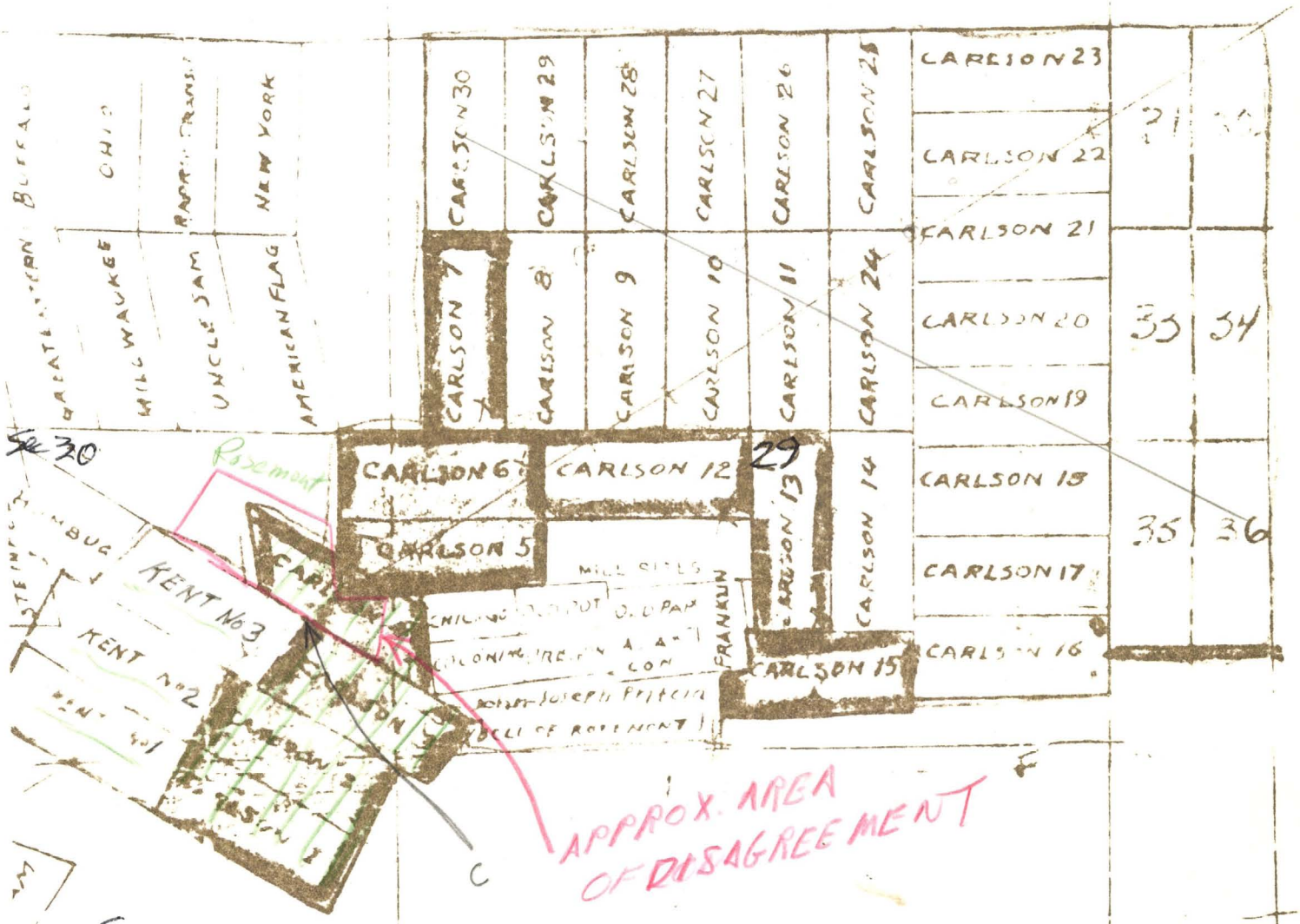
ARIZONA.



VAR 12° 45' E

SCALE = 1 INCH = 400 FEET

R 16 E



CLAIMS MAP ROSEMONT AREA

HELVETIA MINING DIST. PIMA CO. ARIZ.

1" = 1200' APPOX

Sec 32

CARLSON

JUNE, 1962

BY G. N. Stevens

Registered Professional Engineer (Ariz.)
CERTIFICATE EXPIRES
T. N. STEVENS