R. I. 3928 AUGUST 1946

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

BUREAU OF MINES
R. R. SAYERS, DIRECTOR

REPORT OF INVESTIGATIONS

EXPLORATION OF THE MOUNT HOPE MINE
EUREKA COUNTY, NEVADA

BY

E. J. MATSON

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EXPLORATION OF THE MOUNT HOPE MINE, EUREKA COUNTY, NEVADA[1/]

By E. J. Matson[2/]

SUMMARY

The Bureau of Mines has been investigating deposits of critical and essential minerals in the United States since 1939. Projects were set up on only the most promising properties.

A preliminary examination of the Mount Hope mine was made in January 1943 by the Bureau's engineers, who recommended exploration by diamond drilling.

The mine is in the unsurveyed portion of T. 22 N., R. 1 E., Mount Diablo base and meridian, south-central Eureka County, Nevada, 25 miles by road north of the village of Eureka. A partly graded and graveled secondary road connects the mine and Eureka on U. S. Highway 50.

Extensive sampling was done by the Bureau in February 1943. Core drilling from the surface was started on March 15, 1944, and completed on April 2, 1945. The 18 holes drilled totaled 7,215 feet. The mining company also did extensive underground core drilling from April 21, 1944, to January 4, 1945. This report gives the results of core drilling supervised by the Bureau of Mines.

The drilling program was designed to explore for extensions of the mineralization exposed in the mine workings. As a result of drilling, additional ore was found, and it is believed that this project has fulfilled the purpose for which it was planned.

ACKNOWLEDGMENT

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

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2/ Mining engineer, Boulder City Division, Mining Branch, Bureau of Mines.

examinations, performs the actual exploratory work, and prepares the final report. The Metallurgical Branch, R. G. Knickerbocker, chief, analyzes samples of ore 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 to Charles W. Merriam of the United States Geological Survey for his interpretation of the Mount Hope mine geology and his cooperation throughout the project; Col. Leverett Davis, former lessee of the property; K. K. Hood, manager of the Mount Hope Unit, Callahan Zinc-Lead Co., Inc.; C. P. Knaebel, assistant manager, and M. P. Nackowski, geologist, of that company, for their help, and to the Sullivan Machinery Co. for its assistance.

Acknowledgment is also made to Glenn L. Allen and G. L. Thompson, who examined the property and recommended the work; Paul T. Allsman, chief, Salt Lake City Division, and A. C. Johnson, chief, Reno Division, Mining Branch; and Lowell B. Moon, chief, Mining Branch, for their aid and direction.

OWNERSHIP

The property is owned by the Universal Exploration Co., a subsidiary of U. S. Steel Corporation. It is under option by the Callahan Zinc-Lead Co., Inc., Empire State Building, New York, N. Y., and consists of 13 lode mining claims and one millsite, a total of 256 acres. The claims are designated Good Hope and Good Hope Millsite in Surveys 37A and B; Parallel Extension, Magnolia, Dixon No. 1, Dixon No. 2, Lorraine, Lorraine No. 1, Lorraine No. 2, Silver Butte, Silver Butte No. 1, Silver Butte No. 2, and San Juan Chief, all in Survey 4704.

HISTORY

The occurrence of lead-zinc ore in the Mount Hope district was first discovered in 1970 by Basque sheepherders, who at times also operated small charcoal furnaces. The charcoal was used in the lead smelters in Eureka. Scant attention was paid to the ore croppings because of their low silver content.

In 1890, Thomas Wren drove the present Mount Hope No. 2 adit in an unsuccessful search for rich lead-silver-gold ore. Wren also sank what is now called the Whim shaft and dug some shallow holes at the surface. Nothing further was ventured until 1926, when the U. S. Smelting, Refining & Mining Co. drove the present No. 1 adit. This was also done in an unrewarded hunt for lead-silver-gold ore.

The major development at the Lorraine section of the property was done about 1886 by a Mr. Batchelder, a resident of Nevada.

In 1928 the Mount Hope properties were optioned by Universal Exploration Co. and exploration work, started in the fall, was continued until January 1930. Approximately 1,000 feet of drifting, 3,500 feet of diamond drilling, and 1,005 feet of churn drilling were done. In October 1930 all the claims were deeded to the Universal Exploration Co. Subsequently the property was

conveyed to the Columbia Steel Co. In July 1943 a lease agreement was given by Columbia Steel Co. to Leverett Davis and further exploratory work was commenced by him. Subsequently, Leverett Davis transferred the lease agreement to the Callhan Zinc-Lead Co., Inc., the present operator, which now has a controlling interest in the lease. In April 1944 the Columbia Steel Co. conveyed the property to the Universal Exploration Co., the present owner.

Between July 17, 1943, and October 31, 1944, 2,757 dry tons of ore, averaging 8.23 percent zinc and 1.76 percent lead, were shipped to Combined Metals Reduction Co. at Bauer, Utah.

Callahan Zinc-Lead Co., Inc., Empire State Building, New York, N. Y., conducted an extensive drilling and development program and constructed a power plant and concentrating mill on the property to treat about 200 tons of ore per day. Productive operations commenced July 1945, and the first cadmium-bearing zinc concentrates were shipped ton July 9, 1945.

PHYSICAL FEATURES

The property is on the southeast side of Mount Hope, which rises to an altitude of about 8,000 feet. The portal of the main adit, from which the present mining operations are being conducted, is 6,745 feet in altitude, and the camp site is 50 to 100 feet lower. The relief of the area is moderate at the camp site and at the portal of the mine adit but rises steeply and is very rugged towards the crest of Mount Hope, as shown in accompanying illustrations.

Sparse to moderate vegetation occurs in the area; no timber suitable for mine use can be cut. Potable water for mine and camp comes from an old drill hole near the face of No. 2 adit; the supply is limited. The winze in No. 1 adit encountered some water (40 g.p.m.), but it is not suitable for domestic use. The company has churn-drilled two holes about 2 miles south of the mine, and these will furnish abundant water for all domestic and operation purposes.

The climate varies from hot, dry summers to moderately cold winters. Heavy snows may occur often during the winter months, necessitating the use of snow-removal equipment to open the roads.

Railroad points are Palisade, Ely, Fallon, and Reno at distances of 60, 102, 208, and 271 miles, respectively. Eureka, postal center from which telephone connection is available, is 25 miles south of the property. Eureka is a small village on U. S. Highway 50 with a population of about 500 and is connected to the mine by a partly graveled road.

Ore is shipped via truck over State Highway 20 to Palisade, a station on the Southern Pacific and Western Pacific Railroads. The road has recently been graveled and made serviceable under the mine-access road program.

LABOR AND LIVING CONDITIONS

The company has no permanent living quarters for the staff or employees. However, 40 trailer cabins for living purposes have been obtained temporarily from the Federal Public Housing Authority. In addition, F.P.H.A. has supplied two utility cabins and two lavatory cabins.

Alternating 60-cycle, 110-volt electric current is supplied by the company for lighting. The company also maintains a shower-equipped change house for the employees at the mine and boarding house for all unmarried employees.

Two school-type busses, each capable of hauling about 25 men, also are available for transporting men to and from Eureka.

At the time of writing, miners were paid a base rate of $7.65 per 8-hour day, and muckers got $7.15, base pay, all with time and one-half for work over 40 hours. Men were obtained from Eureka and from the U. S. Employment Service at Ely, Nev.

MINE WORKINGS AND PLANT

The property consists of four main areas of development, designated herein as (1) No. 1 adit, (2) No. 2 adit, (3) Whim shaft area, and (4) Lorraine area.

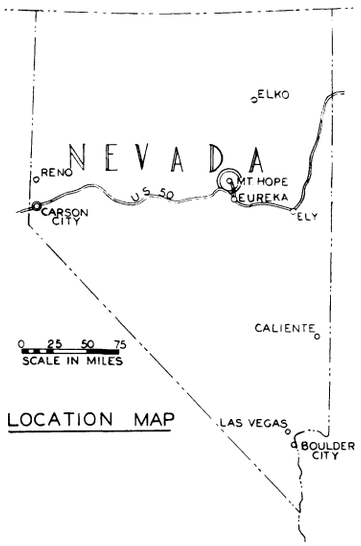
1. No. 1 adit area consists of an adit about 800 feet long, with numerous drifts, crosscuts, raises, and winzes totaling about 4,055 linear feet. Present mining operations and development in this area are being conducted where about 15,000 cubic feet of stoping had been done up to July 1945.

2. No. 2 adit area comprises one adit 1,350 feet long, with about 385 feet of subdrifts, crosscuts, raises, and one 10-foot winze - a total of about 1,745 linear feet. No. 2 adit has been bulkheaded at the portal and is used as a reservoir for water supply. The water comes from an old diamond drill hole near the face of the drift and supplies the bare necessities for domestic and mine use.

3. Whim shaft area is developed by a 90-foot shaft and a small stoped area. On the west face of the stope there is a 3-foot showing of ore that assayed 16.2 percent zinc and 15.4 percent lead. The shaft and workings, however, are inaccessible, and as continuity of mineralization was not established, no further work has been done in this area.

4. Lorraine workings comprise two vertical shafts 90 and 135 feet, respectively, and five levels - the main adit (0-foot level), 30-foot, 50-foot, 85-foot, and 130-foot levels.

The main adit (0-foot level) extends northwesterly about 240 feet with an irregular drift to the northeast 240 feet in length. The northeasterly drift is connected with the surface at a point about 140 feet east of the main portal. Numerous small subdrifts and crosscuts comprise the development of this level and total 834 linear feet.



LOCATION MAP

FIG. 1. - LOCATION & GENERAL TOPOGRAPHY OF CALLAHAN ZINC-LEAD COMPANY — MT. HOPE PROJECT NO. 15-151 — EUREKA COUNTY, NEVADA

COMPILED FROM COMPANY MAPS

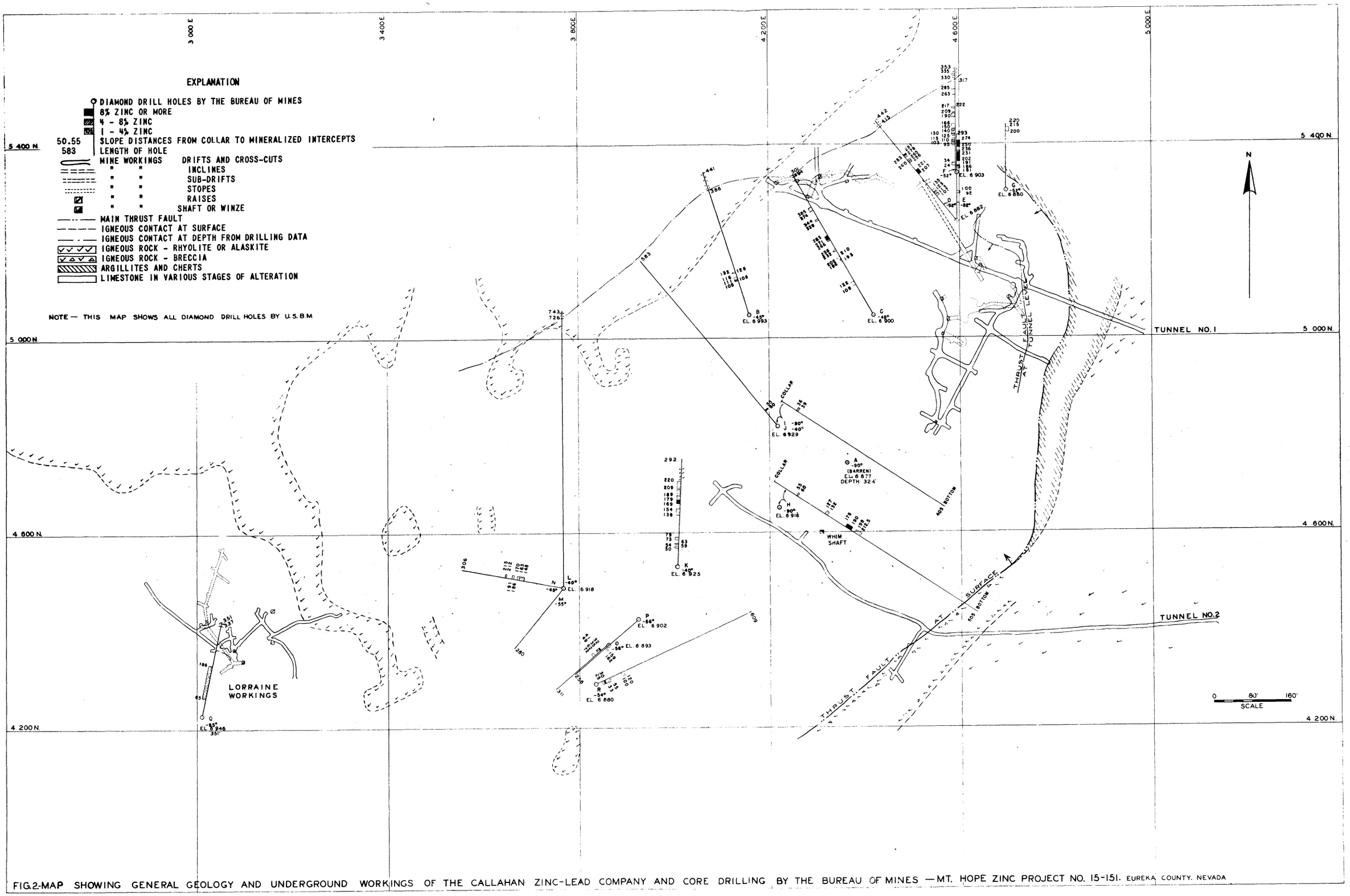


FIG. 2-MAP SHOWING GENERAL GEOLOGY AND UNDERGROUND WORKINGS OF THE CALLAHAN ZINC-LEAD COMPANY AND CORE DRILLING BY THE BUREAU OF MINES — MT. HOPE ZINC PROJECT NO. 15-151. EUREKA COUNTY, NEVADA

The two vertical shafts are 90 and 135 feet deep and are only 20 feet apart. The deepest shaft connects with the 30, 50, 85, and 130-foot levels, and the 90-foot shaft reaches all but the 130-foot level. The connecting passageways are now caved and inaccessible. The 30-foot level joins both shafts and has one drift 25 feet long, on about 15 feet long, and two small subdrifts, a total of 81 linear feet.

The 50-foot level also connects the two shafts and has a short crosscut along midway between aggregating 36 linear feet.

The 85-foot level is an "L"-shaped drift that connects the two shafts and has a total length of 98 linear feet.

The 130-foot or deepest level has one long drift extending northerly for a distance of 265 feet from the main shaft. Numerous short subdrifts 5 to 33 feet long have been driven at approximately right angles from the main drift. A small stope or raise (inaccessible) estimated to be 40 feet long extends from the lower level. Total drifting and raising is about 443 feet on this level.

Total drifting, sinking, and raising at the Lorraine workings amounts to 1,769 feet.

The mine has enough equipment for ordinary mining operations of approximately 200 ton per day.

GEOLOGY[3/]

Ore at the Mount Hope mine occurs as replacement deposits in altered limestone near the alaskite stock that forms the dome. These altered limestone zones occur within roof pendants wholly or partly engulfed by the intrusive magma and are not large. Consequently, the areas favorable for further exploration are limited. Ore distribution is erratic and is controlled by the contact with the intrusive, by the low-angle Mount Hope thrust fault, by northeasterly trending high-angle fault fissures, and by the bedding planes.

Principal ore mineral is marmatite, iron-rich zinc sulfide, occurring as seams, lenses, and disseminated specks in the altered limestone. Cadmium in small quantities is associated with the zinc. Galena also occurs in the Mount Hope ores, but not in as large quantities as the marmatite, and lead is only a minor metal. Other accessory minerals are pyrrhotite, chalcopyrite, garnet, calcite, limonite, and altered limestone. Ore is thought to have been formed by ascending solutions following the high-angle fissure and thrust-fault zone.

Sedimentary rocks at the Mount Hope mine are limestones, cherts, and argillites correlated as Pennsylvanian and Ordivician. These have been intruded by the Mount Hope stock, a porphyritic alaskite, and the economic metallic minerals were believed to have been deposited during the late stages of the intrusion.

3/ From oral communications and preliminary notes by C. W. Merriam, geologist, Federal Geological Survey.

Principal structural features are a low-angle thrust fault of irregular trace with a northerly over-all strike, dipping west from 10 to 30 degrees, and a highly asymmetrical fold occurring in the Pennsylvania sediments on the hanging-wall side of the thrust. A large number of fault fissures are present, some having a northeasterly strike and others somewhat parrallel to the thrust fault.

Bedding in the anticlinal fold has a northwesterly strike; in the southwest area it dips steeply to the southwest, whereas towards the northeast it flattens out appreciably and is almost flat. In the footwall of the main thrust chert and argillite beds are sheared and dislocated but dip westward at 40 to 60 degrees.

MINING METHODS

At present the only mining system developed has been the open-stope method. The ground in both No. 1 and No. 2 adits has shown no signs of sloughing or caving except at the juncture of the thrust fault with No. 1 adit, where a small amount of timbering was necessary. Stoped areas have no timber and show no signs of sloughing and as the unsupported ground stands well, the flat ore zones are worked cheaply by selective mining by the room-and-pillar method. Most pillars are low-grade or barren areas, and mucking is done with scrapers.

The smaller vertical zones also are mined by the open-stope method, using pillars or occasional stulls where necessary.

ORE DRESSING

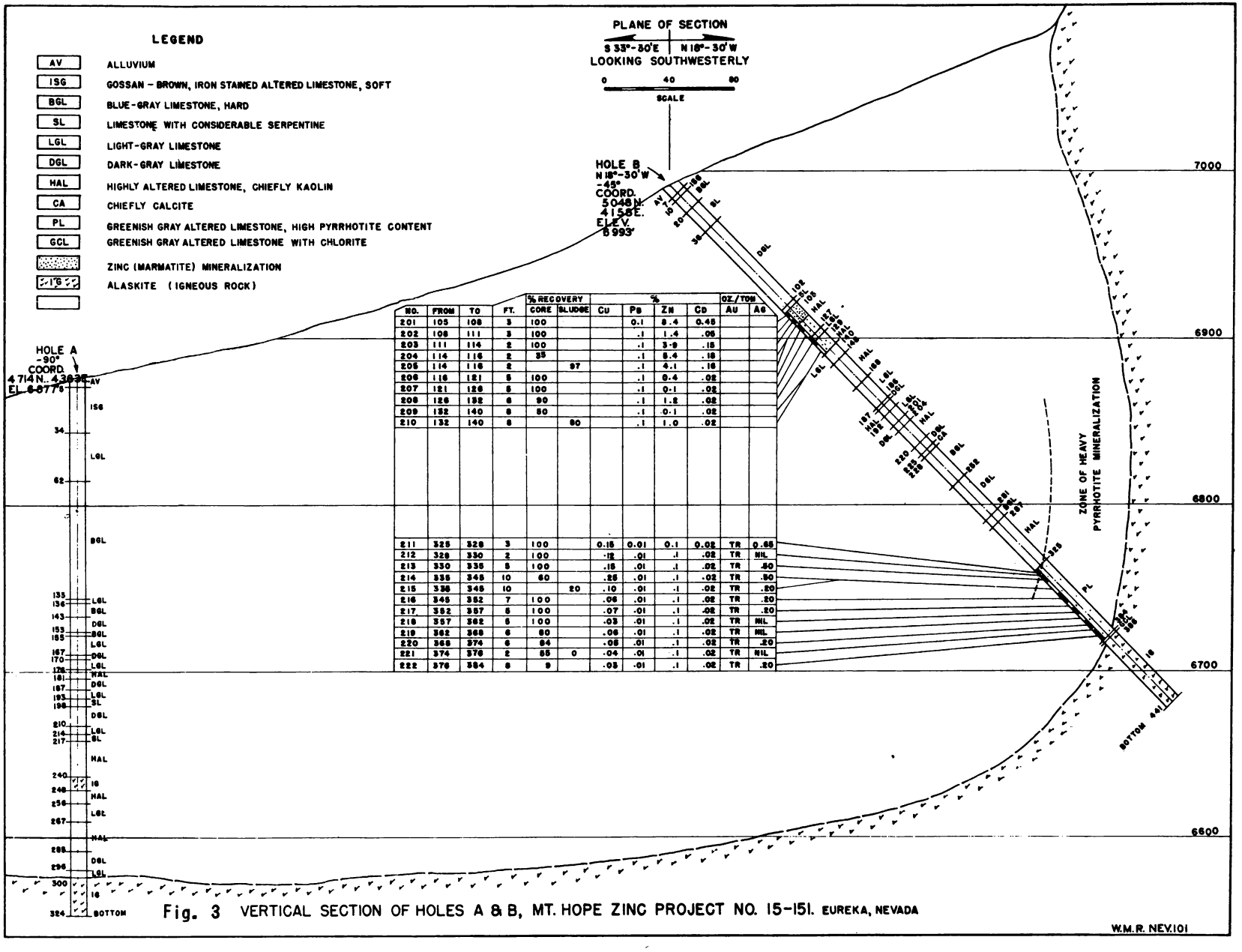
The concentrator at the property was still under construction at the time project work was completed by the Bureau. Most of the equipment to be installed has been transferred from the Duquesne mill of the Callahan Zinc-Lead Co., Inc., near Nogales, Ariz., and the Western-Knapp Engineering Corp. was awarded the contract for the construction.

Preliminary tests were made by the ore-dressing laboratory of the Bureau of Mines at Salt Lake City on a composite of eight samples from No. 1 adit, which analyzed as follows:

Percent											Oz./ton	
Zn	Ox.Zn.	Cd	Cu	Pb	Fe	S	Insol.	CaO	MgO	Al_2O_3	Au	Ag
12.75	0.7	0.6	0.1	.05	10.6	13.2	50.4	12.8	3.6	1.8	Tr	0.96

Briefly, these tests indicated:

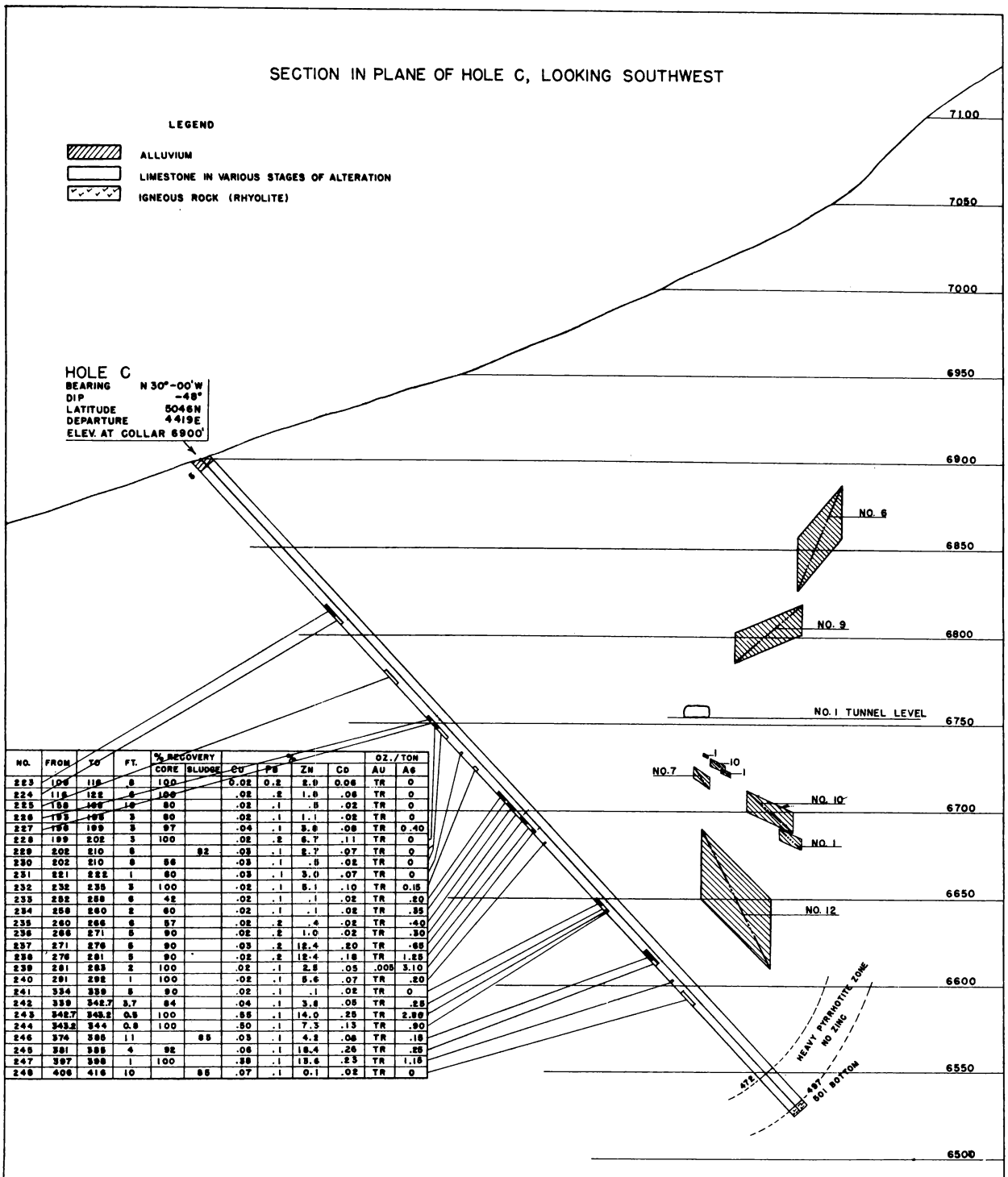
By selective flotation of ore ground to minus 100-mesh, over 90 percent of the zinc and cadmium was recovered in a concentrate assaying 42.2 percent zinc, 16.1 percent Fe, 1.8 percent Cd, and 4.8 percent insol. Owing to the inclusion of fine foreign sulfides in the zinc concentrate, a finer grind was next employed. After minus 200-mesh grinding, 74.1 percent of the zinc was recovered in a product



NO.	FROM	TO	FT.	% RECOVERY CORE	% RECOVERY SLUDGE	% CU	% PB	% ZN	% CD	OZ./TON AU	OZ./TON AG
201	105	108	3	100			0.1	8.4	0.45		
202	108	111	3	100			.1	1.4	.06		
203	111	114	2	100			.1	3.9	.15		
204	114	116	2	35			.1	5.4	.18		
205	114	116	2		97		.1	4.1	.16		
206	116	121	5	100			.1	0.4	.02		
207	121	126	5	100			.1	0.1	.02		
208	126	132	6	90			.1	1.2	.02		
209	132	140	8	80			.1	0.1	.02		
210	132	140	8		80		.1	1.0	.02		
211	325	328	3	100		0.18	0.01	0.1	0.02	TR	0.68
212	328	330	2	100		.12	.01	.1	.02	TR	NIL
213	330	335	5	100		.18	.01	.1	.02	TR	.80
214	335	345	10	60		.25	.01	.1	.02	TR	.80
215	335	345	10		20	.10	.01	.1	.02	TR	.20
216	345	352	7	100		.06	.01	.1	.02	TR	.20
217	352	357	5	100		.07	.01	.1	.02	TR	.20
218	357	362	5	100		.03	.01	.1	.02	TR	NIL
219	362	368	6	80		.06	.01	.1	.02	TR	NIL
220	368	374	6	84		.08	.01	.1	.02	TR	.20
221	374	376	2	85	0	.04	.01	.1	.02	TR	NIL
222	376	384	8	9		.05	.01	.1	.02	TR	.20

Fig. 3 VERTICAL SECTION OF HOLES A & B, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA

W.M.R. NEV.101

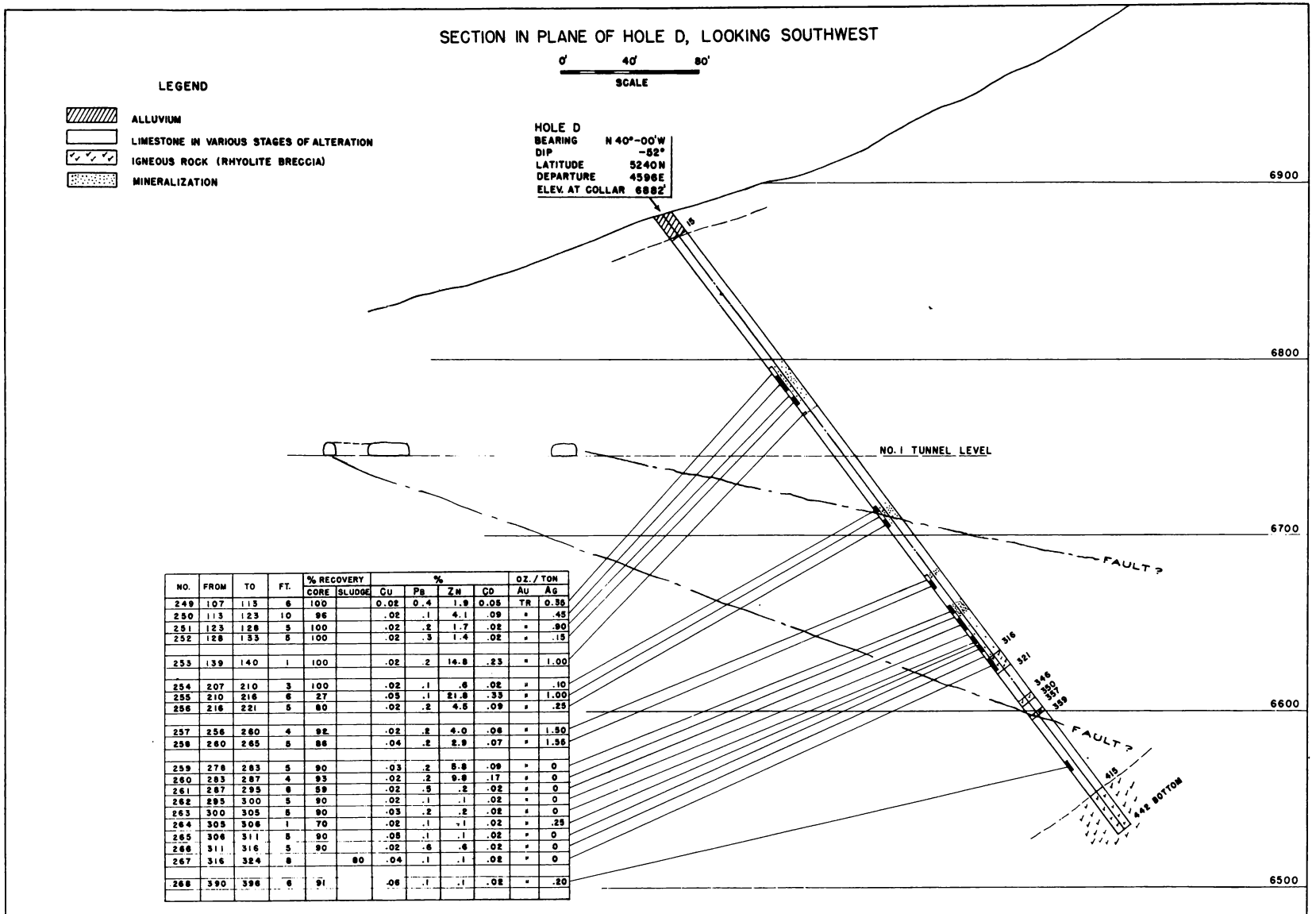


NO.	FROM	TO	FT.	% RECOVERY		OZ./TON					
				CORE	SLUDGE	Cu	Pb	Zn	Cd	Au	Ag
223	108	118	8	100		0.02	0.2	2.9	0.06	TR	0
224	118	122	4	100		.02	.2	1.0	.06	TR	0
225	158	168	10	80		.02	.1	.8	.02	TR	0
226	195	198	3	80		.02	.1	1.1	.02	TR	0
227	196	199	3	97		.04	.1	5.8	.08	TR	0.40
228	199	202	3	100		.02	.2	6.7	.11	TR	0
229	202	210	8		92	.03	.1	2.7	.07	TR	0
230	202	210	8	56		.03	.1	.8	.02	TR	0
231	221	222	1	60		.03	.1	3.0	.07	TR	0
232	232	235	3	100		.02	.1	8.1	.10	TR	0.15
233	252	258	6	42		.02	.1	.1	.02	TR	.20
234	258	260	2	60		.02	.1	.1	.02	TR	.35
235	260	266	6	57		.02	.2	.4	.02	TR	.40
236	266	271	5	90		.02	.2	1.0	.02	TR	.30
237	271	276	5	90		.03	.2	12.4	.20	TR	.65
238	276	281	5	90		.02	.2	12.4	.18	TR	1.25
239	281	283	2	100		.02	.1	2.5	.05	.008	3.10
240	291	292	1	100		.02	.1	5.6	.07	TR	.20
241	334	339	5	90		.02	.1	.1	.02	TR	0
242	339	342.7	3.7	84		.04	.1	3.8	.05	TR	.25
243	342.7	343.2	0.5	100		.55	.1	14.0	.25	TR	2.90
244	343.2	344	0.8	100		.50	.1	7.3	.13	TR	.90
246	374	385	11		85	.03	.1	4.2	.06	TR	.18
245	381	385	4	92		.06	.1	18.4	.26	TR	.25
247	397	398	1	100		.58	.1	13.6	.23	TR	1.15
248	406	416	10		85	.07	.1	0.1	.02	TR	0

MT. HOPE ZINC PROJECT NO. 15-151

Fig. 4

W.M.R. NEV.101

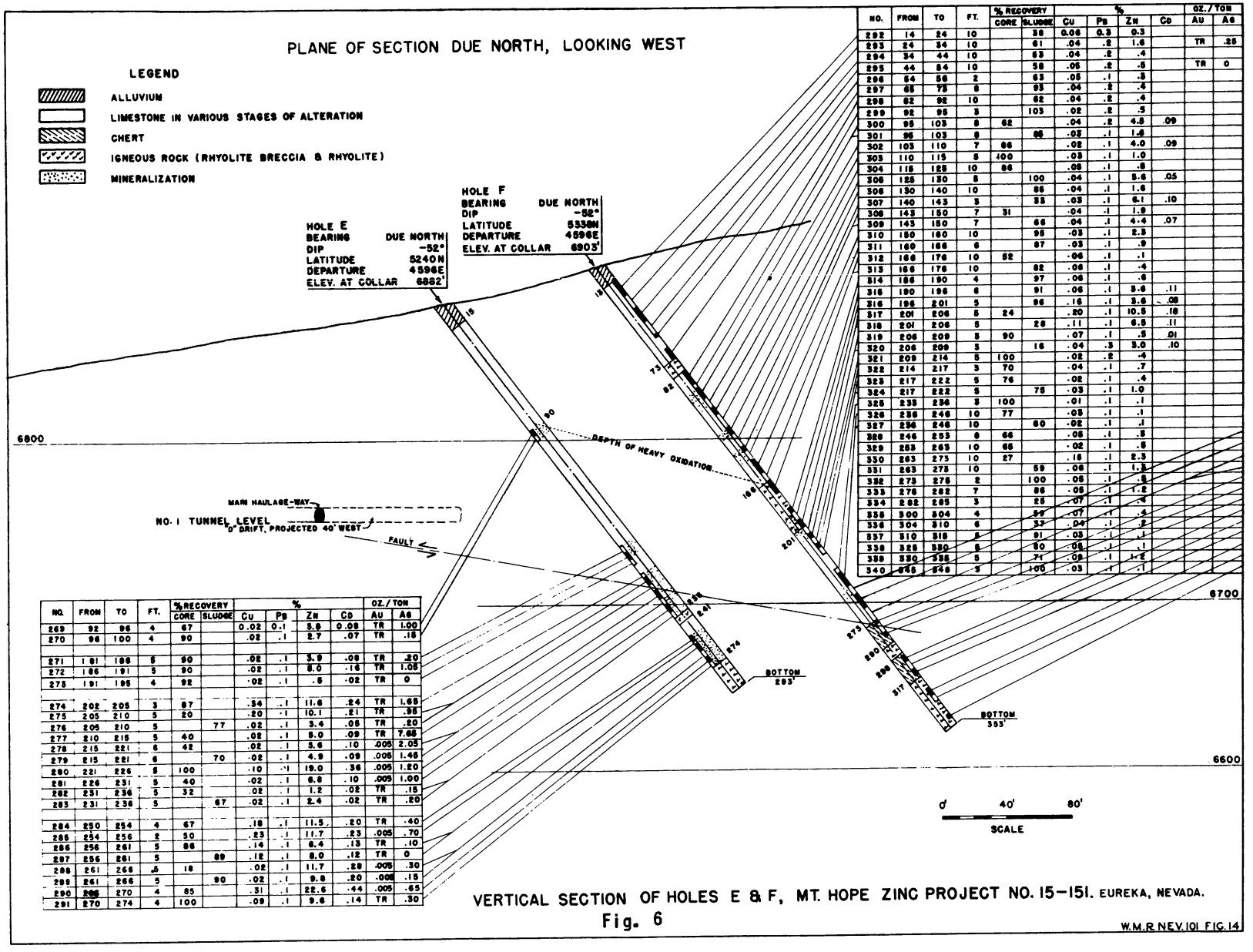


NO.	FROM	TO	FT.	% RECOVERY		%				OZ. / TON	
				CORE	SLUDGE	Cu	Pb	Zn	Co	Au	Ag
249	107	113	6	100		0.02	0.4	1.9	0.05	TR	0.56
250	113	123	10	96		.02	.1	4.1	.09	"	.45
251	123	128	5	100		.02	.2	1.7	.02	"	.90
252	128	133	5	100		.02	.3	1.4	.02	"	.15
253	139	140	1	100		.02	.2	14.8	.23	"	1.00
254	207	210	3	100		.02	.1	.6	.02	"	.10
255	210	216	6	27		.05	.1	21.8	.33	"	1.00
256	216	221	5	80		.02	.2	4.5	.09	"	.25
257	256	260	4	92		.02	.2	4.0	.06	"	1.50
258	260	265	5	86		.04	.2	2.9	.07	"	1.56
259	278	283	5	90		.03	.2	5.8	.09	"	0
260	283	287	4	93		.02	.2	9.8	.17	"	0
261	287	295	8	59		.02	.5	.2	.02	"	0
262	295	300	5	90		.02	.1	.1	.02	"	0
263	300	305	5	90		.03	.2	.2	.02	"	0
264	305	306	1	70		.02	.1	.1	.02	"	.25
265	306	311	5	90		.05	.1	.1	.02	"	0
266	311	316	5	90		.02	.6	.6	.02	"	0
267	316	324	8		80	.04	.1	.1	.02	"	0
268	390	396	6	91		.06	.1	.1	.02	"	.20

Fig. 5

VERTICAL SECTION OF HOLE D. MT. HOPE PROJECT NO. 15-151. EUREKA, NEVADA

W.M.R. NEV.101



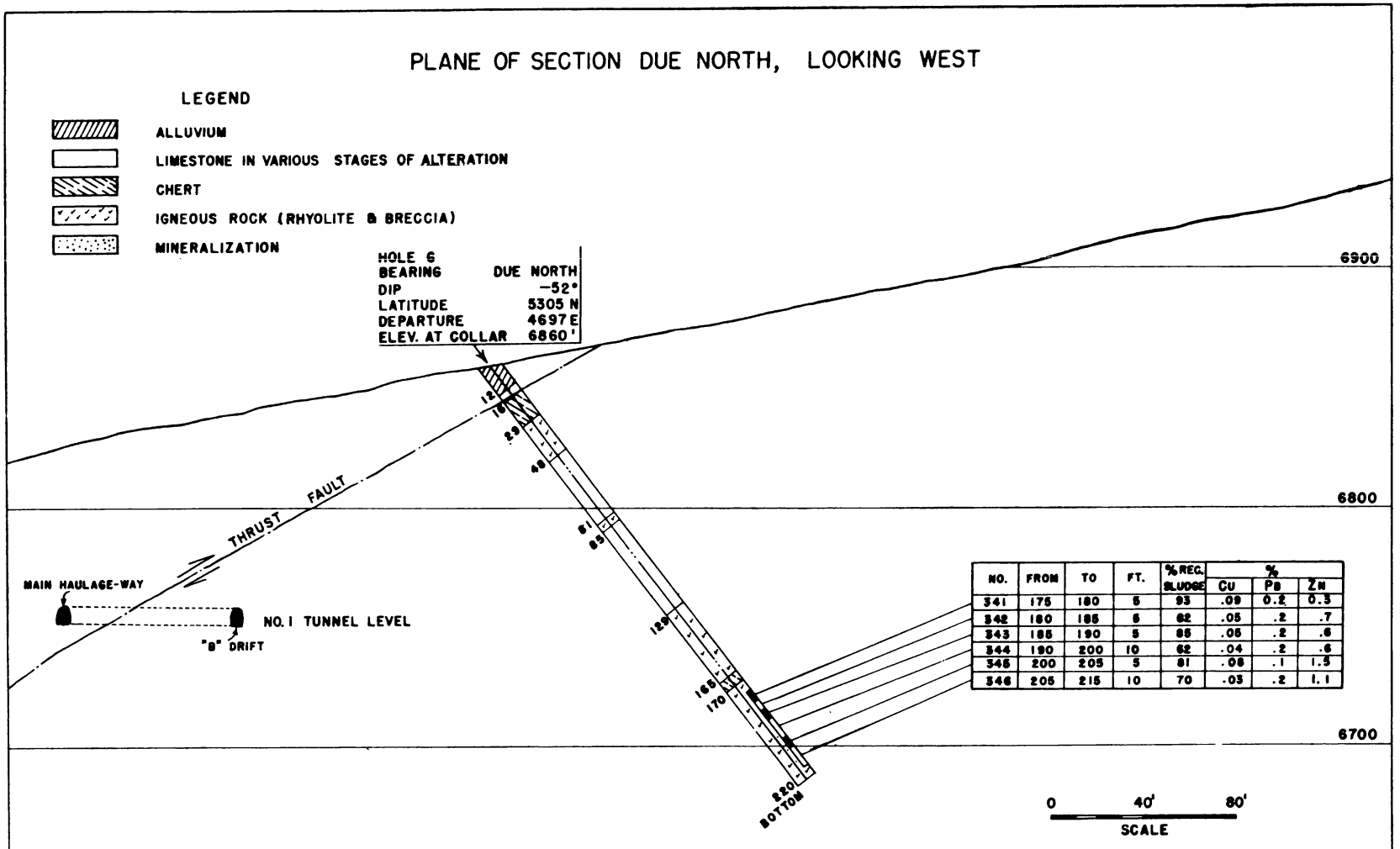
NO.	FROM	TO	FT.	% RECOVERY CORE	% RECOVERY SLUDGE	% Cu	% Pb	% Zn	% Co	OZ./TON Au	OZ./TON Ag
269	92	96	4	67		0.02	0.1	5.9	0.08	TR	1.00
270	96	100	4	90		.02	.1	2.7	.07	TR	.18
271	181	186	5	90		.02	.1	5.9	.08	TR	.20
272	186	191	5	90		.02	.1	8.0	.16	TR	1.08
273	191	195	4	92		.02	.1	.8	.02	TR	0
274	202	205	3	87		.34	.1	11.8	.24	TR	1.65
275	205	210	5	20		.20	.1	10.1	.21	TR	.95
276	205	210	5		77	.02	.1	3.4	.05	TR	.20
277	210	215	5	40		.02	.1	8.0	.09	TR	7.68
278	215	221	6	42		.02	.1	5.6	.10	.005	2.05
279	215	221	6		70	.02	.1	4.9	.09	.005	1.48
280	221	226	5	100		.10	.1	19.0	.36	.005	1.20
281	226	231	5	40		.02	.1	6.8	.10	.005	1.00
282	231	236	5	32		.02	.1	1.2	.02	TR	.15
283	231	236	5		67	.02	.1	2.4	.02	TR	.20
284	250	254	4	67		.18	.1	11.5	.20	TR	.40
285	254	256	2	50		.23	.1	11.7	.23	.005	.70
286	256	261	5	86		.14	.1	6.4	.13	TR	.10
287	256	261	5		89	.12	.1	8.0	.12	TR	0
288	261	266	5	18		.02	.1	11.7	.28	.005	.30
289	261	266	5		90	.02	.1	9.8	.20	.005	.15
290	266	270	4	85		.31	.1	22.6	.44	.005	.65
291	270	274	4	100		.09	.1	9.6	.14	TR	.30

NO.	FROM	TO	FT.	% RECOVERY CORE	% RECOVERY SLUDGE	% Cu	% Pb	% Zn	% Co	OZ./TON Au	OZ./TON Ag
292	14	24	10		38	0.06	0.3	0.3			
293	24	34	10		61	.04	.2	1.6		TR	.25
294	34	44	10		63	.04	.2	.4			
295	44	54	10		58	.06	.2	.6		TR	0
296	54	56	2		63	.05	.1	.3			
297	66	73	8		95	.04	.2	.4			
298	82	92	10		62	.04	.2	.4			
299	92	95	3		105	.02	.2	.5			
300	95	103	8	62		.04	.2	4.8	.09		
301	96	103	8		86	.02	.1	1.6			
302	103	110	7	86		.02	.1	4.0	.09		
303	110	115	5	100		.03	.1	1.0			
304	115	125	10	86		.08	.1	.8			
306	125	130	5		100	.04	.1	5.6	.05		
308	130	140	10		86	.04	.1	1.6			
307	140	143	3		33	.03	.1	6.1	.10		
308	143	150	7	31		.04	.1	1.9			
309	143	150	7		66	.04	.1	4.4	.07		
310	150	160	10		95	.03	.1	2.3			
311	160	166	6		87	.03	.1	.9			
312	166	176	10	82		.06	.1	.1			
313	166	176	10		82	.06	.1	.4			
314	186	190	4		97	.06	.1	.6			
315	190	196	6		91	.06	.1	3.6	.11		
316	196	201	5		96	.16	.1	3.6	.08		
317	201	206	5	24		.20	.1	10.5	.18		
318	201	206	5		28	.11	.1	6.5	.11		
319	206	209	3	90		.07	.1	.5	.01		
320	206	209	3		16	.04	.3	3.0	.10		
321	209	214	5	100		.02	.2	.4			
322	214	217	3	70		.04	.1	.7			
323	217	222	5	76		.02	.1	.4			
324	217	222	5		75	.03	.1	1.0			
325	233	236	3	100		.01	.1	.1			
326	236	246	10	77		.03	.1	.1			
327	236	246	10		60	.02	.1	.1			
328	246	253	8	66		.06	.1	.8			
329	253	263	10	66		.02	.1	.8			
330	263	273	10	27		.16	.1	2.3			
331	263	273	10		59	.06	.1	1.3			
332	273	275	2		100	.06	.1	.5			
333	276	282	7		86	.06	.1	1.2			
334	282	285	3		26	.07	.1	.4			
335	300	304	4		59	.07	.1	.4			
336	304	310	6		33	.04	.1	.2			
337	310	316	6		91	.03	.1	.1			
338	328	330	2		80	.06	.1	.1			
339	330	335	5		71	.09	.1	1.2			
340	845	848	3		100	.03	.1	.1			

VERTICAL SECTION OF HOLES E & F, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA.

Fig. 6

W.M.R. NEV. 101 FIG. 14

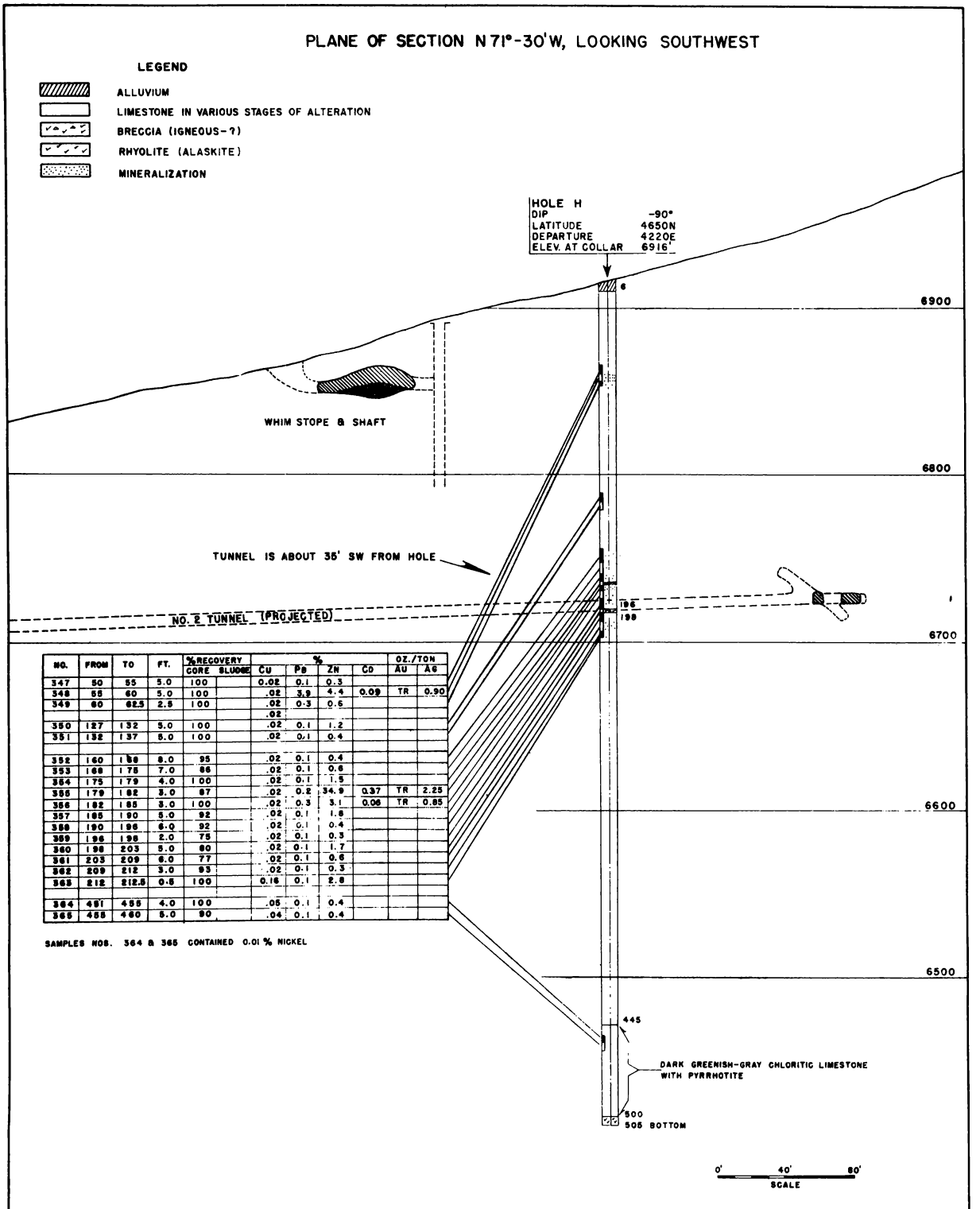


NO.	FROM	TO	FT.	% REC. SLUDGE	% CU	% PB	% ZN
341	175	180	5	93	.09	0.2	0.3
342	180	185	5	82	.05	.2	.7
343	185	190	5	85	.05	.2	.6
344	190	200	10	62	.04	.2	.6
345	200	205	5	81	.08	.1	1.5
346	205	215	10	70	.03	.2	1.1

VERTICAL SECTION OF HOLE G, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA

Fig. 7

W.M.R. NEV.101



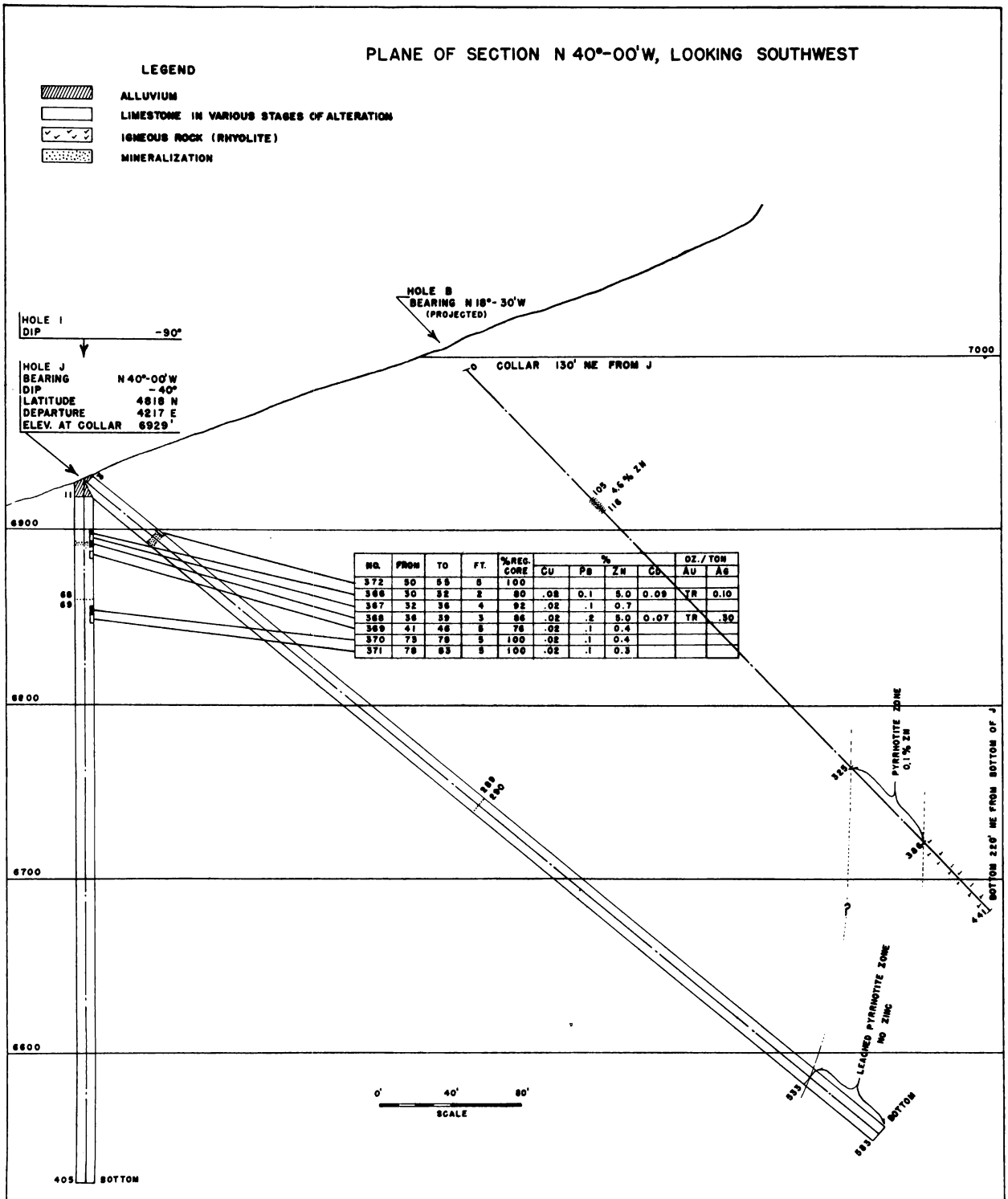
NO.	FROM	TO	FT.	% RECOVERY CORE	% RECOVERY SLUDGE	% CU	% PB	% ZN	% CO	OZ./TON AU	OZ./TON AG
347	50	55	5.0	100		0.02	0.1	0.3			
348	55	60	5.0	100		.02	3.9	4.4	0.09	TR	0.90
349	60	62.5	2.5	100		.02	0.3	0.6			
						.02					
350	127	132	5.0	100		.02	0.1	1.2			
351	132	137	5.0	100		.02	0.1	0.4			
352	160	168	8.0	95		.02	0.1	0.4			
353	168	175	7.0	86		.02	0.1	0.6			
354	175	179	4.0	100		.02	0.1	1.5			
355	179	182	3.0	67		.02	0.2	34.9	0.37	TR	2.25
356	182	185	3.0	100		.02	0.3	3.1	0.06	TR	0.85
357	185	190	5.0	92		.02	0.1	1.8			
358	190	196	6.0	92		.02	0.1	0.4			
359	196	198	2.0	75		.02	0.1	0.3			
360	198	203	5.0	80		.02	0.1	1.7			
361	203	209	6.0	77		.02	0.1	0.6			
362	209	212	3.0	93		.02	0.1	0.3			
363	212	212.5	0.5	100		0.16	0.1	2.8			
364	491	495	4.0	100		.05	0.1	0.4			
365	455	460	5.0	90		.04	0.1	0.4			

SAMPLES NOS. 364 & 365 CONTAINED 0.01 % NICKEL

VERTICAL SECTION OF HOLE H, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA.

Fig. 8

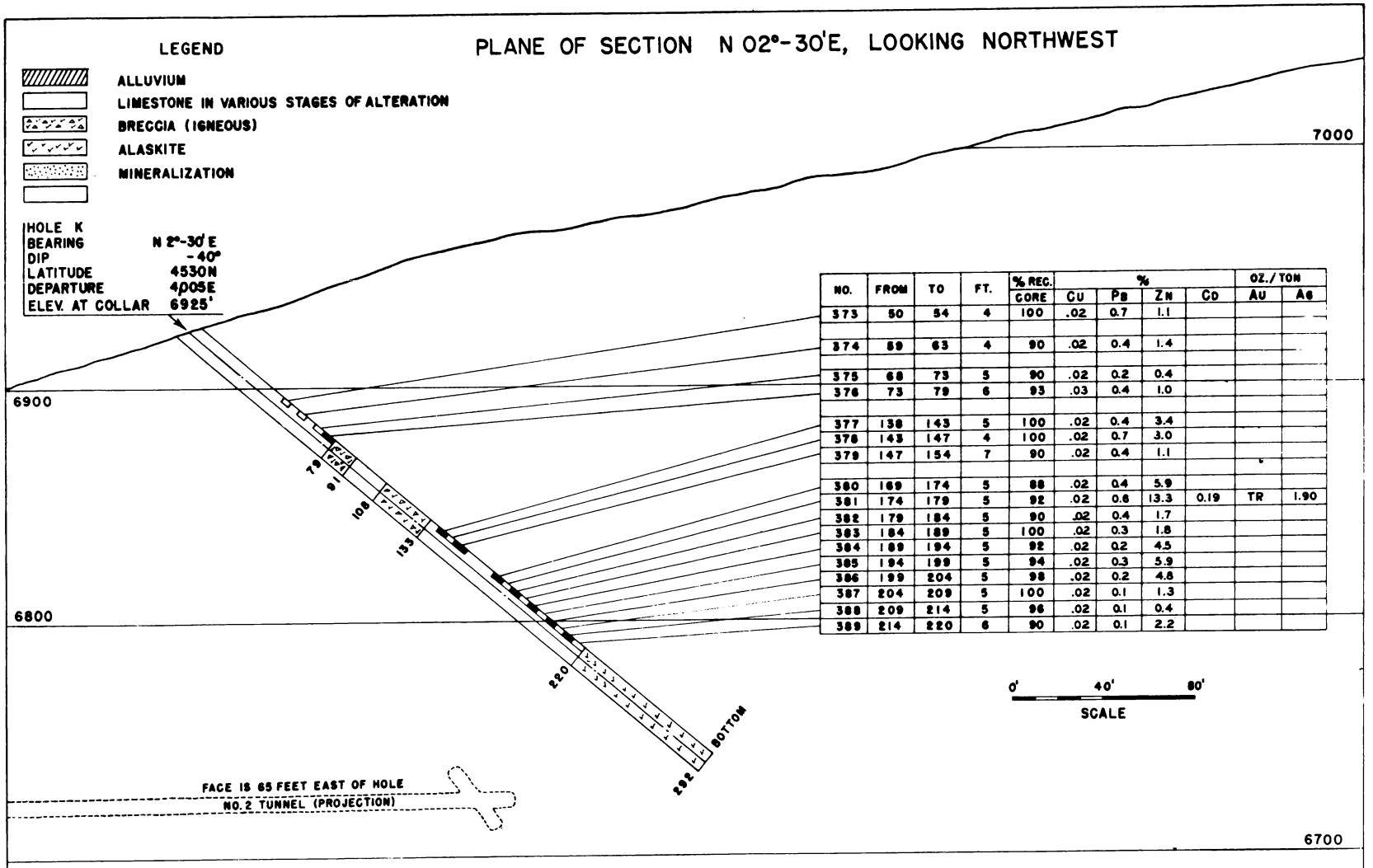
W.M.R NEV. 101



NO.	FROM	TO	FT.	%REC. CORE	% CU	% PB	% ZN	% CD	OZ./TON AU	OZ./TON AG
372	50	55	5	100						
366	30	32	2	80	.08	0.1	5.0	0.09	TR	0.10
367	32	36	4	92	.02	.1	0.7			
368	36	39	3	86	.02	.2	5.0	0.07	TR	.30
369	41	46	5	76	.02	.1	0.4			
370	73	78	5	100	.02	.1	0.4			
371	78	83	5	100	.02	.1	0.3			

VERTICAL SECTION OF HOLES I & J, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA.
(ALSO SHOWING HOLE B, PROJECTED INTO PLANE OF SECTION)

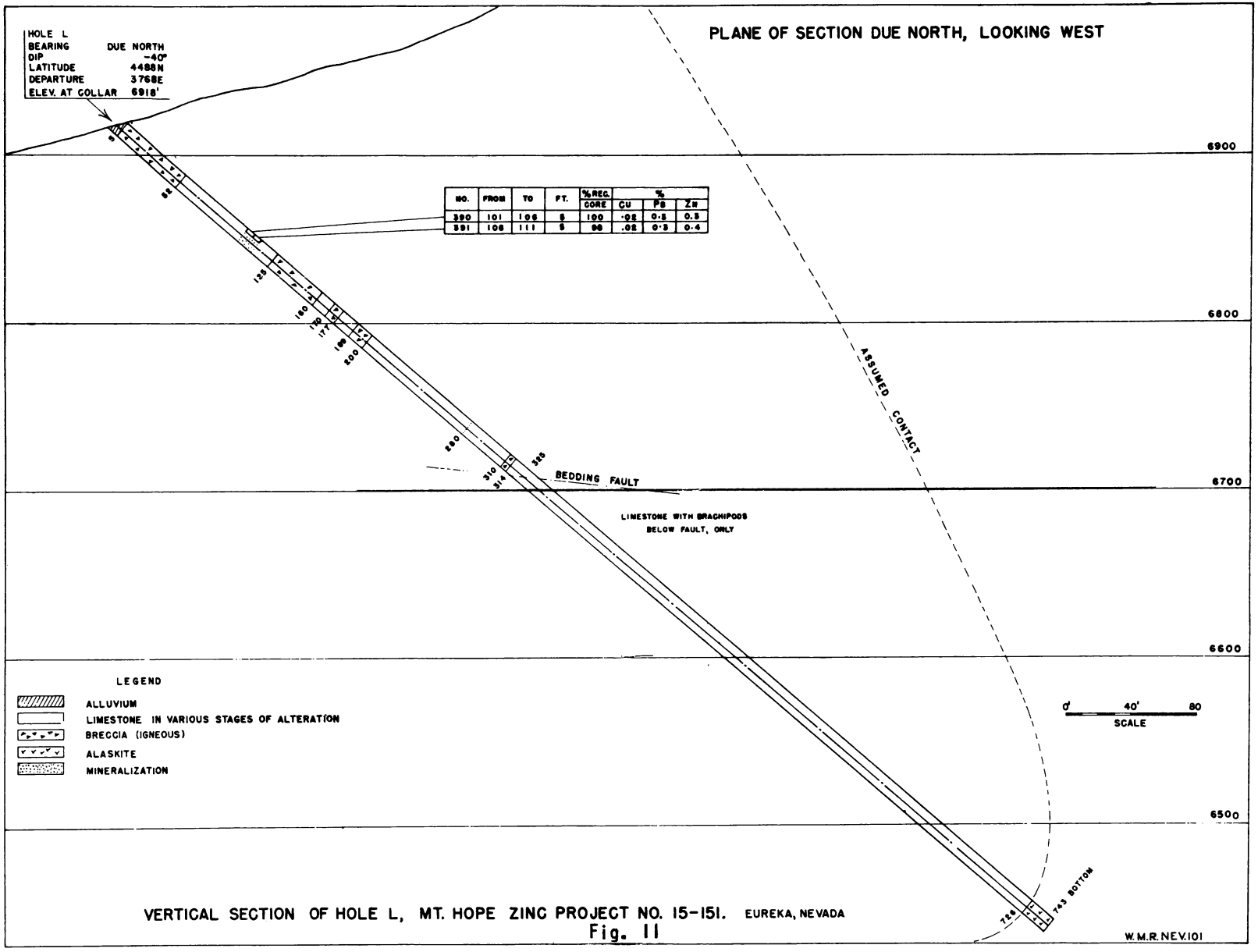
Fig. 9



NO.	FROM	TO	FT.	% REC. CORE	% CU	% PB	% ZN	% CD	OZ./TON AU	OZ./TON AG
373	50	54	4	100	.02	0.7	1.1			
374	59	63	4	90	.02	0.4	1.4			
375	68	73	5	90	.02	0.2	0.4			
376	73	79	6	93	.03	0.4	1.0			
377	138	143	5	100	.02	0.4	3.4			
378	143	147	4	100	.02	0.7	3.0			
379	147	154	7	90	.02	0.4	1.1			
380	169	174	5	88	.02	0.4	5.9			
381	174	179	5	92	.02	0.6	13.3	0.19	TR	1.90
382	179	184	5	90	.02	0.4	1.7			
383	184	189	5	100	.02	0.3	1.8			
384	189	194	5	92	.02	0.2	4.5			
385	194	199	5	94	.02	0.3	5.9			
386	199	204	5	98	.02	0.2	4.8			
387	204	209	5	100	.02	0.1	1.3			
388	209	214	5	96	.02	0.1	0.4			
389	214	220	6	90	.02	0.1	2.2			

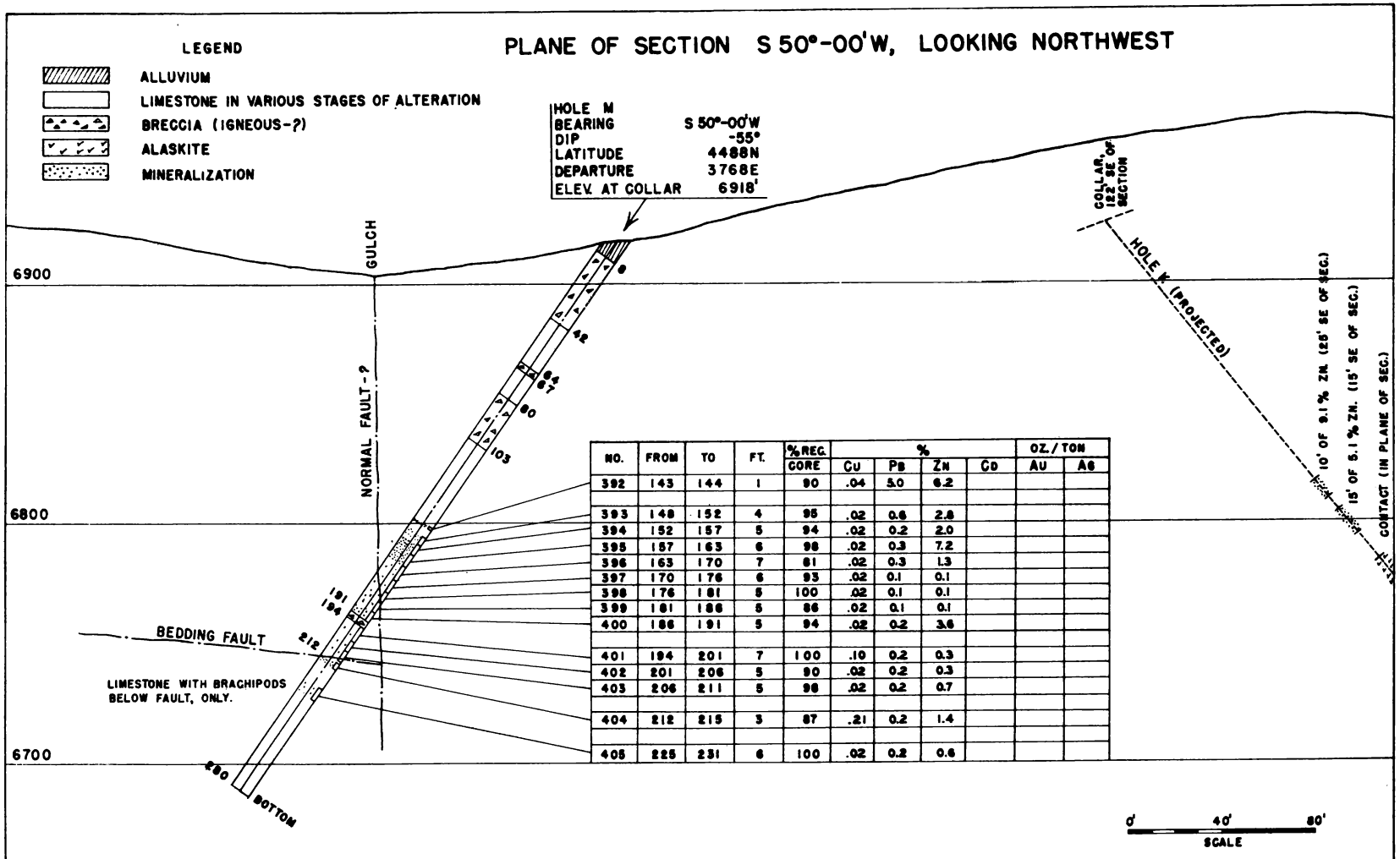
VERTICAL SECTION OF HOLE K, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA
Fig. 10

W.M.R. NEV. 101



VERTICAL SECTION OF HOLE L, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA

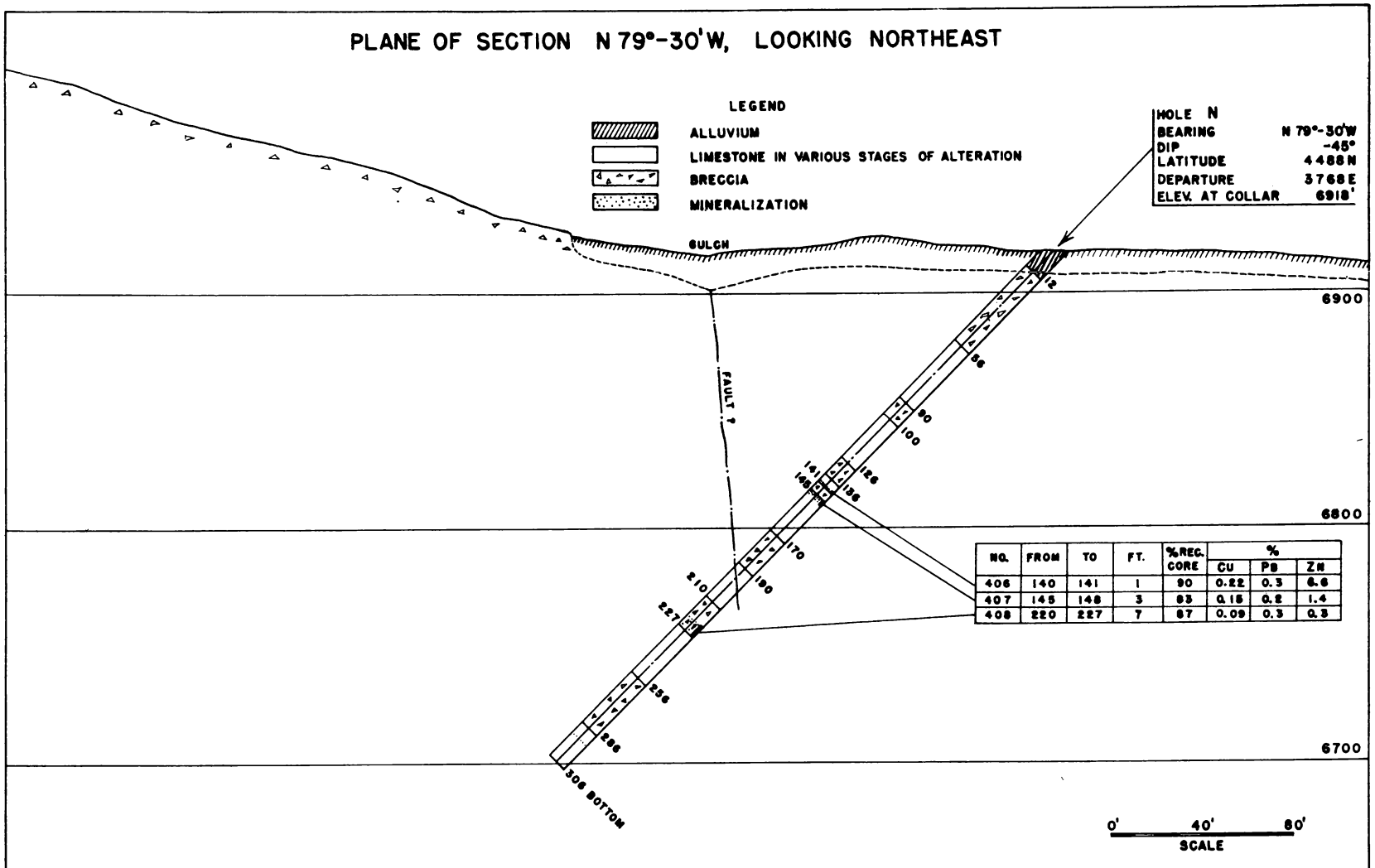
Fig. 11



NO.	FROM	TO	FT.	%REC. CORE	% Cu	% Pb	% Zn	% Cd	OZ./TON Au	OZ./TON Ag
392	143	144	1	90	.04	5.0	6.2			
393	148	152	4	95	.02	0.6	2.8			
394	152	157	5	94	.02	0.2	2.0			
395	157	163	6	98	.02	0.3	7.2			
396	163	170	7	81	.02	0.3	1.3			
397	170	176	6	93	.02	0.1	0.1			
398	176	181	5	100	.02	0.1	0.1			
399	181	186	5	86	.02	0.1	0.1			
400	186	191	5	94	.02	0.2	3.6			
401	194	201	7	100	.10	0.2	0.3			
402	201	206	5	90	.02	0.2	0.3			
403	206	211	5	98	.02	0.2	0.7			
404	212	215	3	87	.21	0.2	1.4			
405	225	231	6	100	.02	0.2	0.6			

VERTICAL SECTION OF HOLE M, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA.
(ALSO SHOWING PROJECTION OF HOLE K)
Fig. 12

W.M.R. NEV 101

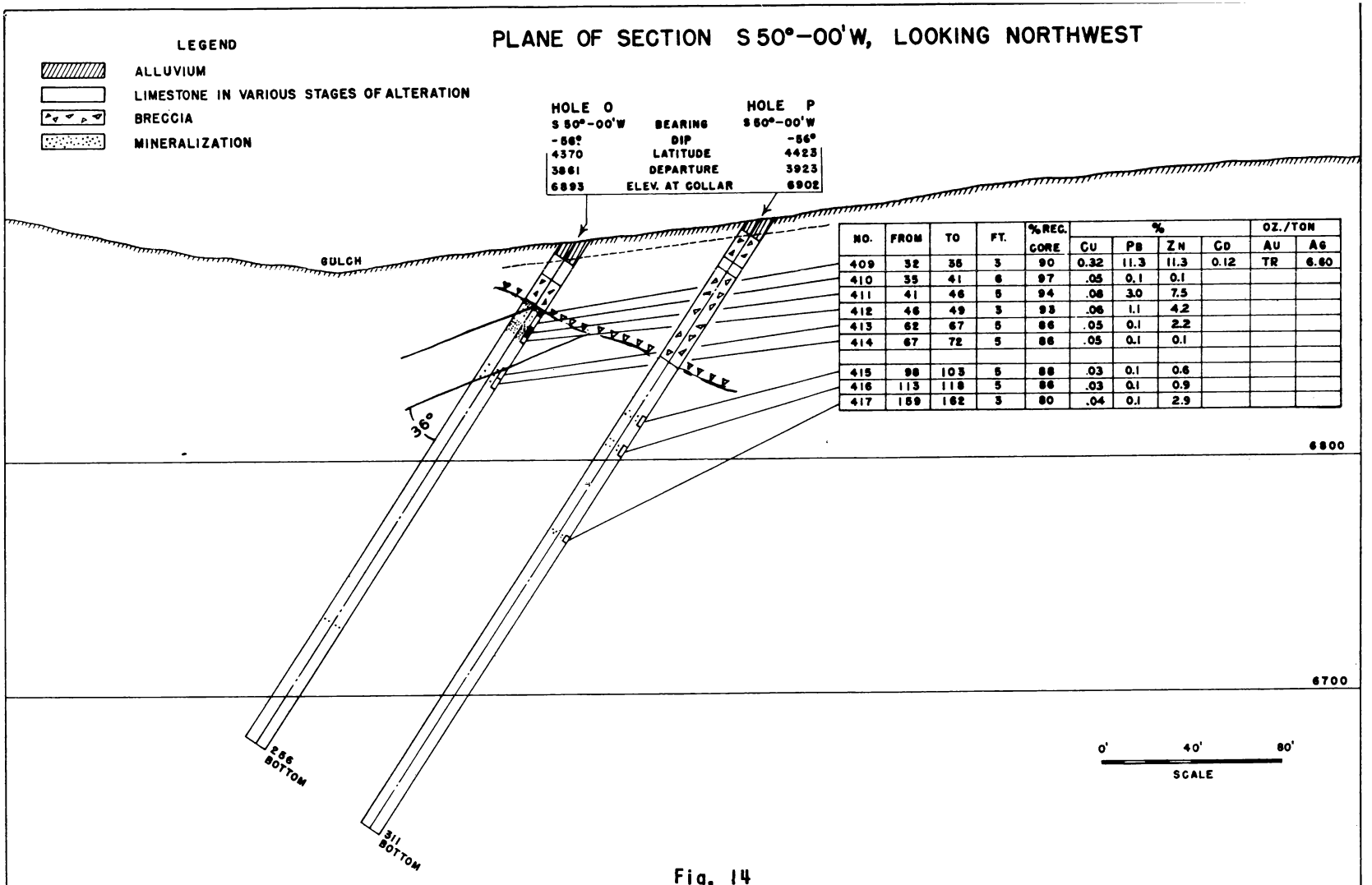


NO.	FROM	TO	FT.	%REC. CORE	%		
					CU	PB	ZN
406	140	141	1	90	0.22	0.3	8.6
407	145	148	3	83	0.15	0.2	1.4
408	220	227	7	87	0.09	0.3	0.3

VERTICAL SECTION OF HOLE N, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA

Fig. 13

W.M.R. NEV101

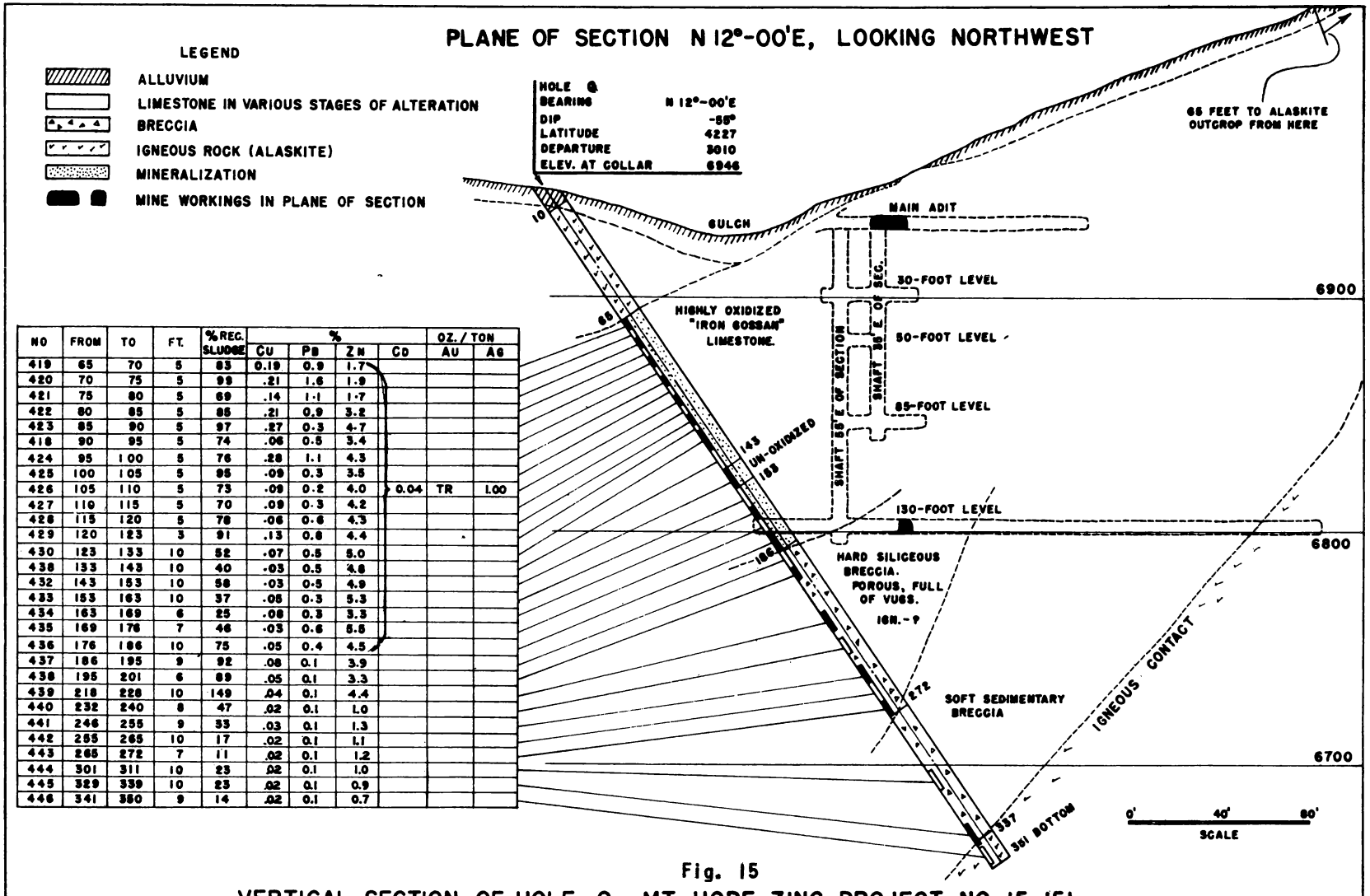


NO.	FROM	TO	FT.	%REC. CORE	% CU	% PB	% ZN	% CD	OZ./TON AU	OZ./TON AG
409	32	35	3	90	0.32	11.3	11.3	0.12	TR	6.60
410	35	41	6	97	.05	0.1	0.1			
411	41	46	5	94	.08	3.0	7.5			
412	46	49	3	93	.06	1.1	4.2			
413	62	67	5	86	.05	0.1	2.2			
414	67	72	5	86	.05	0.1	0.1			
415	98	103	5	88	.03	0.1	0.6			
416	113	118	5	86	.03	0.1	0.9			
417	159	162	3	80	.04	0.1	2.9			

Fig. 14

VERTICAL SECTION OF HOLES O & P, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA

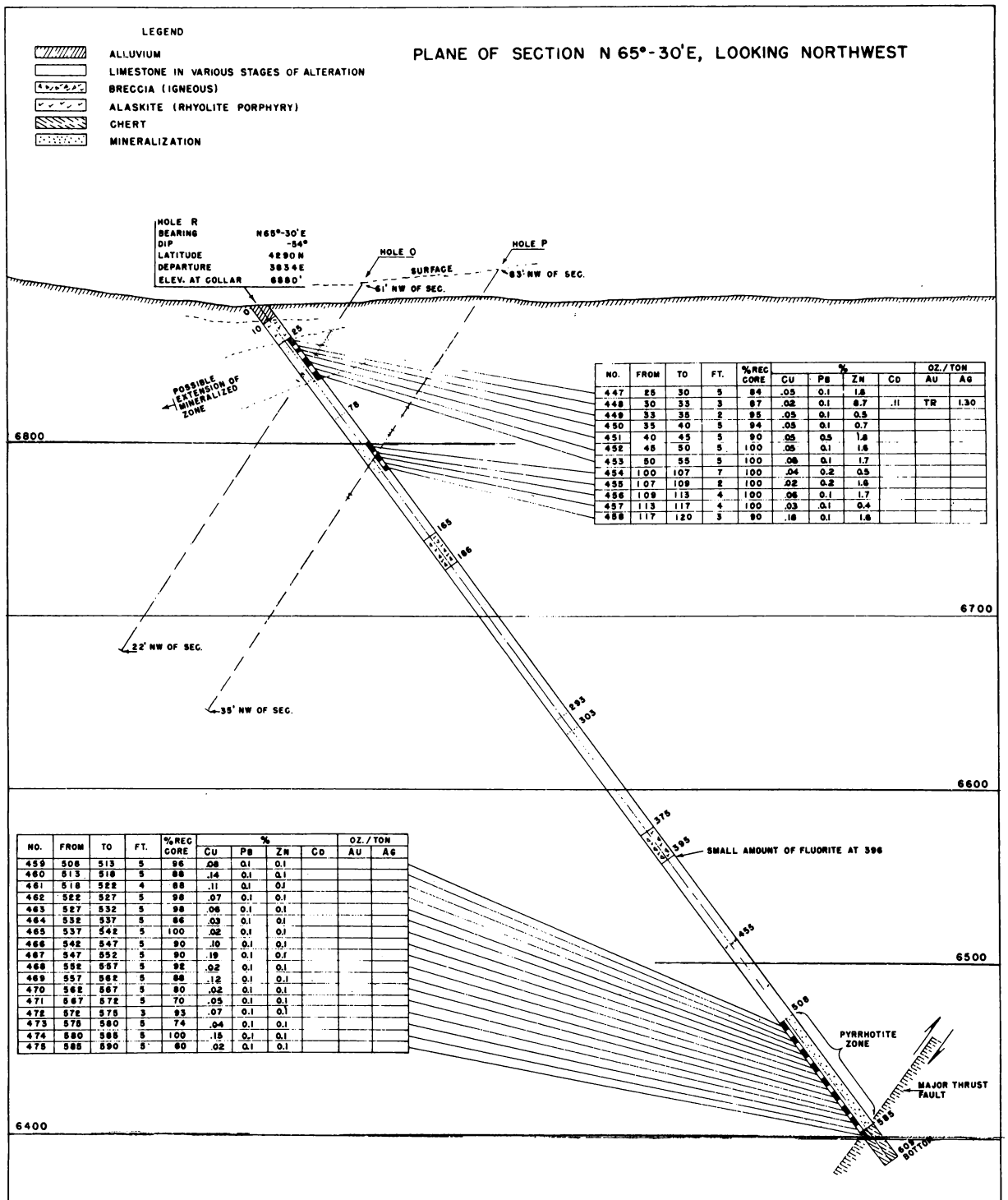
W.M.R NEV.101



NO	FROM	TO	FT.	% REC. SLUDGE	% CU	% PB	% ZN	% CD	OZ./TON AU	OZ./TON AG
419	65	70	5	83	0.19	0.9	1.7			
420	70	75	5	99	.21	1.6	1.9			
421	75	80	5	69	.14	1.1	1.7			
422	80	85	5	85	.21	0.9	3.2			
423	85	90	5	97	.27	0.3	4.7			
418	90	95	5	74	.06	0.5	3.4			
424	95	100	5	76	.28	1.1	4.3			
425	100	105	5	95	.09	0.3	3.5			
426	105	110	5	73	.09	0.2	4.0	0.04	TR	1.00
427	110	115	5	70	.09	0.3	4.2			
428	115	120	5	78	.06	0.6	4.3			
429	120	123	3	91	.13	0.8	4.4			
430	123	133	10	52	.07	0.5	5.0			
438	133	143	10	40	.03	0.5	4.8			
432	143	153	10	58	.03	0.5	4.9			
433	153	163	10	37	.05	0.3	5.3			
434	163	169	6	25	.08	0.3	3.3			
435	169	176	7	46	.03	0.6	5.5			
436	176	186	10	75	.05	0.4	4.5			
437	186	195	9	92	.08	0.1	3.9			
438	195	201	6	89	.05	0.1	3.3			
439	218	228	10	149	.04	0.1	4.4			
440	232	240	8	47	.02	0.1	1.0			
441	246	255	9	33	.03	0.1	1.3			
442	255	265	10	17	.02	0.1	1.1			
443	265	272	7	11	.02	0.1	1.2			
444	301	311	10	23	.02	0.1	1.0			
445	329	339	10	23	.02	0.1	0.9			
446	341	350	9	14	.02	0.1	0.7			

Fig. 15

VERTICAL SECTION OF HOLE Q, MT. HOPE ZINC PROJECT NO. 15-151, EUREKA, NEVADA.
(ALSO SHOWING A VERTICAL PROJECTION OF THE LORRAINE MINE WORKINGS)



NO.	FROM	TO	FT.	%REC CORE	% CU	% PB	% ZN	% CD	OZ./TON AU	OZ./TON AG
447	25	30	5	84	.05	0.1	1.8			
448	30	33	3	87	.02	0.1	8.7	.11	TR	1.30
449	33	35	2	95	.05	0.1	0.5			
450	35	40	5	94	.05	0.1	0.7			
451	40	45	5	90	.05	0.5	1.8			
452	45	50	5	100	.05	0.1	1.6			
453	50	55	5	100	.06	0.1	1.7			
454	100	107	7	100	.04	0.2	0.5			
455	107	109	2	100	.02	0.2	1.6			
456	109	113	4	100	.06	0.1	1.7			
457	113	117	4	100	.03	0.1	0.4			
458	117	120	3	90	.18	0.1	1.8			

NO.	FROM	TO	FT.	%REC CORE	% CU	% PB	% ZN	% CD	OZ./TON AU	OZ./TON AG
459	508	513	5	96	.08	0.1	0.1			
460	513	518	5	88	.14	0.1	0.1			
461	518	522	4	88	.11	0.1	0.1			
462	522	527	5	98	.07	0.1	0.1			
463	527	532	5	98	.06	0.1	0.1			
464	532	537	5	86	.03	0.1	0.1			
465	537	542	5	100	.02	0.1	0.1			
466	542	547	5	90	.10	0.1	0.1			
467	547	552	5	90	.19	0.1	0.1			
468	552	557	5	92	.02	0.1	0.1			
469	557	562	5	88	.12	0.1	0.1			
470	562	567	5	80	.02	0.1	0.1			
471	567	572	5	70	.05	0.1	0.1			
472	572	575	3	93	.07	0.1	0.1			
473	575	580	5	74	.04	0.1	0.1			
474	580	585	5	100	.15	0.1	0.1			
475	585	590	5	60	.02	0.1	0.1			

Fig. 16

VERTICAL SECTION OF HOLE R, MT. HOPE ZINC PROJECT NO. 15-151. EUREKA, NEVADA.
(ALSO SHOWING PROJECTION OF HOLES O & P)

W.M.R. NEV.101

assaying 45.6 percent Zn, 14.6 percent Fe, and 1.6 percent insol. The maximum grade of concentrate obtained was 46.4 percent Zn, and microscopic examination indicated that a high degree of mineralogical purity had been obtained.

WORK DONE BY THE BUREAU OF MINES

The work first outlined by the Bureau called for the exploration of three ore horizons by core drilling to investigate continuity of mineralization, as suggested by geologic reports and by the Bureau's previous examinations. As exploration progressed, the above theory was abandoned and drilling was confined to exploration in fracture zones and to ascertain a definite trend of mineralization. Ground explored by diamond drilling under Bureau supervision embraced an area roughly 2,320 feet long and 360 to 920 feet in width. Eighteen diamond-drill holes, lettered A to R, inclusive, were completed by the Bureau. With the exception of Q, holes A to R explored the sulfide area. Hole Q was in an oxide zone in the Lorraine area.

Four holes, C, D, E, and F, proved the existence of a flat-lying ore zone below the level of adit No. 1, as shown by cross-section figures. Hole G, which was virtually barren, delimited the eastern extension of this zone.

Holes A, B, H, I, J, K, L, M, N, O, P, and R were drilled in an endeavor to find some continuity of the mineralization and to establish a trend westward toward the Lorraine workings.

Holes B, H, J, K, O, and R passed through small zones of milling-grade ore and some submarginal ore zones also.

Holes I, L, N, and P penetrated only submarginal ore.

Hole Q, which was farthest to the west, was drilled in the oxide zone of the Lorraine area to determine the grade of the mineralization and to investigate the possibility of sulfide mineralization below the oxide formation. The hole encountered oxide ore of submarginal grade only, and further drilling in the Lorraine area was abandoned.

Plans showing the location of the drill holes and vertical sections showing the holes and sample analyses in the ore zones accompany the report.

The project work, supplemented by company drilling and development, proved the ore to be spotty. Continuity of mineralization can be established only by more closely spaced drill holes. The ore does not grade from a strongly mineralized zone to submarginal ore, but more often the mineralization starts and ends abruptly.