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Robert S. Sanford

R. I. 4344

September 1948

UNITED STATES
DEPARTMENT OF THE INTERIOR
J. A. Krug, Secretary

BUREAU OF MINES
James Boyd, Director

REPORT OF INVESTIGATIONS

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

INVESTIGATION OF THE CAPE ROSIER ZINC-COPPER-LEAD MINE, HANCOCK COUNTY, MAINE[1]

By S. B. Levin[2] and Robert S. Sanford[3]

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INTRODUCTION AND SUMMARY

The Bureau of Mines has been investigating deposits of critical and essential minerals in the United States and Alaska since 1939.

During the fall of 1942, the Bureau of Mines put down nine diamond-drill holes at the Cape Rosier zinc-copper-lead mine in Hancock County, Maine, that aggregated 2,883 feet of bore. These holes supplemented 13 holes, aggregating 5,501 feet, put down on the property about 2 years earlier by the St. Joseph Lead Co. Veins of mixed sulfides were intersected in 15 of the holes drilled. Beneficiation tests were made on samples of ore obtained from old dumps.

Zinc-copper-lead sulfides occur at the Cape Rosier mine as lenses in a zone of altered agglomerate beneath and between a series of diorite sills. The mineralized zone strikes N. 17° E. and dips southeast.

Between July 1881 and September 1883 the mine produced about 10,000 tons of ore reported to have contained 20 percent zinc, 2.8 percent copper, and some lead. The crude ore was hand-sorted, and some 3,000 tons were reported shipped.

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 4344."
2/ Formerly mining engineer, Bureau of Mines, College Park, Md.
3/ Mining engineer, Bureau of Mines, College Park, Md.

This report describes the work done by the Bureau of Mines and presents the data obtained in the two periods of drilling.

ACKNOWLEDGMENTS

The chemical analyses included in this report were performed at the Eastern Experiment Station of the Bureau of Mines at College Park, Md., under the general supervision of Paul M. Tyler, regional engineer, Eastern Region. Frank D. Lamb, metallurgist, and Thomas S. Bailey conducted the beneficiation tests. W. H. Newhouse of the Federal Geological Survey assisted the project engineer in logging the diamond-drill cores.

The mineral exploration was under the supervision of J. D. Bardill, district engineer. The work was done under the immediate supervision of S. Benedict Levin.

Special acknowledgments are made to the St. Joseph Lead Co. and to the owners, Capt. Orville Veague and John Murray Veague, for permission to publish data supplied by them.

LOCATION AND ACCESSIBILITY

The mine is situated at latitude 44° 21' N. and longitude 68° 48.5' W., in the Castine quadrangle (M46) at Harborside on Cape Rosier on the east side of lower Penobscot Bay, Maine; it is on the shore of Goose Falls Pond, a tidal estuary on the northwest side of the cape. Harborside is easily reached via State highways 175 and 176 from Bucksport. Location of the mine is shown on figures 1 and 2.

The nearest railhead for freight is at Belfast, 12 miles across the bay, a terminus of the Belfast & Moosehead Lake railroad. To obviate loading and unloading from a boat, the most convenient railhead is the terminus of the Maine Central Railroad at Bucksport, 32 miles by road north of the mine.

A good macadam road connects with the main highways to Ellsworth, Bucksport, and Bangor and extends to within 2 miles of the mine. From this point, a gravel road, passable all year, extends to the mine.

PHYSICAL FEATURES AND CLIMATE

The Cape Rosier surface is composed of rounded, spruce-covered hills with maximum relief about 250 feet. The immediate vicinity of the mine lies from sea level to 50 feet altitude, except for the 190-foot Dyer's Hill just south of shaft 4. The cape shoreline is highly irregular, marked by deeply indented estuaries and coves, cliffed headlands, and rocky islands.

Goose Falls Pond is separated from Mill Cove by a tidal waterfall of about 6 feet maximum drop. Mean tide range in the Pond is about 3 feet; outside in the cove it is about 10. The upper Pond attains depths of about 50 to 60 feet.

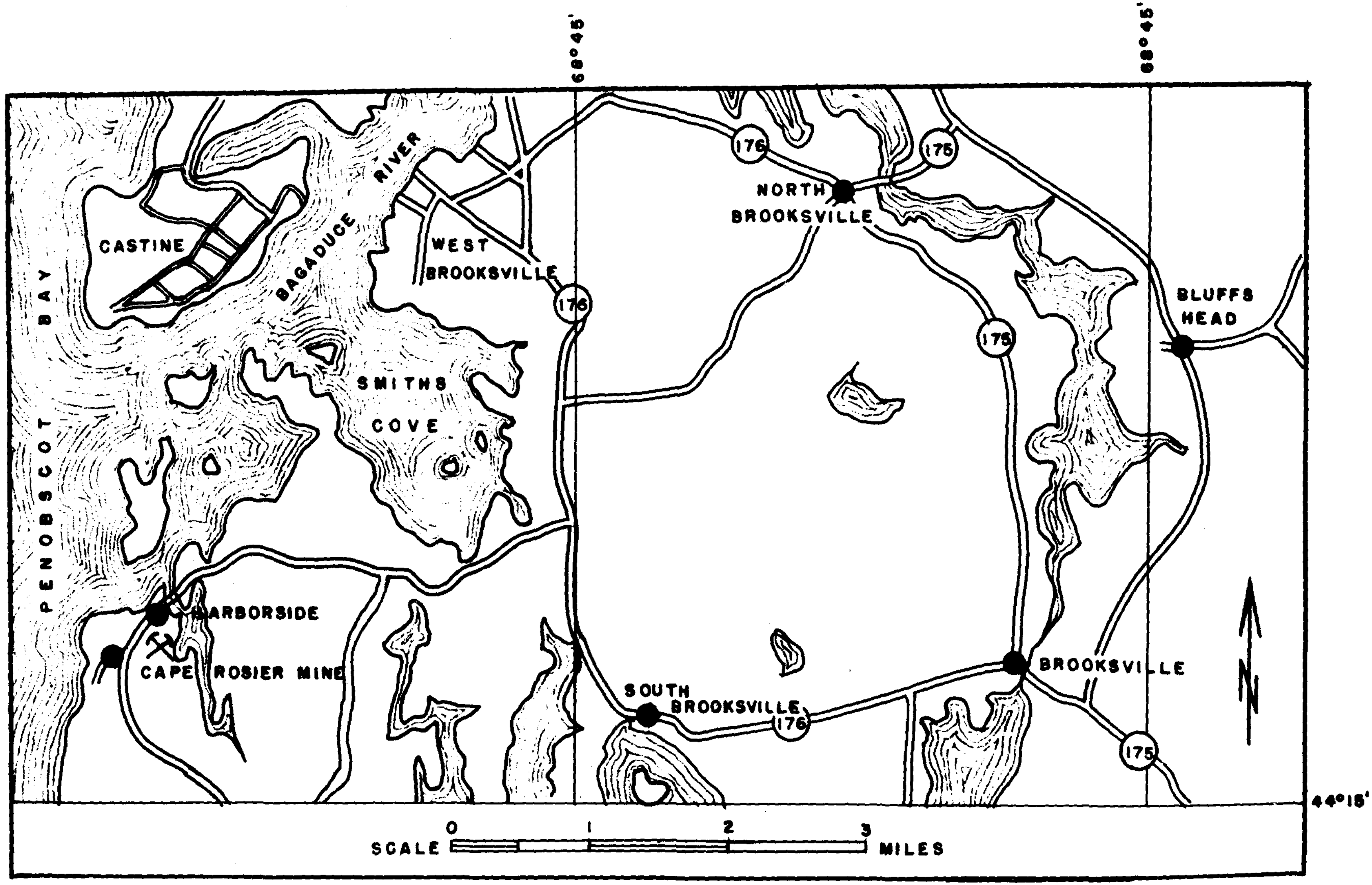
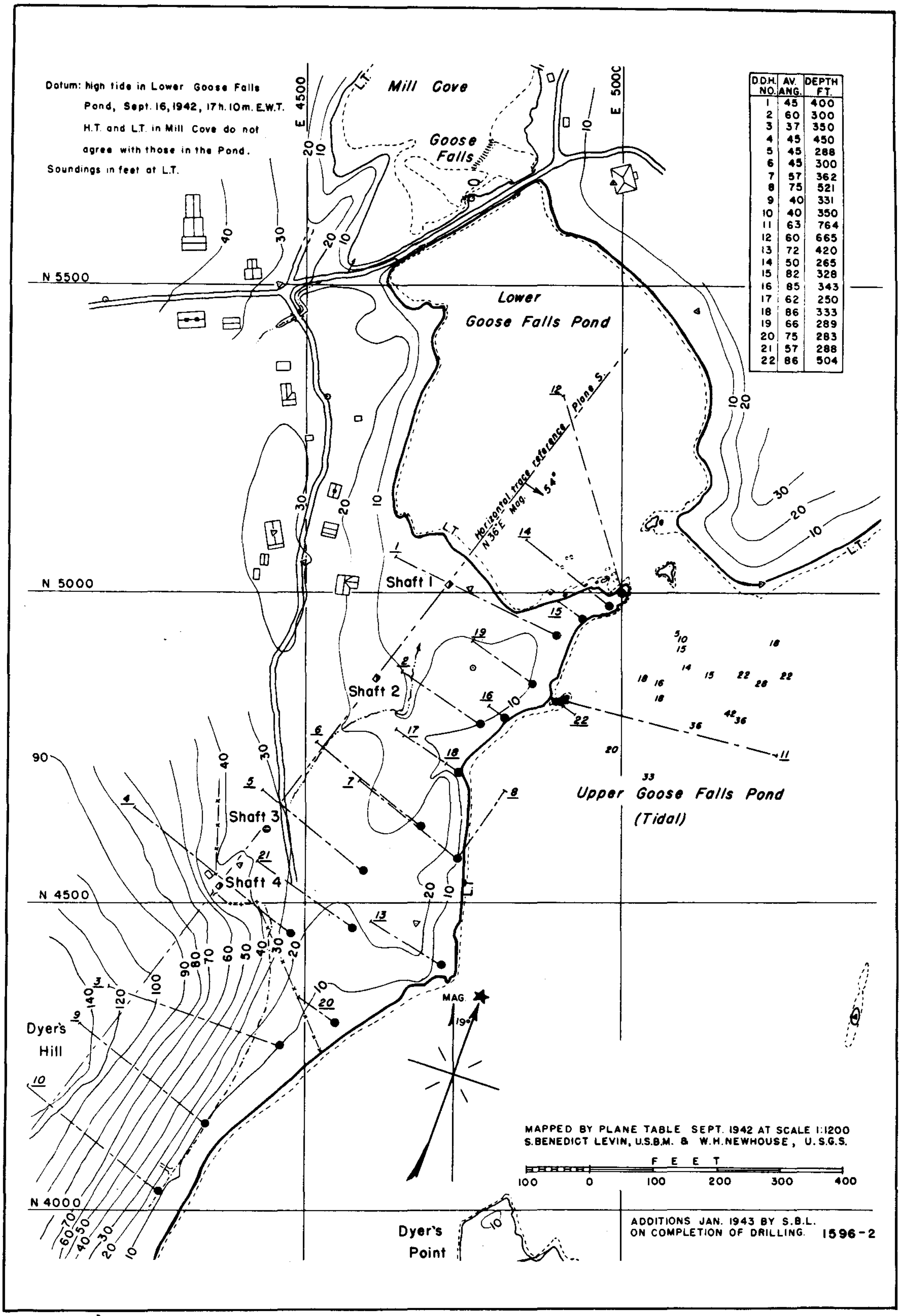


Figure 1. - Cape Rosier mine, Hancock County, Maine.



D.D.H. NO.	AV. ANG.	DEPTH FT.
1	45	400
2	60	300
3	37	350
4	45	450
5	45	288
6	45	300
7	57	362
8	75	521
9	40	331
10	40	350
11	63	764
12	60	665
13	72	420
14	50	265
15	82	328
16	85	343
17	62	250
18	86	333
19	66	289
20	75	283
21	57	288
22	86	504

Figure 2. - Cape Rosier mine, Hancock County, Maine.

The climate is humid, slightly modified by proximity to the sea. Summer temperatures average 65° F; winter temperature 22° F. Occasional abnormal temperatures of 95° in summer and 25° below zero in winter have been recorded. Total annual precipitation ranges from 35 to 55 inches, averaging about 45 inches. Precipitation is well-distributed throughout the year with fair uniformity, although May through August tend to be dry and April tends to be wet. Cumulative snowfall may occasionally reach several feet. Prevailing winds are onshore (from south) in summer, offshore (northwest) in winter. Occasional high velocities (70 m.p.h.) are attained.

HISTORY, PRODUCTION, AND OWNERSHIP

Old operating records, as reported by two independent examining engineers, credit the Cape Rosier mine with a production between July 1881 and September 1883 of approximately 10,000 tons of ore, the metal content of which was estimated at about 20 percent zinc, 2.8 percent copper, and some lead. The ore was not concentrated, but from the crude ore hoisted some 3,000 tons of hand-sorted ore was reported shipped. No other significant operations were reported.

During the period October 1940 to April 1941, 13 diamond-drill holes (1 to 13, inclusive), aggregating 5,501 feet in length, were drilled by the St. Joseph Lead Co. The analyses of core samples were made available to the Bureau of Mines, and split halves of sampled cores have been reexamined and the entire core has been logged.

From October 15 to December 30, 1942, an additional 2,883 feet (9 holes, 14 to 22, inclusive) were drilled by the Bureau of Mines.

Title has not been investigated. The mine is said to be owned by Capt. Orville Veague of Castine, Maine; his brother, John Murray Veague; and their mother, Bertha L. Veague. Title includes mineral rights within the 50-acre Dyer farm, on which the mine is situated, and surface ownership of a strip of ground 99 feet wide flanking the line of strike of the deposit and extending diagonally across the Dyer farm. Surface rights, it is stated, include the right to erect buildings, and structures essential to the mining and milling operations anywhere within the limits of the Dyer farm. Mineral rights extend under the tidal pond by legislative action of the State of Maine.

DESCRIPTION OF THE DEPOSIT[4/]

The Cape Rosier deposit occurs as lenses of mixed sulfides of zinc, copper, lead, and iron replacing highly sheared and altered agglomerate. The country rock of Cape Rosier and of the adjacent portion of the mainland is composed of a series of volcanics - rhyolitic and andesitic flows,

4/ Emmons, William H., Some Ore Deposits in Maine and the Milan Mine, New Hampshire: Geol. Survey Bull. 432, 1910.

agglomerates, and pyroclastics - folded with northeasterly regional strike and intruded by sills and dikes of diorite. The volcanics are collectively called the Castine formation and tentatively assigned to the early or middle Paleozoic. The cover of glacial till averages only a few feet in thickness, and outcrops are numerous, especially along the shores. Four miles east of the mine is the contact between the volcanics and the southwestern end of a late Paleozoic batholith of granite and diorite. The Cape Rosier deposit and other prospects in the district are thus marginally situated with respect to the batholith, whereas the deposits in the Bluehill district to the east are situated in a schist roof pendant. A genetic relationship between the ore deposits of this region and the batholith or its offshoots is implied.

In the immediate vicinity of the Cape Rosier Mine two agglomerates, the Goose Falls and Dyer's Point, and a black rhyolite are recognized, though when highly sheared their distinction is uncertain.

The Goose Falls agglomerate is characterized by fragments ranging from 1/4 inch to 5 inches in size and colored grayish buff. The Dyer's Point agglomerate is characterized by 5- to 7-inch angular fragments of black rhyolite, which weathers white in a fine-grained groundmass that weathers gray.

The rhyolite is black, massive, and very fine-grained. The general strike of these structures is approximately N. 17° E., and the dip is southeasterly. In the area drilled, the Goose Falls agglomerate is intruded by two diorite sills and several minor tongues of variable thickness and characterized by pinching, swelling, and splitting. Typical diorite is well-exposed on the point near holes 12, 14 and 15. It is massive, unsheared and fresh; the color is light gray with a slight greenish tone.

The agglomerate is strikingly sheared adjacent to the diorites. Two sets of shear planes (one strikes N. 30° to 50° E. the other about N. 16° E.) were observed. In the workings south of shaft 4, two sets of shearing are seen in rhyolite, the N. 36° E., dipping about 80° SE, and the N. 16° E. set dipping 54° SE.

Traces of mineralization at the surface are rare, but drilling establishes a mineralized zone that coincides approximately with the zone of intensely sheared and thoroughly altered agglomerate lying chiefly below and to a lesser extent between the diorite sills. The sheared agglomerate has been converted into (1) a green-black, macroscopically nonmineralic, chlorite schist; or (2) a coarse aggregate of creamy-white, nonfoliate talc and white calcite, in which the carbonate appears to be healing a talc breccia; or (3) a chlorite-talc-calcite rock. The mineralized zone dips about 55° SE near the surface and flattens with the diorite to about 30° SE at depths down dip of 200 to 400 feet. The thickness of the chief mineralized zone (not the ore) beneath the lower diorite ranges from a few inches up to 110 feet. The thickest portion occurs in the area between shafts 1 and 2 (see fig. 2), where it appears to be localized by or related to a rather abrupt 45° deflection in the strike of the lower diorite; the latter strikes N. 6° E. in the area south of shaft 2 and about N. 51° E. in the vicinity of holes 2, 19, 1, 15, 14, and 12.

Within the mineralized zone, that is, within the zone of sheared agglomerate largely or wholly altered to chlorite, talc, and calcite, and carrying disseminated sulfides, there occur several sphalerite-chalcopyrite-galena ore shoots of lenslike habit. The largest of these are localized in the thickest part of the mineralized zone, in the vicinity of shafts 1 and 2. In this area, three lenses - footwall, middle, and hanging wall - lie beneath and essentially conformable in dip with the lower diorite. These lenses are separated by a very lean mineralized zone.

CHARACTER OF ORE

The high-grade ore is massive and of medium to fine grain. Leaner ore consists of streaks and patches of sulfides in a matrix of alteration products of the agglomerate. Chief ore minerals are brown sphalerite and chalcopyrite. Galena is very minor except locally. Pyrite is a common but minor associate; pyrrhotite is very minor. The gangue consists of chlorite, talc, calcite, and partly altered agglomerate. The thickest ore appears to be accompanied by the very dark-green chlorite or, less commonly, by the talc. Talc-rimmed sphalerite grains in chlorite are common in the leaner mineralized rock. That the mineral ratios are quite irregular is indicated by individual samples as follows:

Sample	Percent Zn	Percent Cu	Percent Pb
1	28.9	1.9	0.4
2	3.3	15.4	0.0
3	23.8	2.0	11.5
4	12.3	9.3	9.1

MINE WORKINGS

Mine workings, flooded with fresh water, were inaccessible during the investigation by the Bureau of Mines. No old maps are believed to exist. The old records and reports show four shafts respectively 424, 204, 80 and 71 feet deep, over 600 feet of drifts, and 3 crosscuts aggregating 50 feet. Five small stopes also are reported. The deepest shaft, No. 1, is reported to be inclined at about 58° in its upper portion and about 49° in the lower portion. The collar, 3.0 feet above high tide, is in good condition. There is no mine or plant equipment of any value at the mine.

WORK DONE BY THE BUREAU OF MINES

During the Bureau's investigation of the Cape Rosier mine, nine diamond-drill holes were completed, aggregating 2,883 feet.

A 5-ton sample was obtained for beneficiation tests.

Analyses of the samples and geologic logs of the 13 holes drilled by the St. Joseph Lead Co. and the 9 holes drilled by the Bureau of Mines are given in figures 4 to 14, inclusive, in the appendix.

BENEFICIATION TESTS

Introduction

The ore contains sphalerite, galena, chalcopyrite, pyrite, and pyrrhotite with quartz and calcite. Five tons of dump ore from the Cape Rosier mine were shipped to the College Park Station of the Bureau of Mines for test purposes.

Flotation Tests

A large sample from the 5-ton lot was prepared for flotation tests by stage grinding (dry) through 20 mesh. A sample for assaying was split from the minus 20-mesh material and gave the following results: zinc, 23.4 percent; lead, 1.4 percent; copper, 1.4 percent. A number of selective flotation tests were made on this ore, an attempt being made to make three products - a sphalerite, a galena, and a chalcopyrite concentrate.

Owing to the low percentage of galena and chalcopyrite in the ore and the high sphalerite content, difficulty was experienced in floating each mineral into its respective concentrate. This factor also made it impossible to clean properly the small amount of galena and chalcopyrite obtained. After being depressed, the sphalerite was very slow in floating, regardless of the quantity of reactivating reagents used. Pyrite and pyrrhotite began to float before a satisfactory percentage of the sphalerite had floated.

Tap water was used in the first test work done on the ore. Tap water tests were not satisfactory.

In view of the fact that the supply of fresh water at the Cape Rosier mine is not adequate for a mill of the capacity contemplated for this property, a 50-gallon drum of sea water from Lower Goose Falls Pond was sent to this station to be used in subsequent tests. Lower Goose Falls Pond lies adjacent to the Cape Rosier mine.

For sea water flotation tests, a new sample was taken from the original 5-ton lot and diluted with drill cores of country rock from the Cape Rosier mine. The object of this dilution was to obtain a sample carrying approximately the percentage of zinc as the average ore from the mine.

The results of a satisfactory sea water test are given in table 1.

TABLE 1. - Cape Rosier ore

Product	Weight percentage	Assay, percent zinc	Percent of total zinc
Zinc concentrate.........	12.30	50.50	87.71
Cleaner tailing..........	1.81	22.00	5.63
Rougher tailing..........	85.89	0.55	6.66
Composite................	100.00	7.08	100.00

TABLE 1. - Cape Rosier ore (Cont'd.)

Pounds per ton

Reagents	Conditioner	Rougher	Cleaner
Caustic soda..............	1.00		
Tetra potassium...........	0.80		0.40
Pyro phosphate............			
Sodium cyanide............	0.80		
Sodium silicate...........	1.60		0.20
Copper sulfate............	0.80		
Pentasol-amyl-xanthate....		0.10	
Aerofloat No. 15..........		0.05	

The test shown in table 1 was carried out in the following manner: A 250-gram sample was stage-ground at 65 percent solids in a laboratory pebble mill to pass a 48-mesh screen. The ground sample was conditioned in a 250-gram, mechanical-agitation flotation machine and rougher concentrates removed. The rougher concentrates were cleaned once to produce the finished concentrates. Sea water was used throughout the test.

Table 2 outlines the results obtained on a selective-flotation test on Cape Rosier dump ore with tap water.

TABLE 2

Product	Percentage	Assay, percent			Distribution, percent		
		Zn	Pb	Cu	Zn	Pb	Cu
Lead concentrate......	3.03	16.2	14.2	4.04	2.00	32.15	9.64
Lead cleaner tails....	2.09	24.3	2.8	4.34	2.09	4.39	7.18
Zinc concentrate......	31.86	54.1	1.4	1.17	70.69	33.42	29.44
Zinc cleaner tails....	17.52	23.5	0.99	2.17	16.88	12.99	30.03
Rougher tails.........	45.50	4.47	0.66	0.66	8.34	17.05	23.71
Composite........	100.00	23.48	2.43	1.26	100.00	100.00	100.00

Pounds per ton

Reagents	Pebble mill	Conditioned	Rougher	Cleaner
Soda ash............	0.50			
Sodium silicate.....	0.50			0.10
Zinc sulfate........	1.00			
Sodium cyanide......	0.25			
Copper sulfate......		2.00		0.10
Sodium xanthate.....			0.20	
Pine oil............			0.05	
Lime................		0.50		

For the test shown in table 2, the ore was stage-ground in tap water to pass a 65-mesh screen, and separate lead and zinc concentrates were floated. Somewhat higher-grade zinc concentrates were obtained than in the sea-water test, but recovery was considerably lower.

Summary

Flotation tests made on a sample of dump ore from the Cape Rosier mine indicate a recovery of over 85 percent of the zinc may be expected by flotation in sea water and a product assaying over 50 percent zinc may be obtained.

Selective flotation tests to produce separate copper, lead, and zinc concentrates were unsuccessful in either tap water or sea water.

A suggested flowsheet is shown on figure 3.

LOGS OF DIAMOND-DRILL HOLES, CAPE ROSIER MINE

Hole	Collar Coordinates N.	Collar Coordinates E.	Elev., feet	Bearing, mag.	Average angle	Depth, feet	True thickness factor
			St. Joseph Lead Co., holes 1 to 13, inclusive				
1	4930	4895	5	N. 63 W.	45	400	0.99
2	4790	4778	10	N. 55 W.	60	300	.98
3	4270	4260	10	N. 70 W.	37	350	.94
4	4450	4475	27	N. 50 W.	45	450	.96
5	4550	4593	25	N. 50 W.	45	288	.96
6	4625	4685	23	N. 50 W.	45	300	.98
7	4570	4740	10	N. 50 W.	57	362	1.00
8	4571	4740	10	N. 35 E.	75	521	.88
9	4140	4340	10	N. 50 W.	40	331	.94
10	4030	4270	13	N. 50 W.	40	350	.94
11	4830	4910	1	S. 75 W.	63	764	.59
12	5000	5000	2	N. 15 W.	60	665	
13	4400	4718	5	N. 56 W.	72	420	.96
						5501	
			Bureau of Mines, holes 14 to 22, inclusive				
14	4980	4980	1	N. 51 W.	50	265	0.96
15	4960	4940	1	N. 54 W.	82	328	.74
16	4800	4815	8	N. 54 W.	85	343	.87
17	4710	4740	0	N. 55 W.	62	250	1.00
18	4709	4741	0	N. 55 W.	86	333	.92
19	4855	4860	8	N. 54 W.	66	289	.94
20	4305	4550	4	N. 54 W.	75	283	.98
21	4460	4575	19	N. 54 W.	57	288	.96
22	4825	4895	-1	S. 54 E.	86	504	.77
						2883	
						8384	

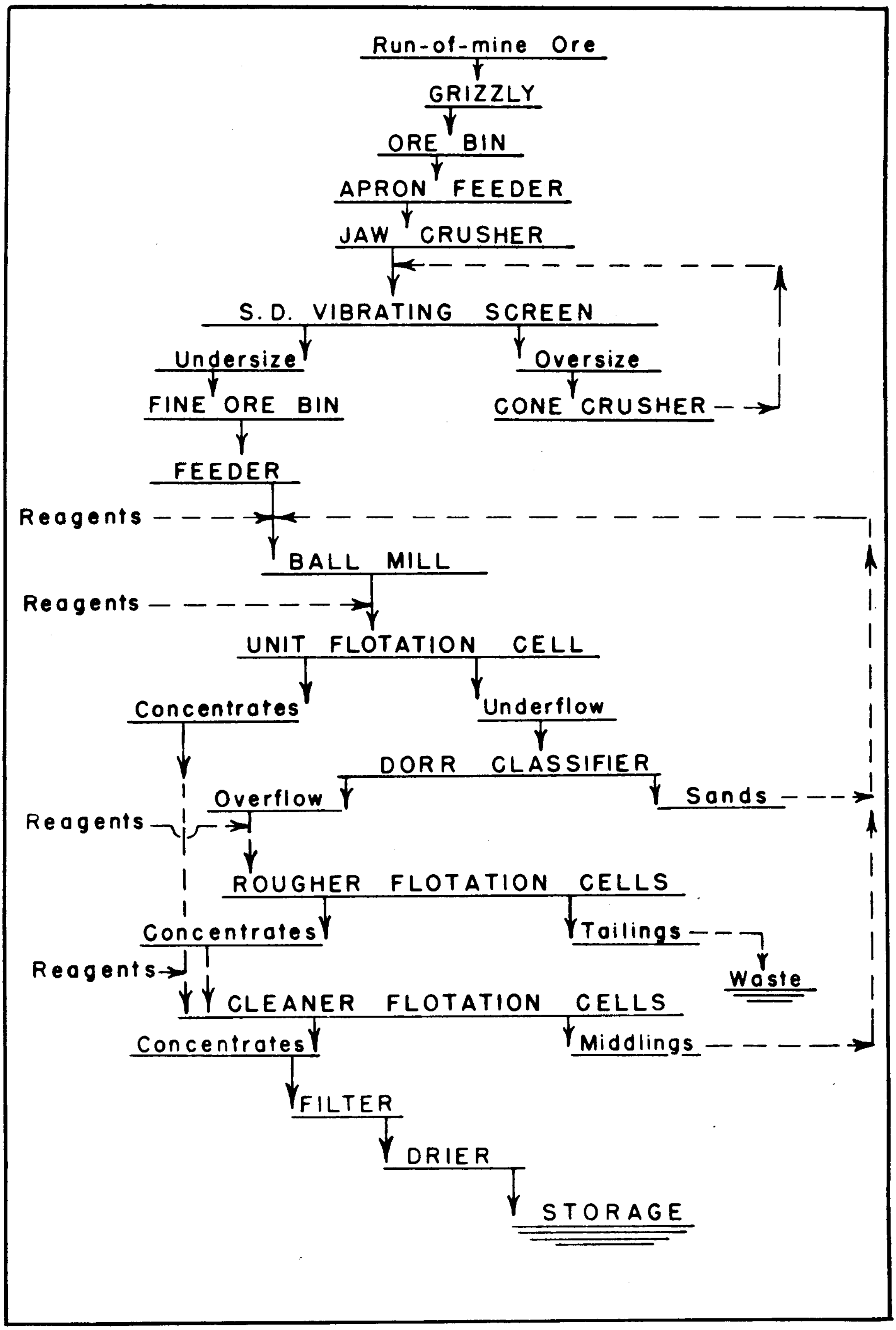
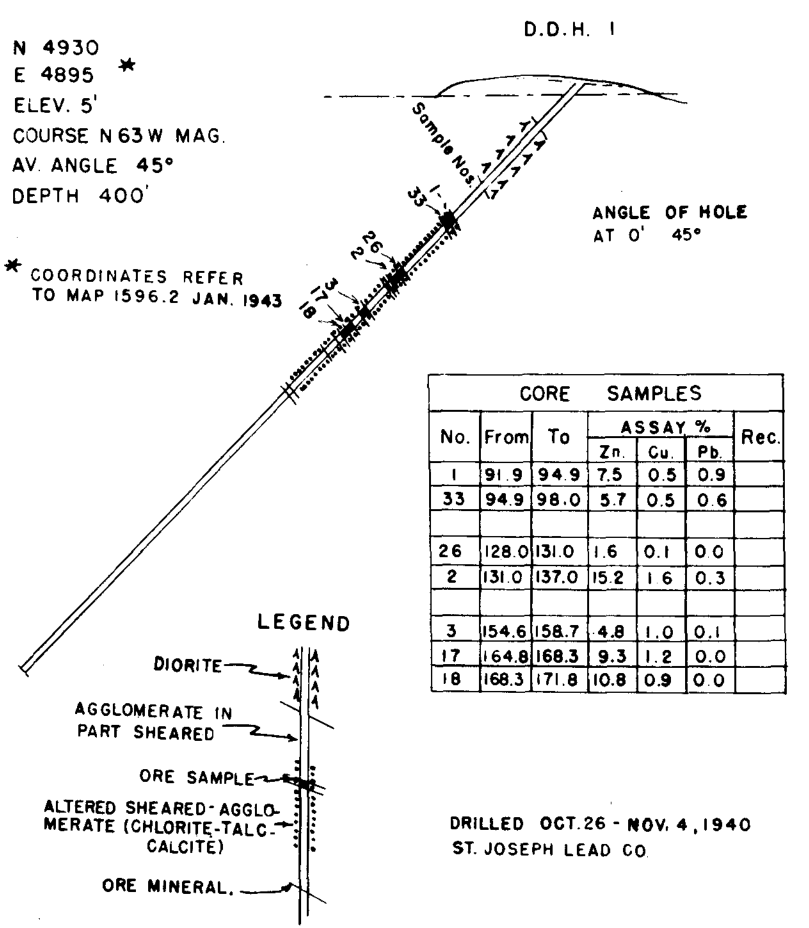
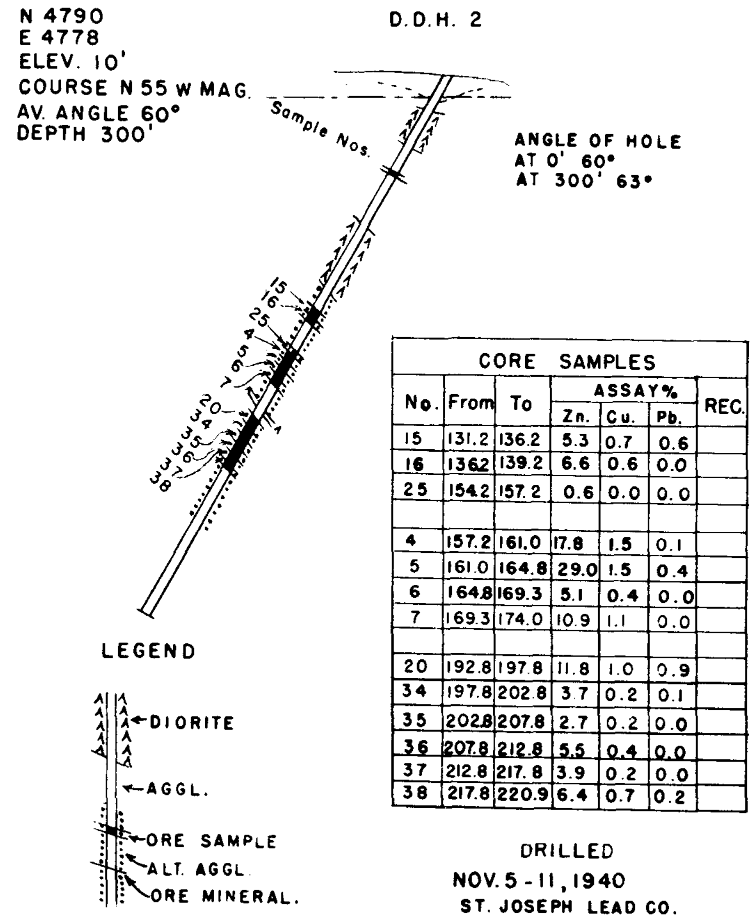


Figure 3. - Flow sheet suggested for treatment of Zn-Cu-Pb ore.



CORE SAMPLES

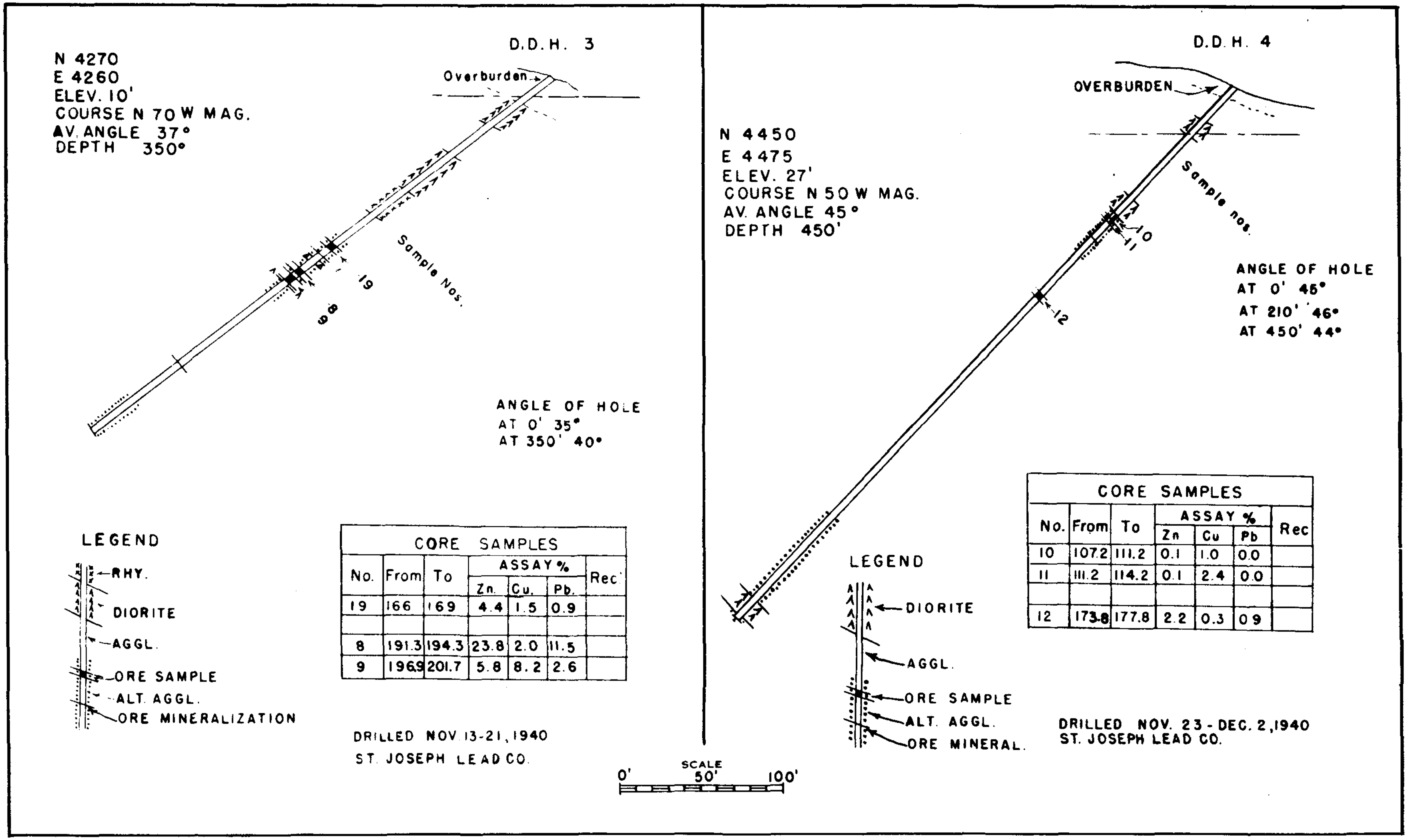
No.	From	To	ASSAY % Zn.	Cu.	Pb.	Rec.
1	91.9	94.9	7.5	0.5	0.9	
33	94.9	98.0	5.7	0.5	0.6	
26	128.0	131.0	1.6	0.1	0.0	
2	131.0	137.0	15.2	1.6	0.3	
3	154.6	158.7	4.8	1.0	0.1	
17	164.8	168.3	9.3	1.2	0.0	
18	168.3	171.8	10.8	0.9	0.0	



CORE SAMPLES

No.	From	To	ASSAY % Zn.	Cu.	Pb.	REC.
15	131.2	136.2	5.3	0.7	0.6	
16	136.2	139.2	6.6	0.6	0.0	
25	154.2	157.2	0.6	0.0	0.0	
4	157.2	161.0	17.8	1.5	0.1	
5	161.0	164.8	29.0	1.5	0.4	
6	164.8	169.3	5.1	0.4	0.0	
7	169.3	174.0	10.9	1.1	0.0	
20	192.8	197.8	11.8	1.0	0.9	
34	197.8	202.8	3.7	0.2	0.1	
35	202.8	207.8	2.7	0.2	0.0	
36	207.8	212.8	5.5	0.4	0.0	
37	212.8	217.8	3.9	0.2	0.0	
38	217.8	220.9	6.4	0.7	0.2	

Figure 4. - Geology and assays, D.D.H. 1 and 2.



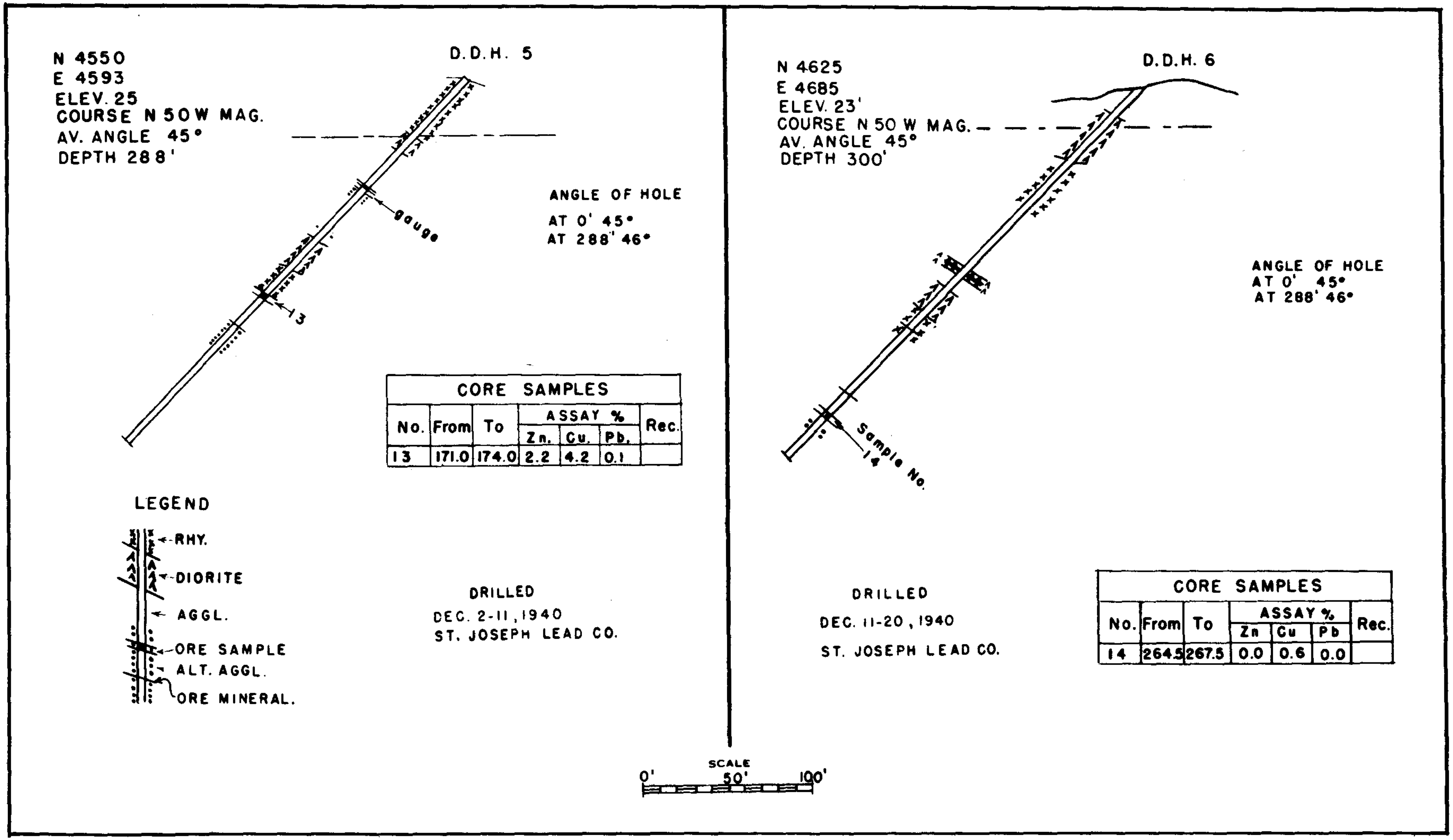
CORE SAMPLES (D.D.H. 3)

No.	From	To	ASSAY % Zn.	Cu.	Pb.	Rec
19	166	169	4.4	1.5	0.9	
8	191.3	194.3	23.8	2.0	11.5	
9	196.9	201.7	5.8	8.2	2.6	

CORE SAMPLES (D.D.H. 4)

No.	From	To	ASSAY % Zn	Cu	Pb	Rec
10	107.2	111.2	0.1	1.0	0.0	
11	111.2	114.2	0.1	2.4	0.0	
12	173.8	177.8	2.2	0.3	0.9	

Figure 5. - Geology and assays, D.D.H. 3 and 4.



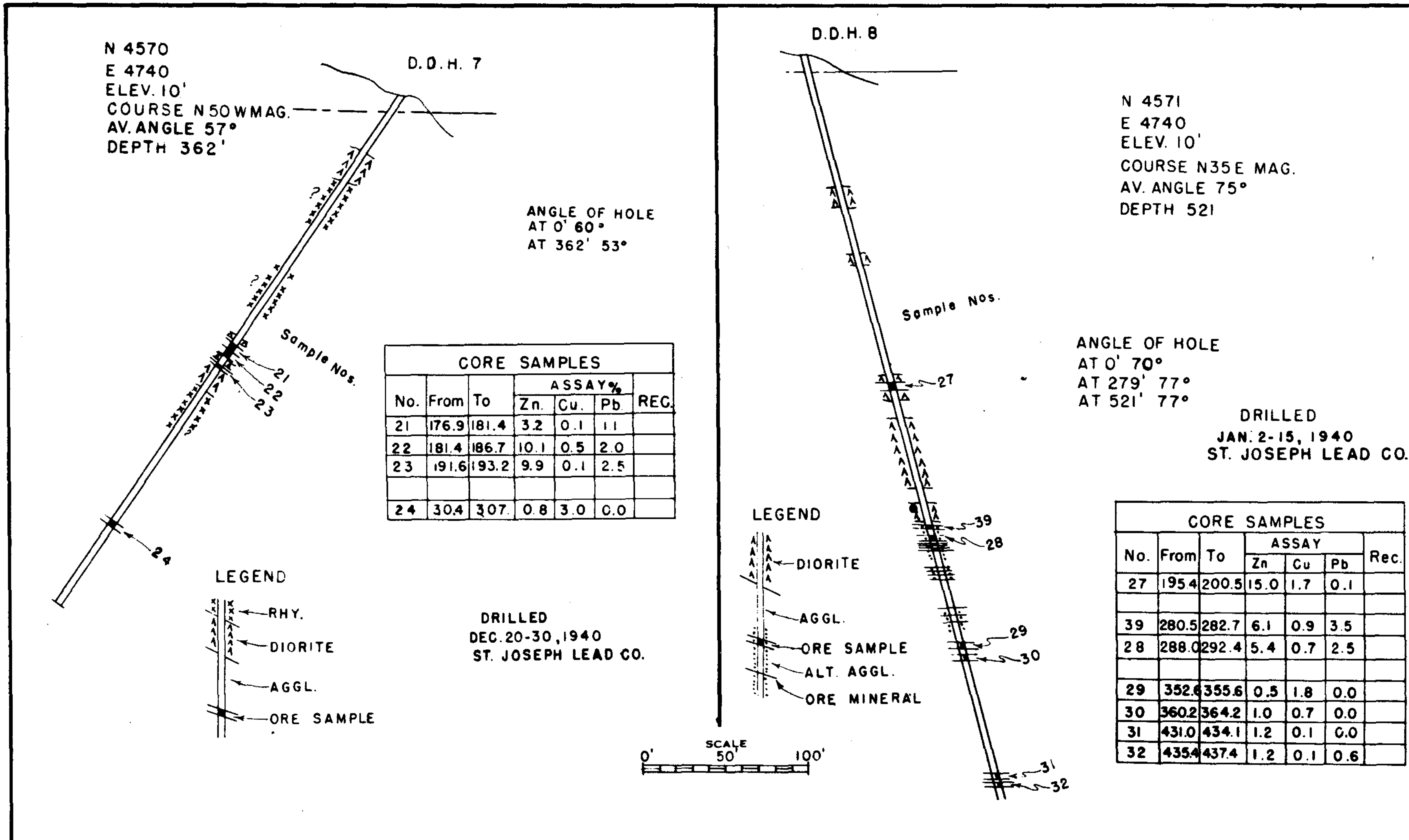
CORE SAMPLES (D.D.H. 5)

No.	From	To	ASSAY % Zn.	Cu.	Pb.	Rec.
13	171.0	174.0	2.2	4.2	0.1	

CORE SAMPLES (D.D.H. 6)

No.	From	To	ASSAY % Zn	Cu	Pb	Rec.
14	264.5	267.5	0.0	0.6	0.0	

Figure 6. - Geology and assays, D.D.H. 5 and 6.



CORE SAMPLES (D.D.H. 7)

No.	From	To	ASSAY % Zn.	Cu.	Pb.	REC.
21	176.9	181.4	3.2	0.1	1.1	
22	181.4	186.7	10.1	0.5	2.0	
23	191.6	193.2	9.9	0.1	2.5	
24	30.4	307.	0.8	3.0	0.0	

CORE SAMPLES (D.D.H. 8)

No.	From	To	ASSAY Zn	Cu	Pb	Rec.
27	195.4	200.5	15.0	1.7	0.1	
39	280.5	282.7	6.1	0.9	3.5	
28	288.0	292.4	5.4	0.7	2.5	
29	352.6	355.6	0.5	1.8	0.0	
30	360.2	364.2	1.0	0.7	0.0	
31	431.0	434.1	1.2	0.1	0.0	
32	435.4	437.4	1.2	0.1	0.6	

Figure 7. - Geology and assays, D.D.H. 7 and 8.

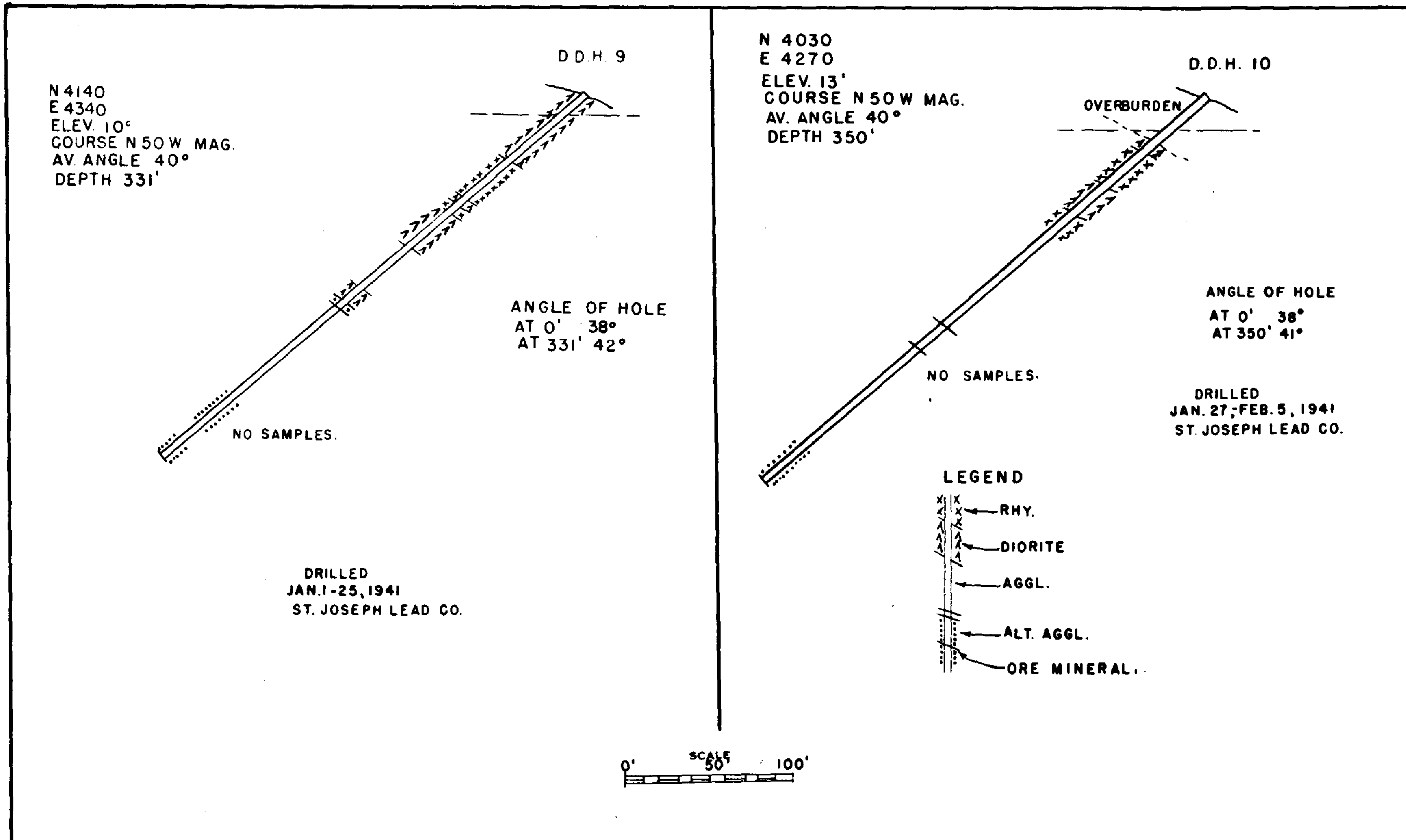
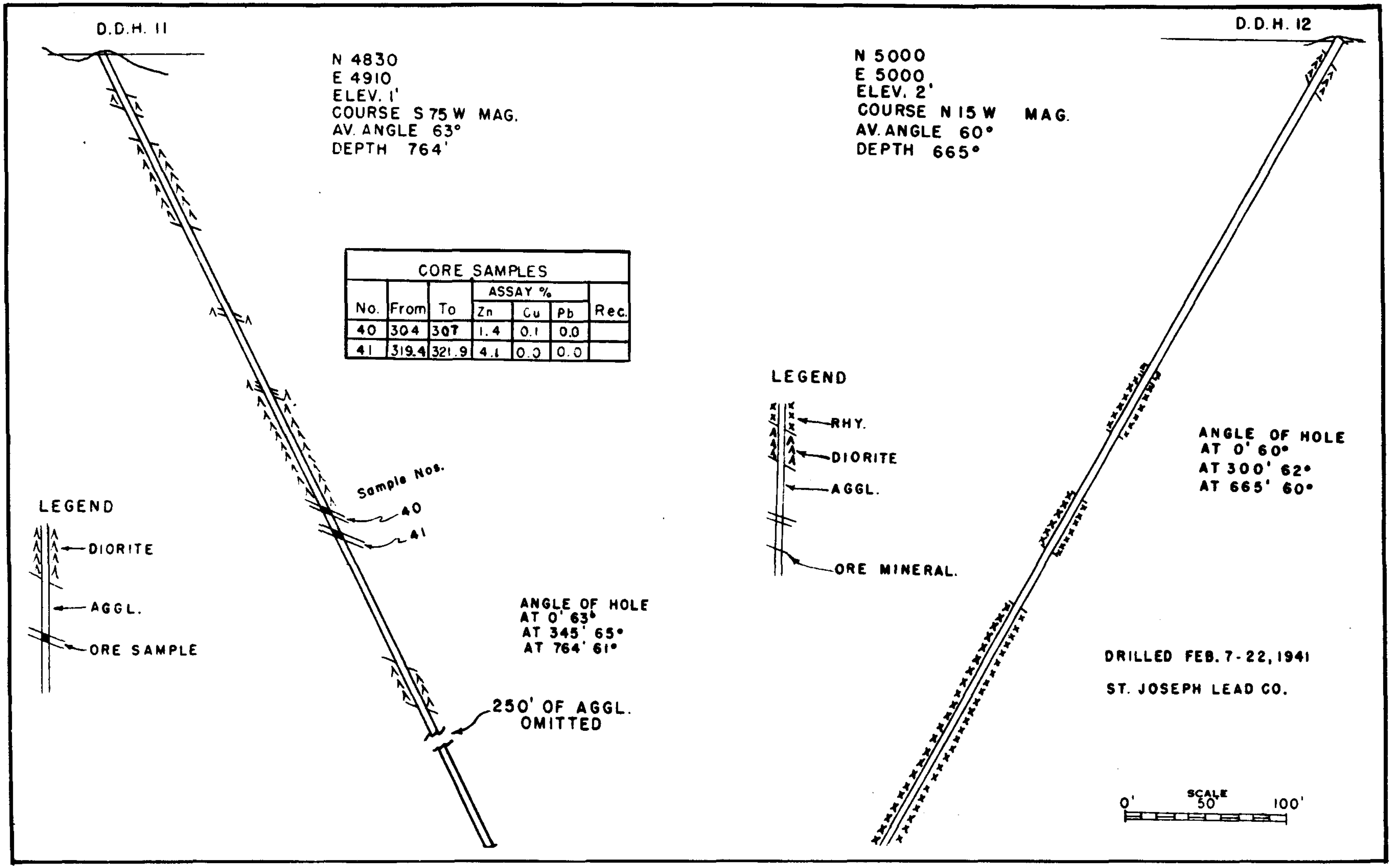


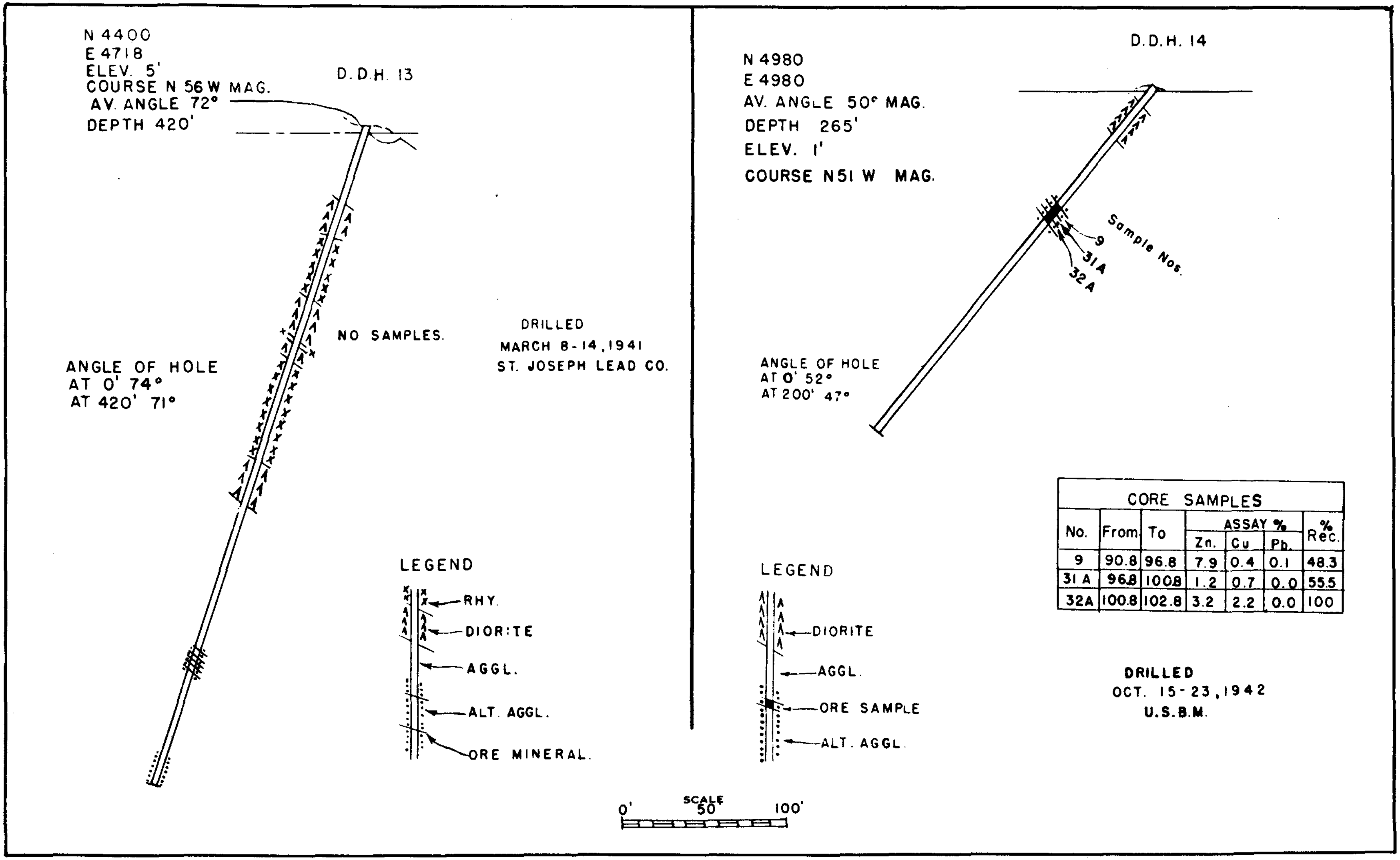
Figure 8. - Geology and assays, D.D.H. 9 and 10.



CORE SAMPLES

No.	From	To	ASSAY % Zn	Cu	Pb	Rec.
40	304	307	1.4	0.1	0.0	
41	319.4	321.9	4.1	0.0	0.0	

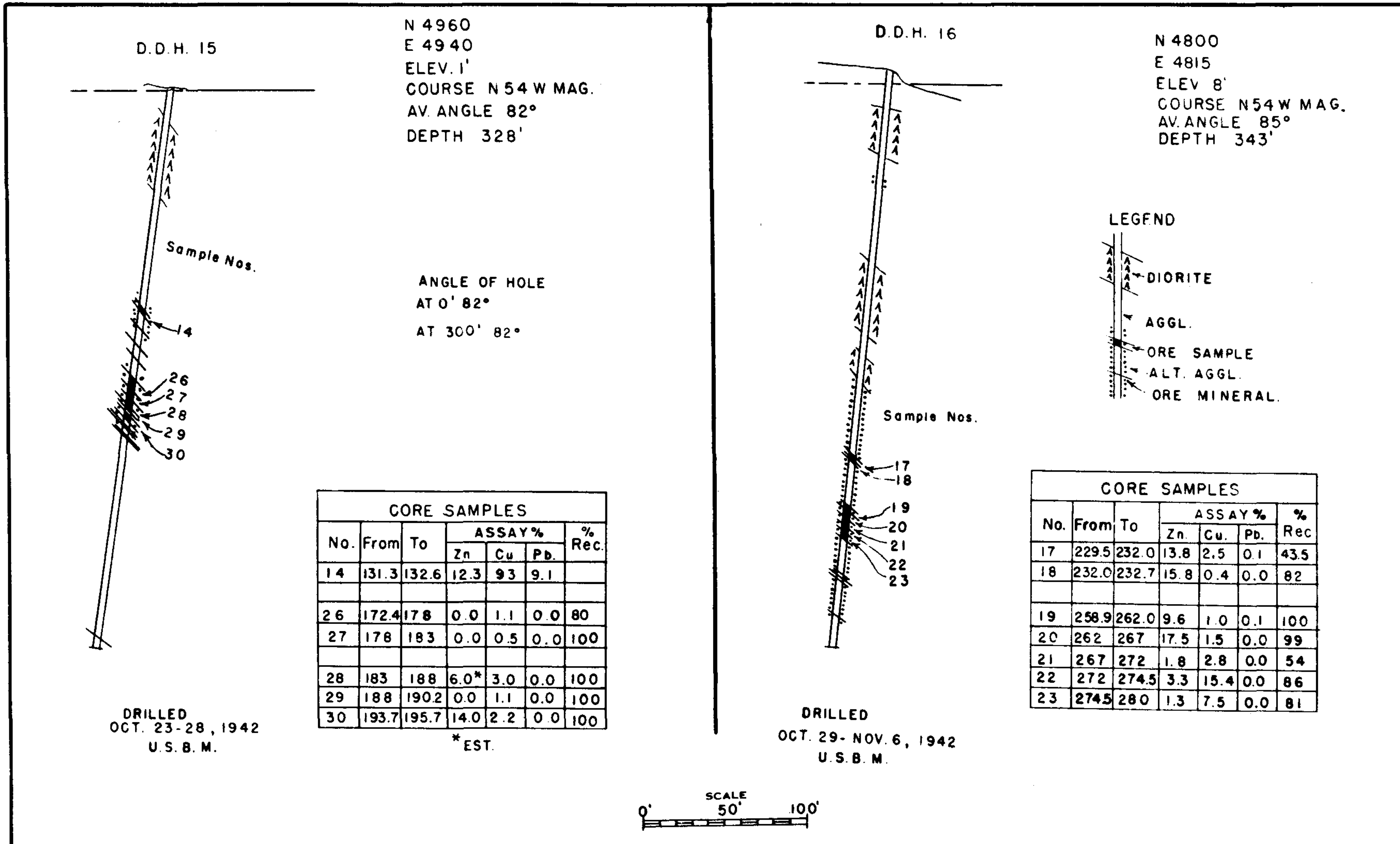
Figure 9. - Geology and assays, D.D.H. 11 and 12.



CORE SAMPLES

No.	From	To	Assay % Zn.	Assay % Cu	Assay % Pb.	% Rec.
9	90.8	96.8	7.9	0.4	0.1	48.3
31 A	96.8	100.8	1.2	0.7	0.0	55.5
32A	100.8	102.8	3.2	2.2	0.0	100

Figure 10. - Geology and assays, D.D.H. 13 and 14.



CORE SAMPLES (D.D.H. 15)

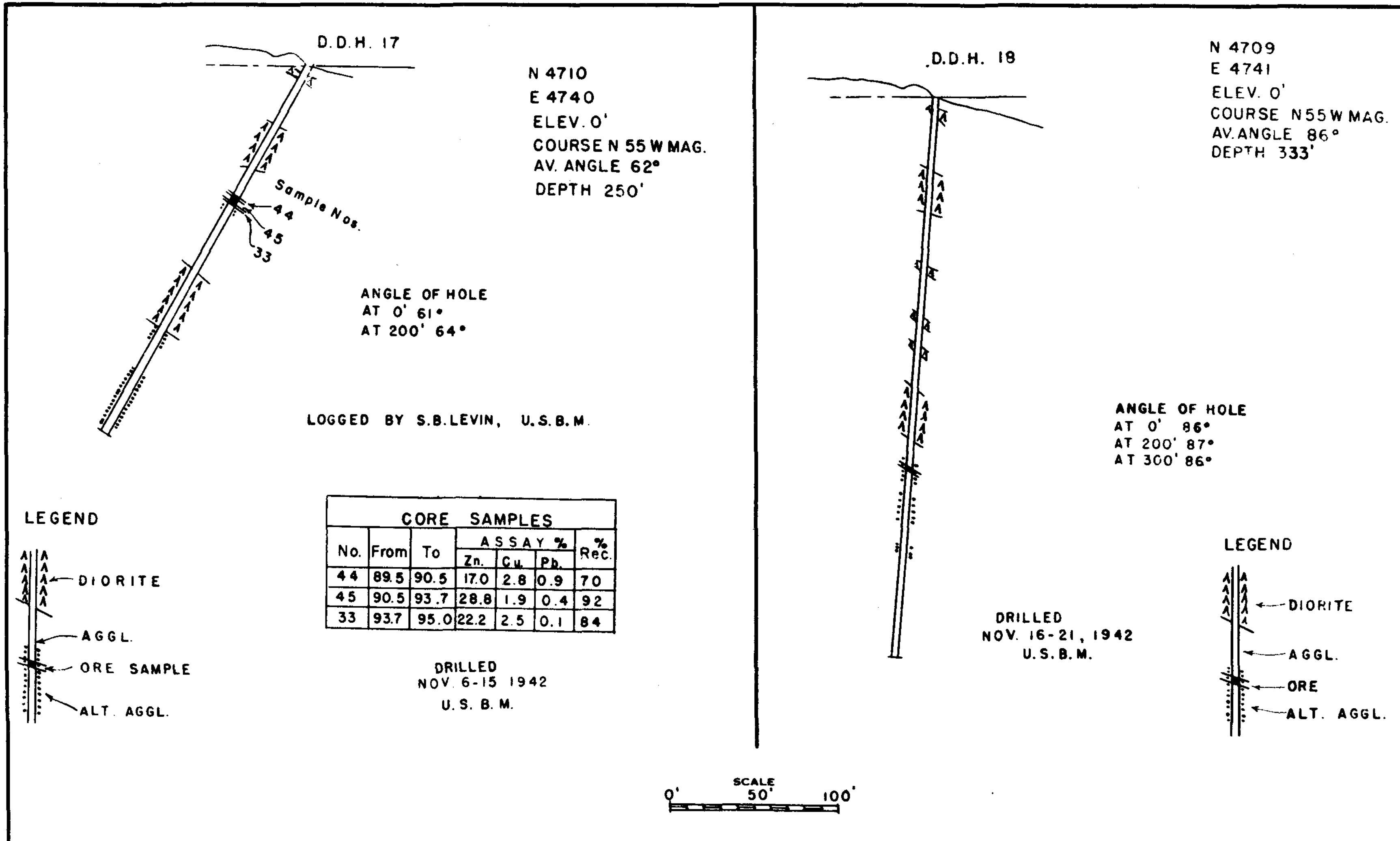
No.	From	To	ASSAY % Zn	Cu	Pb.	% Rec.
14	131.3	132.6	12.3	93	9.1	
26	172.4	178	0.0	1.1	0.0	80
27	178	183	0.0	0.5	0.0	100
28	183	188	6.0*	3.0	0.0	100
29	188	190.2	0.0	1.1	0.0	100
30	193.7	195.7	14.0	2.2	0.0	100

*EST.

CORE SAMPLES (D.D.H. 16)

No.	From	To	ASSAY % Zn.	Cu.	Pb.	% Rec
17	229.5	232.0	13.8	2.5	0.1	43.5
18	232.0	232.7	15.8	0.4	0.0	82
19	258.9	262.0	9.6	1.0	0.1	100
20	262	267	17.5	1.5	0.0	99
21	267	272	1.8	2.8	0.0	54
22	272	274.5	3.3	15.4	0.0	86
23	274.5	280	1.3	7.5	0.0	81

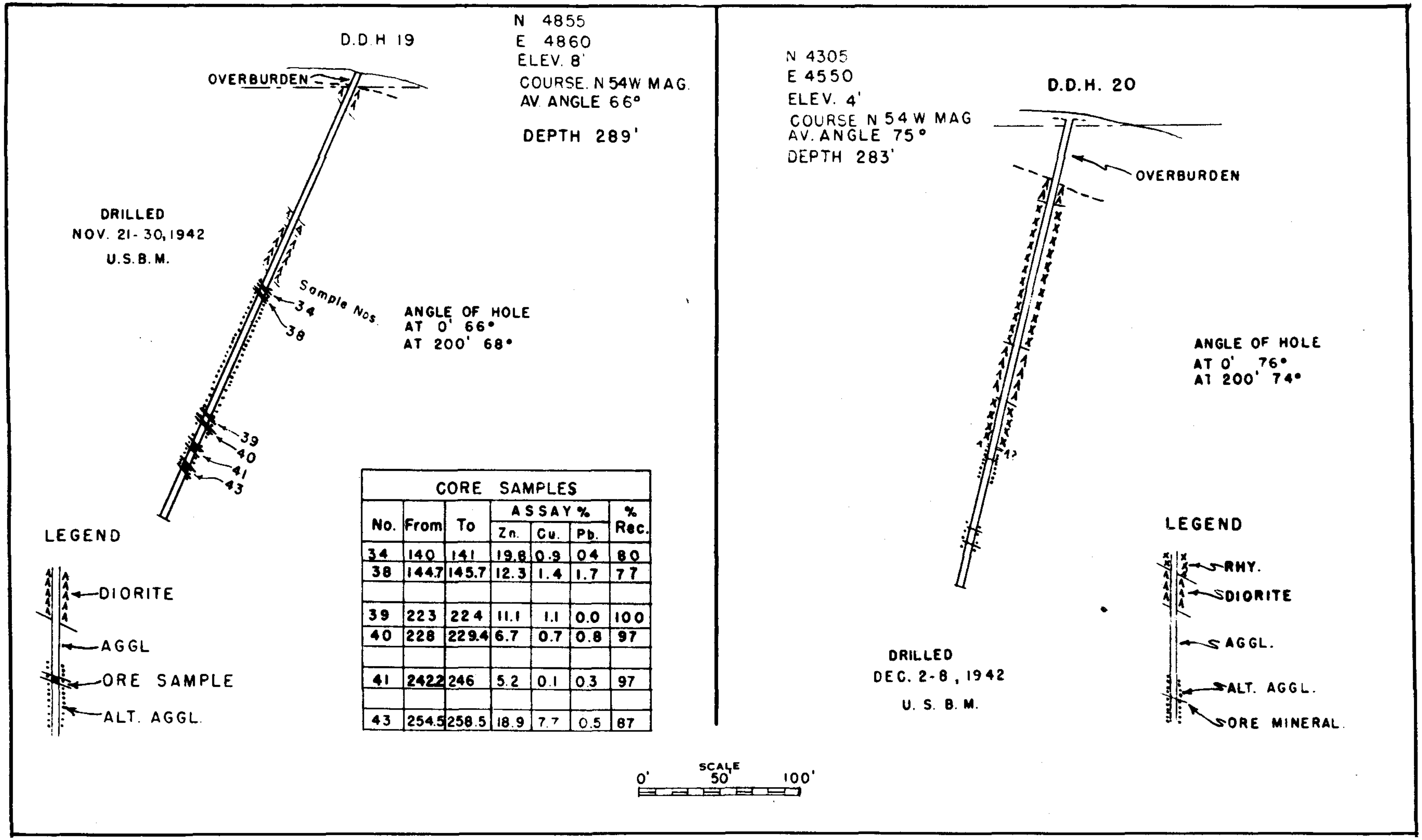
Figure 11. - Geology and assays, D.D.H. 15 and 16.



CORE SAMPLES

No.	From	To	ASSAY % Zn.	Cu.	Pb.	% Rec.
44	89.5	90.5	17.0	2.8	0.9	70
45	90.5	93.7	28.8	1.9	0.4	92
33	93.7	95.0	22.2	2.5	0.1	84

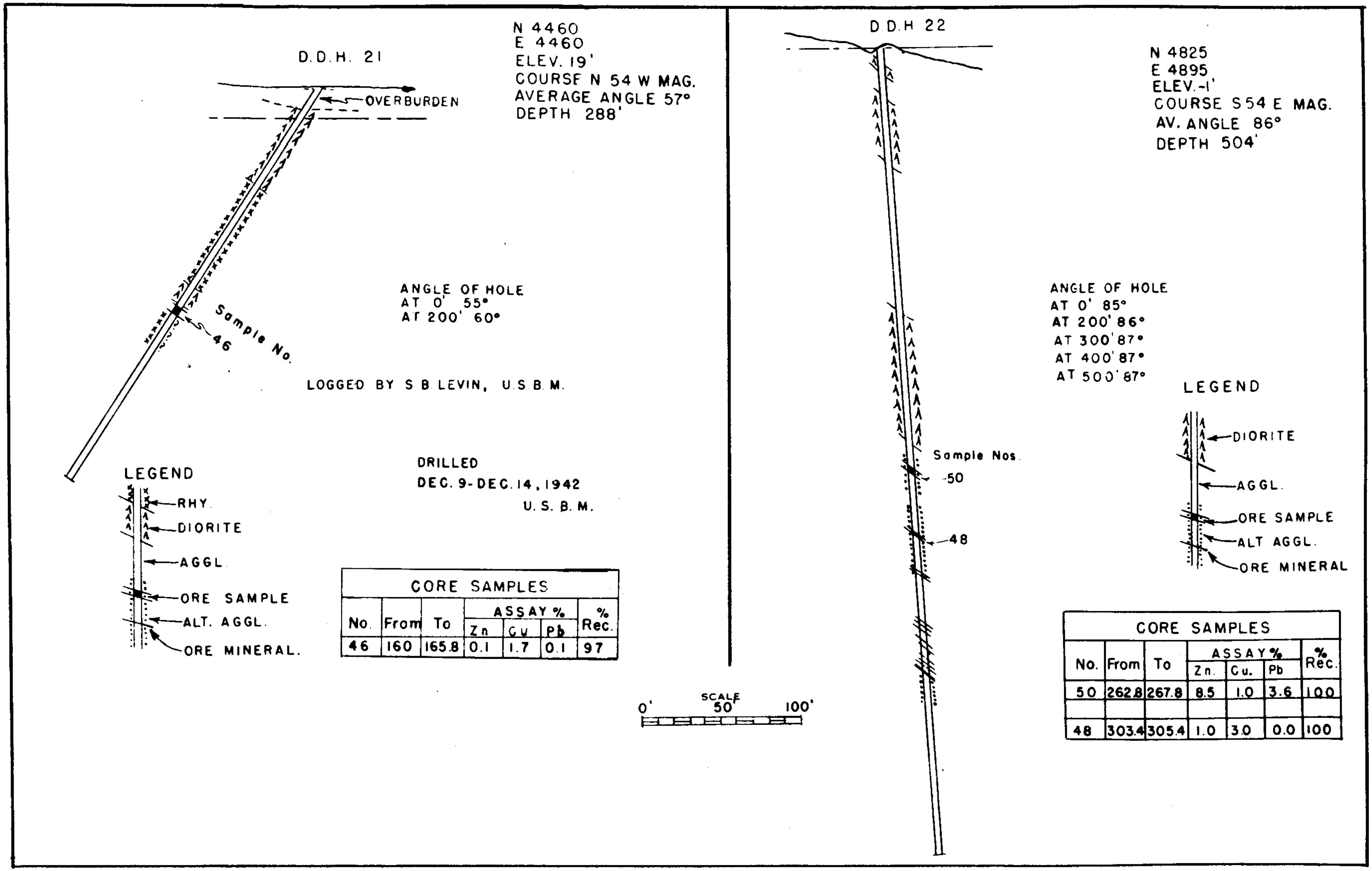
Figure 12. - Geology and assays, D.D.H. 17 and 18.



CORE SAMPLES

No.	From	To	ASSAY % Zn.	Cu.	Pb.	% Rec.
34	140	141	19.8	0.9	04	80
38	144.7	145.7	12.3	1.4	1.7	77
39	223	224	11.1	1.1	0.0	100
40	228	229.4	6.7	0.7	0.8	97
41	242.2	246	5.2	0.1	0.3	97
43	254.5	258.5	18.9	7.7	0.5	87

Figure 13. - Geology and assays, D.D.H. 19 and 20.



CORE SAMPLES

No.	From	To	ASSAY % Zn	Cu	Pb	% Rec.
46	160	165.8	0.1	1.7	0.1	97

CORE SAMPLES

No.	From	To	ASSAY % Zn.	Cu.	Pb	% Rec.
50	262.8	267.8	8.5	1.0	3.6	100
48	303.4	305.4	1.0	3.0	0.0	100

Figure 14. - Geology and assays, D.D.H. 21 and 22.