OPEN FILE REPORT 108

HAZEN RESEARCH, INC.

4601 INDIANA STREET
GOLDEN, COLORADO • 80401
TELEPHONE 303/279-4501

HRI Project 4618
Copy No. _____

CONSULTING SERVICE AT MINING AND MILLING CORPORATION OF AMERICA

Hachita, New Mexico

for

The Peoples Company
P. O. Box 546
Ellinwood, Kansas 65726

April 27, 1979

Prepared by:

William T. Hamling
Senior Mining Engineer

John S. Holland
Chief Geologist

Approved by:

F. M. Stephens, Jr.
Vice President

TABLE OF CONTENTS

INTRODUCTION AND SUMMARY

The Peoples Company, of Ellinwood, Kansas, sponsored a limited program of core drilling to evaluate the possibility of finding gold and silver mineralization in a prominent quartz vein which occurs within mining claims of the Mining and Milling Corporation of America.

The claims are located in Hidalgo County, New Mexico, in the extreme southwest corner of the State. Within the property the dominant feature is an elongated hill which reflects the underlying Winkler anticline. The anticline is an elongated dome having its long axis trending northeasterly. Parallel to the axis there are a number of normal faults having only moderate displacements. The faults have provided channels for the introduction of quartz in veins and as irregular replacement masses in the limestones comprising the exposed rocks of the fold structure.

The most prominent quartz vein, which occurs along the northwest flank of the fold, is accompanied by a quartz latite porphyry dike which varies from a few feet to nearly 200 feet in thickness. The relative ages of dike and veins are not clear.

Previous sampling by others along the trend of the quartz vein disclosed modest gold and silver content. The three-hole drilling program was planned to provide intersections of the quartz vein at depths which were expected to be below the zone of weathering of any sulfides which might be present in the vein.

The drilling program was started late in December and terminated on February 28, 1979.

Two holes were drilled in the quartz vein and failed to intersect any significant mineralization. The remainder of the contracted drilling footage was utilized to drill three short holes to probe the possible downward extension of fluorite mineralization which had been the basis of the Mining and Milling Corporation's operation. Only minor fluorite was intersected; not enough to justify further interest.

LOCATION AND ACCESS

The Mining and Metallurgical Corporation's (hereafter to be referred to as M. & M. Corp.) property is situated in the southern part of Hidalgo County in the extreme southwest corner of New Mexico. The area is about 20 miles north of the Mexican border and about the same distance east of the Arizona - New Mexico boundary.

The property is on the east flank of the Animas Mountains at elevations ranging from 5,100 feet to just over 5,700 feet. The Animas Range is one of several elongate, north-south trending fault block mountains of the Basin and Range type. The adjacent valleys are broad, essentially flat, gravel-filled features.

Lordsburg is 55 miles to the north; Deming is about 65 miles to the northeast. The small settlement of Hachita is about 30 miles northeast. In recent years Phelps Dodge Corp. built its Playas copper smelter in the Playas Valley, about 15 miles northeast of the M. & M. Corp. property. Phelps Dodge has assembled extensive property holdings in the region.

The main access route is by New Mexico Highway 81 running south from Hachita then westerly across the Playas Valley 13 miles on a good gravel road.

The region is arid with an average annual precipitation of about 10 inches, most of which is from summer thunderstorms. Winters are usually mild with some rain and light snow.

Vegetation and wildlife are typical of the Sonoran zone of southwest New Mexico and northern Mexico. Cacti, mesquite, and creosote bush, plus grasses and shrubs are the dominant plant forms.

REGIONAL GEOLOGY

The M. & M. Corp. claims are within the Walnut Wells quadrangle which was studied intermittently during the 1950's by Zeller and Alpert. 1/

The Animas Mountains are comprised mainly of layered Tertiary rocks of mostly volcanic origin, a series of flows of various composition, conglomerate, and fine-grained sedimentary beds.

As many as four periods of deformation influenced the area to produce folding, faults, and unconformities. West and north of the claim area are small intrusions of monzonite porphyry. A buried intrusive has probably caused the formation of the Winkler anticline, a doubly plunging and northeast trending elongated dome. The arching of this structure and resultant erosion has exposed rocks of late Paleozoic and Cretaceous age, most of which are limestones with minor amounts of shale and dolomite.

1/ Zeller, R. A., and Alper, A. M., 1965, Geology of the Walnut Wells Quadrangle, Hidalgo County, New Mexico. New Mexico Bureau of Mines and Mineral Resources Bulletin 84. Socorro, NM.

WINKLER ANTICLINE

The Winkler Anticline, or dome, was developed during several distinct periods of deformation, according to Zeller and Alper. The tectonic activity produced a number of faults whose strike is roughly parallel to the structure's northeast trending axis. At a later stage numerous transverse faults developed, all of relatively small displacement.

The northeasterly faults provided channels for intense silicification which has formed vein-like masses and also irregularly shaped quartz replacements in the limestone. The fault zone along the northwest flank of the anticline was intruded by a quartz latite porphyry dike which varies in thickness from 10 feet or less to over 200 feet.

MINERAL DEPOSITS

QUARTZ VEINS AND SILICIFICATION

The only mine development on the quartz veins has been in the Gillespie Mine, discovered in 1880-1881 where silver mineralization was found at shallow depth. Two shafts were sunk on a massive quartz vein-silicified zone, but production was probably insignificant.

The Gillespie is at the extreme southwest end of the quartz vein and silicification can be traced for nearly two miles. The outcrop is not continuous as the transverse faults have produced a series of vein segments offset in an en echelon pattern.

Examination of the quartz outcrops disclosed scattered indications of copper mineralization reflected by the green staining of malachite. Limonite, iron oxide, though ubiquitous, is not abundant. It is usually found in cavities and boxworks in the quartz, indicative of the former presence of pyrite.

A report dated August 29, 1978, by T. L. Sheldon, geologist, lists 15 grab samples taken from a number of localities in and near the property, and all of which showed gold and silver values. Gold assays ranged from 0.002 ounce to 0.045 ounce per ton. Silver values ranged from 0.026 ounce to 7.26 ounces per ton.

In 1977 L. L. Osmer, geologist, wrote a report based on a brief inspection. He recommended a drilling program to prospect the quartz vein which is referred to as the Curtis vein in Osmer's and Sheldon's reports. Osmer did not report any sampling but did make calculations of "possible ore reserves" of just under 2.5 million tons to which he assigned a gross value of $30.00 per ton, the derivation of which was not given.

FLUORITE DEPOSITS

Fluorite occurrences were discovered in the area around the northeast nose of the Winkler Anticline in 1943. Exploratory work consisting of drilling, trenching and test-pitting was carried on during 1970 and 1971 1/. The Athena claims were leased by A. J. Curtis in 1971. Additional claims were located in 1972.

Mining and Milling Corporation was formed to operate the fluorite mine and a 200 tons per day flotation mill was erected on the property.

The fluorite is associated with calcite and quartz as fillings of voids, in brecciated zones, and as replacement masses in a specific limestone bed. The fluorite-calcite-quartz assemblage in fracture fillings and breccia zones appears to be less selective as to a favorable limestone bed as is the replacement bodies, according to L. W. Krummey, Jr., a geologist who worked on the geology of the mine area and supervised much of the earlier drilling.

1/ McNulty, W. N., Sr., 1972, "Winkler Anticline Fluorspar, Hidalgo County, New Mexico. New Mexico State Bureau of Mines and Mineral Resources Target Exploration Report E-3.

DRILLING PROGRAM

A visit was made to the property in late November - early December to become aquainted with the general geology and to select locations for three drill holes on the main quartz vein. Subsequently, proposals from three drilling contractors were evaluated and compared, and a recommendation of Joy Manufacturing Co. was made to Peoples Company. Hole locations are shown on Figures 1 and 2.

A. J. Curtis, the on-site representative for Peoples Company, and for himself, prepared access roads and drill sites. Drilling commenced at hole M & M No. 3 [1/] on December 22, 1979.

The results of the drilling are summarized in the following section; the detailed logs of the holes are contained in the Appendix.

1/ Hole numbers were assigned at time of layout rather than in the order drilled.

Summary of Holes Drilled
M & M No. 3

Elevation: 5,360 ± 10'
Bearing: S 45° E
Inclination: 31-1/2°

T.D. 647 feet

Interval	Description
0-9	Overburden and talus.
9-313.5	Mostly limestone, some dolomite, limey sandstone and a few thin shale beds.
313.5-476	Quartz latite porphyry dike; mostly fresh with sparsely disseminated fine-grained pyrite.
476-564.3	Quartz latite porphyry with abundant quartz flodding in bands and irregular masses. Some tan colored altered zones, pyrite oxidized. Porphyry locally banded and brecciated.
564.3-567	Massive and vuggy quartz vein. No visible sulphides.
567-645.7	Limestone and dolomite with quartz and calcite stringers, thin shale bands, some disseminated pyrite.
645.7-647	Fracture zone. Quartz, siderite with iron oxide and manganese oxide.

M & M No. 2

(not drilled)

M & M No. 1

Elevation, 5,350' ± 10'
Bearing, S 29° E
Inclination, -35°

T. D. 412 feet

Internal	Description
0-10	Overburden, talus, and broken near surface limestone.
10-328	Limestone, mostly gray, some tan colored. Abundant calcite in stringers and irregular masses. Some pyrite and chalcopyrite 170'-179', malachite specks at 204', erratic disseminated pyrite.
328-336	Zone of gray quartz mixed with limestone, calcite stringers, some hematite staining. Considerable fracturing 318'-328', fault zone?
336-412	Gray limestone, local shale partings, calcite stringers generally abundant, minor silicification, locally spotty pyrite.

Two cored intervals which exhibited considerable oxidation as reflected by abundant iron oxide were assayed, as follows:

		Assay	
Interval	HRI No.	oz/ton Au	oz/ton Ag
324-330	15106-1	<0.005	<0.005
393-399	15106-2	<0.005	<0.005

Hole M & M No. 3 showed no sulphide mineralization in the quartz vein which was much narrower than expected. The thick section of quartz latite porphyry dike contained weakly disseminated fine-grained pyrite throughout.

Four intervals of drill core were split and assayed, with the following results.

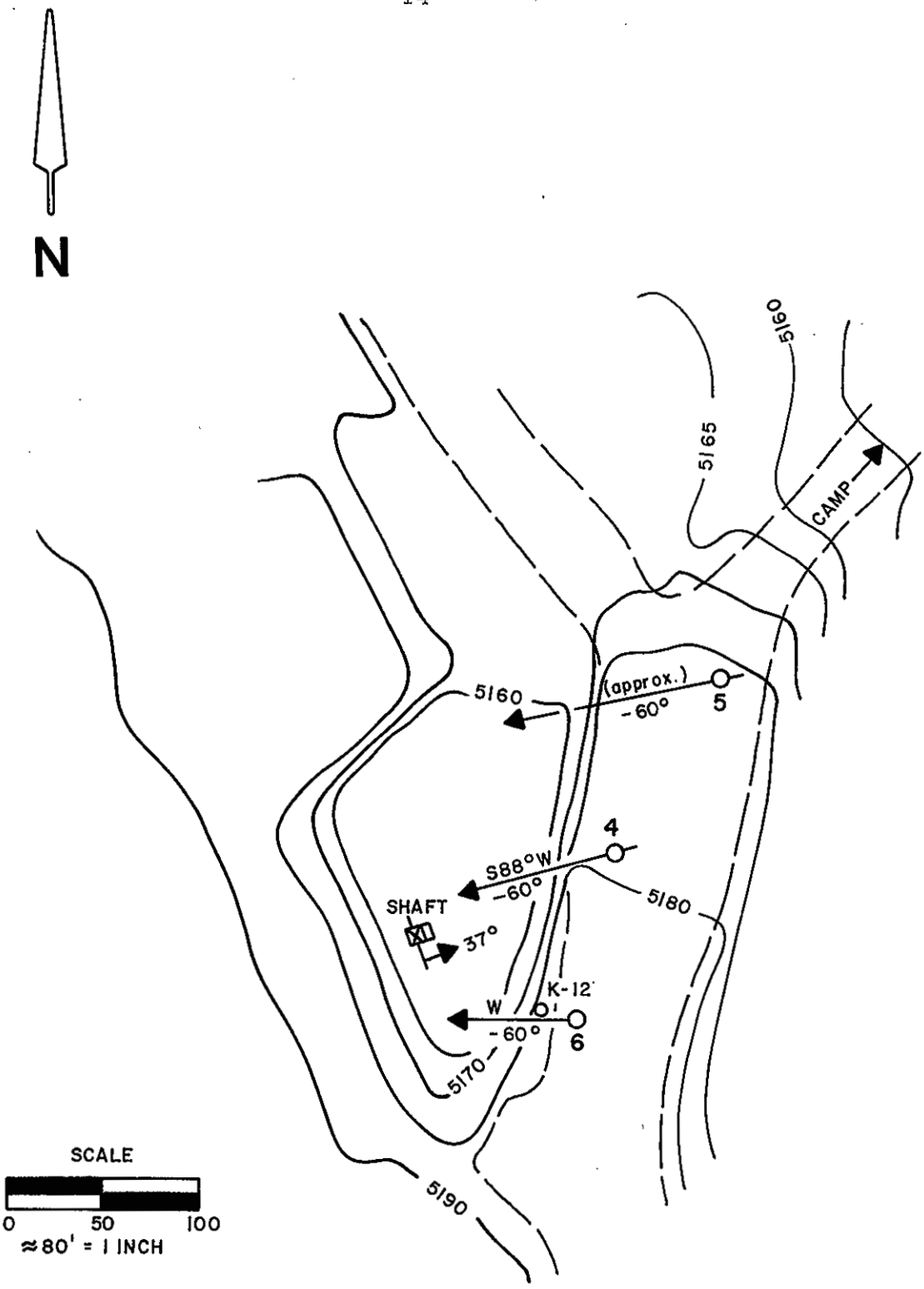
Interval	HRI No.	Rock Description	oz/ton Gold	oz/ton Silver
485-489	15047-1	Gray porphyry with abundant quartz, feldspar, fresh pyrite.	<0.005	<0.005
507-512	15047-2	Altered tan porphyry, abundant quartz, no visible pyrite.	<0.005	<0.005
564-567	15047-3	Zone of quartz veining and flooding, with limestone.	<0.005	<0.005
577-582	15047.4	Gray, siliceous limestone breccia.	<0.005	<0.005

Hole M & M No. 1 intersected only one narrow zone of quartz mineralization. At the total depth drilled it was concluded that the hole had extended well beyond any reasonable downward projection of the surface expression of the quartz vein.

These two holes, approximately one mile apart, effectively reduced the favorable possibilities of significant quartz vein mineralization at depth. Inasmuch as the drilling contract called for not less than 1,500 feet of hole, it was decided to drill some shallow holes in the fluorite mine area to explore for the downward continuation of the fluorite-bearing zone. Previous exploration drilling of the mine area was done with percussion machines. Fluorite estimation was based on examination of the cuttings, a method not conducive to clear definition of rock-vein contacts.

Three holes, M & M Numbers 4, 5, and 6, were drilled in the mine area. All were inclined toward the southwest to intersect the downward projection of fluorite mineralization exposed in the mined area. Only meager amounts of fluorite were intersected although there was evidence of abundant fracturing and brecciation. In essence, the channel-ways were provided but the channel filling was almost all quartz and calcite, only a few discrete grains and small masses of fluorite being observed (Figure 2).

Detailed logs of these holes may be found in the Appendix; the data are summarized as follows:



DRILL HOLES-FLUORITE PIT

BASE FROM MAP BY L.W. KRUMREY JR., 4/7/75

Figure 2

M & M No. 4

Elevation: 5,179' ± 1'
Bearing: S 88°W T.D. 137 feet
Inclination: -60°

Interval	Description
0-11	Oxidized, tan, broken and silicified limestone (?)
11-75.3	Limestone, mostly gray, locally cherty. Locally broken or brecciated with quartz and calcite cement. Minor iron oxide.
75.3-93.5	Zone much altered, cherty and brecciated. Quartz in stringers and breccia cement. Few small masses of fluorite.
93.5-137	Limestone, mostly gray and massive. Locally fractured,

M & M No. 5

Elevation: 5,175' ± 1'
Bearing: approx due west T.D. 132 feet
Inclination: -60°

Interval	Description
0-4	Overburden-disturbed rock.
4-86.5	Limestone, mostly massive gray and tan. Locally altered and bleached, minor chert.
86.5-95	Limestone, bleached, some iron oxide.
95-117	Limestone, altered to pink brecciated. Fluorite stringers at 95, 96.7, 103.5, 104-110.
117-120	Dark gray chert.
120-127	Marble with some fluorite as stringers, druse and small masses.
127-132	Gray limestone, massive with calcite stringers.

M & M No. 6

Elevation: 5,184' ± 1'
Bearing: due west
Inclination: -60°

T.D. 129'

Interval	Description
0-10	Overburden and disturbed material
10-47	Gray limestone, calcite veins, some alteration and iron oxide staining.
47-54	Probable fault zone; gouge, broken rock, abundant iron oxide.
54-88.6	Limestone, tan to gray, mostly massive, locally mottled coloring.
88.6-113	Silicified and cherty limestone. Chert mostly black. Quartz in veins and vugs. Some fluorite in vugs.
113-129	Limestone, gray to tan, locally mottled. Broken. Locally altered to clay.

CONCLUSIONS

The drilling was not successful in intersecting mineralization of interest in the quartz vein structure at depth, nor was there significant fluorite mineralization in the three holes drilled to intersect the projection of the fluorite zone exposed in the mine pit and in the shallow shaft sunk below the pit floor.

The thickness of the quartz vein intersected by the drill holes is only a fraction of the widths exposed on the surface. Reasons for the change are a matter of conjecture, and the possibilities are several. The quartz latite dike may have caused a localized plugging or squeezing of the channelway which is likely a preexisting fault. Changes in dip and strike along a fault structure can result in development of alternating open and closed sections along the structure. Also, vein structures are rarely tabular, but usually pinch and swell in both strike and dip directions.

In the case of the fluorite-bearing limestone bed, there was evidently ample preparation of the bed in the form of fracturing and brecciation to provide voids. However, the spaces were filled with quartz and calcite accompanied by only minor amounts of fluorite.

The drilling program, though quite limited, appears to have been adequate to leave little liklihood of there being significant gold-silver or fluorite occurrences in the property.

APPENDIX

Log M&M No. 1

Interval	Drilled	Core	Remarks
10-30.5	20.5	10	Core loss 10.5 ft. Broken gray limestone, weathered and crumbly, becoming more competent at 29 ft.
30.5-40	9.5	9.8	Gray limestone with calcite fracture breccia at 37.5 and recemented with calcite; Fe-oxide and clay with MnO_2 dendrites.
40-49.5	9.5	9.5	Gray limestone with 50% calcite filling at 40.4; gray limestone finely brecciated and recemented; gradual transition to dark gray shale from 41-43.5; highly carbonaceous shale to 44.2; light gray limestone with some bedding.
49.5-59	9.5	9.5	Gray limestone to 51.3; tan and gray sandstone with SiO_2 cement; grades into sandy limestone at 53.3; fracture zone at 57-59 with some SiO_2 cement; light gray limestone with calcite fracture filling.
59-68	9	9.5	Gray limestone with large vugs calcite lined from 60.7-62.5; Fracture zone with 2 in. clay and top brecciated and banded limestone with calcite and SiO_2 cement; shale oxidized to orange at 62.5; gray limestone, some fractures with calcite cement.
68-77	9	9.3	Gray limestone calcite fracture filling; some breccia from 75-76.
77-86	9	9.3	Gray limestone with calcite fracture filling; Fe-oxide or fracture at 85.5; shear zones recemented with evidence of calcite replaced fossils.
86-95.5	9.5	9.5	Gray limestone with calcite fracture filling.
95.5-104.5	9	10	Gray limestone with calcite fracture filling.
104.5-114.4	9.9	9.5	Light and dark gray limestone, calcite fracture filling; clay in fracture zone at 109.9 and 114.
114.4-124	9.6	9.8	Light gray limestone; at 121.7 banded brown mudstone; last 2 in. unoxidized and gray; crumbly at top; 122 gray limestone with calcite.
124-133.5	9.5	9.8	Gray limestone banded with abundant calcite fracture filling; at 132.5 1 in. of gray shale crumbled; partings of gray shale throughout; pyrite with shale on some fractures.
133.5-143	9.5	9.8	Crumbled and recemented gray limestone to 133.8; gray limestone competent to 139.2; broken and calcite cemented gray limestone with vugs and Fe-oxide stain to 143; shale and clay parting at 142.
143-153	10	9.6	Gray limestone calcite cemented at 148; core is badly leached up to 50% at places; this is the place where circulation was lost; at 152 very strong hematite stain inside leach cavities.
153-163	10	9.9	Gray limestone with calcite cement; at 162.7 fracture zone with slickensides on shale filling; pyrite in this zone.
163-170	7	7.0	Continuation of fracture zone to 164; gray limestone with pyrite.
170-179	9	9.7	Gray limestone Fe-oxide from 170.5-171.5 with SiO_2 filled at 172; pyrite and chalcopyrite throughout, possibly 1/2% sulfides; occasional oxidized zones.
179-189	10	9.7	Tan limestone Fe-oxide with large calcite stringers; grades to a sandy limestone between 182-183, pyrite absent; bleaching ends at 187; back to gray at 188.1; becomes shaly light brown limestone.
189-199	10	9.9	Tan limestone with calcite stringers; at 191 massive calcite filling in limestone breccia; two 6-in. zones of pure calcite; alteration stops at 195 and 196 somewhat brecciated gray limestone with calcite stringers.
199-208	9	9.7	Gray limestone calcite stringer; at 204 breccia zone with calcite filling; speck of malachite with MnO_2 on fracture face; sandy limestone to 205; at 205 quartz badly leached and somewhat crumbly; calcite stringer throughout; at 206.3 slightly sandy limestone with MnO_2 and calcite stringer, strong limonite stain.

Interval	Drilled	Core	Remarks
208-217	9	9.8	Slightly leached tan limestone with much calcite stringers; MnO_2; grades to gray at 210 and back to tan at 214; pyrite in the gray limestone.
217-227	10	9.5	Tan and maroon limestone with calcite stringers and MnO_2 on fracture planes; limonite staining on fractures also.
227-236	9	9.3	Same tan and maroon limestone; grades at 229.8 into a dark gray dolomite that is badly fractured; slightly leached and calcite cement; at 232 back to gray limestone, then tan limestone at 234; all badly broken and recemented with calcite.
236-245	9	9.7	Broken tan limestone with increase of clay to 237.2; then gray limestone with calcite stringers; at 243 a number of gray shale portions becomes more shale at 244; pyrite after 241.
245-254	9	9.3	Limey gray shale with a 1 in. calcite stringer; at 245 grades back to limestone at 246 and a shale limestone at 253; pyrite throughout.
254-263	9	9.3	Shaley limestone, dark gray as calcite stringer; very fine-grained pyrite; crumbled zone at 260-260.5.
263-273	10	9.9	Shaley limestone with calcite stringers; at 264 dark gray limestone with occasional thin shale stringers.
273-282	9	9.8	Shaley limestone with calcite stringers; at 275.4 shale stringers disappear, becoming light gray limestone with some vugs, calcite filled; at 280.2 fracture zone with yellow clay and rock fragment filling; at 281 much calcite filling.
282-292	10	9.7	Broken gray limestone with calcite stringers and limonite stain became gray dolomite at 284.8 with calcite stringers; at 287.4 gray and pink limestone pyrite on fracture.
292-301	9	9.5	Gray limestone with calcite stringers; some thin shale partings, weak pyrite.
301-310	9	9.3	Same as above.
310-319	9	9.5	Dark gray limestone with shale and calcite partings; at 311.3 light gray limestone breccia, limy shale; at 318 badly fractured and recemented with calcite.
319-328	9	9.4	Fractured and recemented dark gray shaley limestone blending to tan mudstone; at 324 there is 6 in. of yellow clay and rock fragments; quartz at 324.5 vuggy, broken with occasional pyrite; limonite and hematite stain; at 327, 1 in. very badly leached quartz, then gray limestone with hematite stain.
328-336	8	8.9	Gray quartz to 328 as above; gray limestone to 328.8, gray quartz to 329.5; gray limestone with calcite and hematite stain to 332.1; gray quartz to 332.7; dark gray shaley limestone with thin shale partings and calcite stringers.
336-345	9	9.3	Dark gray shaley limestone with thin shale partings and calcite stringers.
345-353	8	9.3	Gray limestone with occasional shale partings at 345, 347, 352, 352.7; fossiliferous at 351-352, occasional pyrite.
353-363	10	9.3	Gray limestone with numerous shale partings to 345.5; gray limestone with occasional calcite stringers, spotty pyrite.
363-372	9	9.2	Same as above.
372-380	8	9.1	Same as above to 373.5; shaley limestone with many partings to 375; gray limestone, occasional calcite stringers, trace of pyrite.
380-389	9	9.3	Gray limestone, massive, very large calcite stringers; at 387.5 broken zone healed with calcite; at 389 gray limestone, massive, no pyrite.
389-398	9	9.4	Gray limestone, massive, with occasional calcite stringers; at 393.5 black, leached, gray limestone with limonite stain; at 395 gray limestone slightly altered with calcite stringers, grades evenly to a vuggy SiO_2 cemented jasperoid breccia with blebs of fine-grained pyrite surrounded by a halo of hematite; some calcite stringers and filling.

Interval	Drilled	Core	Remarks
208-217	9	9.8	Slightly leached tan limestone with much calcite stringers; MnO_2; grades to gray at 210 and back to tan at 214; pyrite in the gray limestone.
217-227	10	9.5	Tan and maroon limestone with calcite stringers and MnO_2 on fracture planes; limonite staining on fractures also.
227-236	9	9.3	Same tan and maroon limestone; grades at 229.8 into a dark gray dolomite that is badly fractured; slightly leached and calcite cement; at 232 back to gray limestone, then tan limestone at 234; all badly broken and recemented with calcite.
236-245	9	9.7	Broken tan limestone with increase of clay to 237.2; then gray limestone with calcite stringers; at 243 a number of gray shale portions becomes more shale at 244; pyrite after 241.
245-254	9	9.3	Limey gray shale with a 1 in. calcite stringer; at 245 grades back to limestone at 246 and a shale limestone at 253; pyrite throughout.
254-263	9	9.3	Shaley limestone, dark gray as calcite stringer; very fine-grained pyrite; crumbled zone at 260-260.5.
263-273	10	9.9	Shaley limestone with calcite stringers; at 264 dark gray limestone with occasional thin shale stringers.
273-282	9	9.8	Shaley limestone with calcite stringers; at 275.4 shale stringers disappear, becoming light gray limestone with some vugs, calcite filled; at 280.2 fracture zone with yellow clay and rock fragment filling; at 281 much calcite filling.
282-292	10	9.7	Broken gray limestone with calcite stringers and limonite stain became gray dolomite at 284.8 with calcite stringers; at 287.4 gray and pink limestone pyrite on fracture.
292-301	9	9.5	Gray limestone with calcite stringers; some thin shale partings, weak pyrite.
301-310	9	9.3	Same as above.
310-319	9	9.5	Dark gray limestone with shale and calcite partings; at 311.3 light gray limestone breccia, limy shale; at 318 badly fractured and recemented with calcite.
319-328	9	9.4	Fractured and recemented dark gray shaley limestone blending to tan mudstone; at 324 there is 6 in. of yellow clay and rock fragments; quartz at 324.5 vuggy, broken with occasional pyrite; limonite and hematite stain; at 327, 1 in. very badly leached quartz, then gray limestone with hematite stain.
328-336	8	8.9	Gray quartz to 328 as above; gray limestone to 328.8, gray quartz to 329.5; gray limestone with calcite and hematite stain to 332.1; gray quartz to 332.7; dark gray shaley limestone with thin shale partings and calcite stringers.
336-345	9	9.3	Dark gray shaley limestone with thin shale partings and calcite stringers.
345-353	8	9.3	Gray limestone with occasional shale partings at 345, 347, 352, 352.7; fossiliferous at 351-352, occasional pyrite.
353-363	10	9.3	Gray limestone with numerous shale partings to 345.5; gray limestone with occasional calcite stringers, spotty pyrite.
363-372	9	9.2	Same as above.
372-380	8	9.1	Same as above to 373.5; shaley limestone with many partings to 375; gray limestone, occasional calcite stringers, trace of pyrite.
380-389	9	9.3	Gray limestone, massive, very large calcite stringers; at 387.5 broken zone healed with calcite; at 389 gray limestone, massive, no pyrite.
389-398	9	9.4	Gray limestone, massive, with occasional calcite stringers; at 393.5 black, leached, gray limestone with limonite stain; at 395 gray limestone slightly altered with calcite stringers, grades evenly to a vuggy SiO_2 cemented jasperoid breccia with blebs of fine-grained pyrite surrounded by a halo of hematite; some calcite stringers and filling.

Interval	Drilled	Core	Remarks
398-408	10	9.4	Same as previous; at 399.3 large calcite stringer, gray quartz becomes fresh past stringer with vugs to 401.5, sharp change to gray massive limestone with calcite stringers and hematite stain on fracture.
408-412	4	4	Massive, gray limestone with calcite fracture filling.
End of hole			

Log M&M No. 3

Interval	Drilled	Core	Remarks
0-9	9	0	
9-19	10	9.3	Broken at 14 ft; gray and brown sandstone with lime cement, calcareous veinlets; few small vugs.
19-28	9	8.5	19-21.4 brown massive, thin banded, limey sandstone. 21.4-23 broken, abundant Fe-oxide. 23-24.5 brecciated with calcareous filling. 24.5-28 brown to gray limey sandstone with calcareous stringers.
28-37	9	9	28-34 brown limey sandstone, Fe stained, massive. 34-37 gray massive limestone, calcareous stringers, some Fe-oxide.
37-46	9	8.5	37-46 gray limestone; calcareous seams and breccia cement, much broken. 40-42.5 with mud.
46-55	9	9	46-47 gray limestone. 47-48.5 limey sandstone, brown. 48.5 gray and brown fossiliferous limestone, abundant random calcareous stringers.
55-64	9	9	As above; limey shale band 59-60.5; limestone blacker, limey shale in the bands, contorted.
64-73	9	9	64-68 gray-black fossiliferous limestone, slight banding, few thin calcareous stringers. 68-69 light gray limestone, brecciated with calcareous cement. 69-71 gray black fossiliferous limestone. 71-74 gray and brown limey sandstone, massive, with few calcareous stringers.
73-83	10	9.7	77-83 medium dark gray sandy limestone with few random calcareous stringers; extremely fine-grained specks pyrite(?).
83-92	9	9.6	83-87 as above. 87 mottled gray and tan fine-grained massive limestone; some contorted fossils, calcareous veinlets, stringers.
92-101	9	9	92-95.5 tan-gray limestone, abundant calcareous stringers, irregular masses, calcareous vug at 93.6-94. 95.5-101 gray limestone, dark/light mottled look, dark areas and seams, possible limey shale submarine slumps(?), calcareous stringers.
101-111	10	9.1	101-103 as above. 103-106 mottled tan and gray limestone, Fe-oxide streaks, calcareous stringers. 106-109 limey sandstone, tan with Fe-oxide, calcareous, altered or withered 106-106.5 and 109-109.3. 109-111 limestone, massive, gray, quartz healed breccia 109-109.3.
111-120	9	9.3	111-111.3 as above. 111.3-119.8 limey sandstone, mostly tan, little calcite; gray limier bands 115.2-115.6 and 117.5-119; black hematite in sandier beds.
120-131	11	9.4	119.8-124 gray limestone, massive, sparse calcite, 121.5-122 some dark banding. 124-128.3 gray mottled limestone, abundant calcite, dark shaly band and masses very irregular, thin banded, stylolitic in appearance. 129-130 1.2 ft core, gray-brown limestone, some calcite, not mottled.
130-139.2	8.2	9.5	130-133.3 dark gray and tan limey sandstone, sparse calcite. 133.3-136.8 dark gray mottled limestone, moderately abundant calcareous stringers and irregular blebs. 136.5-136.8 tan shale. 136.8-137.4 tan limestone, calcareous. 137.4-137.7 tan shale. 137.7-139.2 light tan limestone, altered and recrystallized, some Fe-oxide and late calcite.

Interval	Drilled	Core	Remarks
139.2-152	12.8	9.5	139.2-142.2 as above, less altered 141.4-142.2. 142.2-143.7 3 ft tan chert and light tan shale, 50 ft, probable core loss ≈0.8 ft. 144-145 tan cherty limestone, silicified fossil fragments (gray) plus white calcite. 145-147 gray mottled limestone, some silicification, abundant calcite, contorted (or distorted) fragmental (not angular) texture, becoming tannish at 146.7. 147-148.3 mottled tan-brown, as above, in texture. 148.3-150 1.7 ft probable core loss. 150-152 massive dark gray limestone, sparse calcite, abrupt change from mottled, no contact.
152-161.6	9.6	9.3	152-157.2 massive gray limestone as above; slight mottling 155.5-157.2. 127.2-160.1 gray-tan slightly mottled limestone, moderate calcite vug, Fe-oxide. 160.1-161.6 limestone fragments and mud.
161.6-170.6			161.6-162 gray limestone, some calcite. 162-165 dark gray mottled limestone, variable calcite, fossils at 162.9-163.6; also fine-grained pyrite. 165-168.7 mostly tan, slightly (165.5-166 broken, few core fragments) limey shale; few calcareous stringers. 168.7-170.6 massive tan-gray limestone, dolomitic.
170.6-180	9.4	9.1	170.6-172 dolomitic limestone as above. 172-177 brown sandy dolomite; broken 174.5-177. 177-178 mottled brown dolomitic limestone. 178-179.5 mottled gray and olive dolomitized limestone, fossiliferous, calcareous stringers (photo 179-179.5).
180-188	8	9	Box dropped, core mixed gray fossiliferous limestone, 1/2-in. calcareous stringers, 1 ft massive tan limestone.
188-198	10	9.2	188-195.5 massive gray limestone, few fossils, few dark gray bands 1.8-1/2-in., calcareous stringers and vug at 191.5. 195.5-196.5 abundant coarse-grained calcite. 196.5-198 brindle light brown-dark gray dolomite with calcareous stringers.
198-207	9	9.2	198-202.8 fine-grained gray limey sandstone, massive sparse calcite. 202.8-203.1 black shale ≈0.5 ft core missing. 203.1-207 limestone, dark gray grading to light gray, abundant fossils, negligible calcite.
207-215 (215.7)	8	9	207-208.6 as above. 208.6-209 black shale, ground. 209-215 alternating dark gray shale and limestone, both massive, limestone fossils. 215-215.7 gray-tan mottled limestone, some earthy Fe-oxide.
215(215.7) 226(225.5)	11	8.9	215.7-216 as above. 216-220 limey sandstone, dark gray, massive, few calcareous stringers. 220-224.5 vaguely banded dark gray limestone, dark gray bands shale, calcareous stringers. 224.5-225.5 massive light greenish-gray dolomite, few fossils.
226(225.5)-235	9	9.5	225.5-228 as above. 228-235 massive gray limestone, fossiliferous. 230-231 few calcareous stringers.
235-245(244.4)	10	9.4	235-238 as above. 238-244.4 massive, structureless gray fine-grained sandstone, slightly limey.
245(244.4)-254	9	9.2	244.4-251.7 as above. 251.7-254 dark gray limestone, fossiliferous, calcareous stringers and vug 253.5-254.

Interval	Drilled	Core	Remarks
254-263(263.4)	9	9.5	254-257 as above. 257-260.4 massive fine sandy (texture) limestone, few thin black partings, shale with pyrite, some miniature fracture (slump) structures (photo) at 260 ft. 260.4-263.4 gray-green mottled to banded limestone, some fossiliferous, some calcareous.
263(263.4)-272(272.3	9	9.1	263.4-266 dark gray limestone grading to black limey shale at 265; at 266 limey shale grading to gray limestone to 269. 269-270.5 massive black shale with calcite. 270.5-272 fine-grained gray limey sandstone.
272-282	10	9.1	272-278.6 gray limey sandstone, some dark gray banding; gray shale at 275, 278; 0.5 core loss at 275, shale calcareous stringers and vugs. 278.6-279.8 black limey shale. 279.8-282 massive fine-grained dolomite limestone, moderately fossiliferous.
282-292	10	9.2	282-292 gray fine-grained limestone, mostly massive, some banding and mottling, shale partings (pyritic), at 291 small scale slump and fracture structures, thin bands fine-grained pyrite (photo) with pen, pyrite above tip.
292-301	9	8.3	292-293.5 as above, some very fine-grained disseminated pyrite; broken shale at 293.5. 293.5-295 gray limestone, considerably brecciated and healed. 295-299 tectonic brecciated dark gray limestone and dolomite limestone with shaly bands (broken and lost core), some calcite, some fine-grained disseminated pyrite. 299-300.5 black shale. 300.5-301 dark gray dolomite, abundant fine-grained disseminated pyrite.
301-310 (310.2)	9	8.9	301-301.5 as above. 301.5-310.2 alternating bands of fine-grained gray dolomite and black shales, ≈ 0.5 ft each; some disseminated pyrite associated with zones of tectonic brecciation.
310(310.2)-319(319.35)	9	9.2	310.2-313.5 gray fine-grained limestone, locally mottled with dark gray; disseminated pyrite in mottled section 312.5-313. 313.5-314 contact zone limestone porphyry broken with Fe-oxide. 314-318.5 Fe-oxide stained porphyry, vague lineation in porphyry at 40° ≈to core axis. 318.5-319.4 fresh light gray porphyry, very fine-grained disseminated pyrite.
319-329	10	9.4	319-329 porphyry gray quartz "eyes" and stringers in white aphanitic groundmass; disseminated pyrite; oxidized 322.7-328.8; Fe-oxide and MnO_2 filling and dendrites in fractures.
329-338	9	9	329-335.5 porphyry, gray, some bands darker gray, flow striated(?) disseminated pyrite. 335.5 oxidized porphyry, fresh band 337.0-337.8.
338-347(347.1)	9	8.8	338-347.1 light gray porphyry, slightly oxidized 338-339; rest fresh, some vague banding.
347-357 (356.7)	9	9.1	347.1-356.7 light gray porphyry banding rate; disseminated pyrite, fewer white phenocrysts 355-356.7.
357(356.7)-366(365.5)	9	9.3	356.7-365.5 light gray porphyry, some banding, none prominent, broken with calcite veining 359-359.6, disseminated pyrite. 360.4 piece for thin section.
366 (365.5)-374	8	9.2	365.5-374 light gray porphyry. 366-367 slight bleaching (alteration?), some vague banding, disseminated pyrite.

Interval	Drilled	Core	Remarks
			1/13/79
374(373.8)-383(383.2)	9	9.4	373.8-383.2 light gray porphyry, disseminated pyrite.
383.2(392.5)-393(392.8)	10	9.3	383.2-392.8 light gray porphyry with pyrite, few narrow fractures with dark gray alteration.
393-402	9	9.4	392.8-402 as above, with local mottling from late(?) quartz, fractures with alteration.
402-411	9	8	402-407 light gray porphyritic pink calcite veining at 405-407. 407-410.6 rusty, altered porphyry with abundant calcite stringers and irregular masses; broken core 409, 410 becoming fresher 410.3-410.6.
			1/14/79
411(410.6)-422	11	9.3	410.6-412.8 gray porphyry with some calcite veining, late quartz. 412.8-417 porphyry-bleached, Fe-oxide, ground at 413.2; probable core loss. 417-422 "normal" gray porphyry, spots of bleaching, feldspars white; some quartz flooding.
422-430(431.1)	8	9.4	422-431.1 light gray porphyry, spotty bleaching, mottled and banded, not intense, quartz stringers and flooding.
			1/31/79
430-439	9	9.8	Light gray porphyry, quartz phenocrysts, some quartz stringers and flooding.
437-448	9	9.5	439-441 as above. 441-448 as above, banded with vugs up to 1/8 in. diameter.
448-458	10	9.6	Light gray porphyry, vugs to 1.8 in., very light banding, quartz stringers and light flooding, disseminated pyrite to 1/16 in. cubes.
458-467	9	9.4	Same as above.
467-476	9	9.1	467-471.4 as above. 471.4-472.7 fractured, weathered with sericite cemented with calcite. 472.7-476 light gray porphyry with quartz stringers and flooding.
476-486	8	9.5	476-476.3 fracture zone, weathered with sericite, calcite cement. 476.3-485.3 light gray porphyry with quartz flooding and stringers, finely disseminated pyrite up to 0.05 mm.
486-494	8	9.3	485.3-489.4 as above.
485-489			489.4-491.6 contact with tan porphyry has quartz stringers and grains mixed in; MnO_2 dendrite on fracture plane; no free pyrite, all converted to Fe-oxide. 491.6-493.5 gradual mixing back to light gray porphyry with fragment of gray quartz and fine disseminated pyrite unaltered, alteration calcite. 493.5-494 contact, back to tan porphyry with stringers of gray quartz and quartz grain scattered throughout; pyrite all oxidized, MnO_2 on fractures, some open fractures.
494-504	10	9.6	494-503.6 as above, with some fractures calcite filled.
506-512	8	9.2	Tan porphyry with gray quartz flooding and grains, MnO_2 on all fractures, alteration strong in places, numerous fractures in all directions, no free pyrite, all oxidized.
512-521	9	8.9	As above, with more intense flooding of gray quartz.
521-530	9	9.3	As above, fracture more intense with some gray quartz flooding up to 1-1/2 in. thick, strong alteration between 528-528.7.

Interval	Drilled	Core	Remarks
530-539	9	9.1	530.3-535.8 tan porphyry with gray quartz stringers and flooding, gray quartz grains to 1/2-in. scattered throughout, pyrite all oxidized, increase of calcareous stringers toward end. 535.8-539.1 blending over 2-in. of tan porphyry and light gray porphyry at 535.8, becoming gray porphyry with calcareous stringers and bands, free finely disseminated pyrite.
539-548	9	9.0	539-542.6 as above. 542.6-544.6 tan porphyry with gray quartz inclusions, MnO_2 dendrites on fracture, all pyrite altered to Fe-oxide. 544.6-545.6 gray porphyry breccia cemented by calcite. 545.6-548 light gray porphyry with free pyrite, some calcite or fracture gray quartz stringers.
548-556	8	9.3	548-552 as above. 552-556.7 zone of mixed tan porphyry and light gray porphyry, some breccia of the tan porphyry with calcite cement, pyrite oxidized in tan quartz and free in gray porphyry.
556-566	10	9.6	556.7-562 birdseye light gray porphyry with some alteration on the pyrite; much sericite present in the alteration zones; quartz stringers. 562-564.3 contact; gray limestone badly broken and recemented with calcite. 564.3-567 gray quartz, massive with white quartz filling of large vugs lined with crystals.
566-636	9	9.4	567-636 gray limestone with stringers and cement of calcite.
636-640.6			Gray, part silicic dolomite with calcite and quartz stringers, pyrite in small clusters and disseminated.
640.6-643.4			Gray limestone with calcareous stringers and pyrite dissemination and stringers.
643.4-645.5			Brecciated white and gray limestone with calcareous stringers.
645.5-645.7			Dark gray shale with calcareous stringers, disseminated pyrite.
645.7-647			Beginning of fracture zone with slickensides.
End of hole			Gray quartz, Fe-oxide, MnO_2, siliceous.
			SAMPLES
485-489			Gray porphyry with abundant quartz, feldspar, fresh pyrite.
507-512			Altered tan porphyry, abundant quartz, light, no visible pyrite.
564-567			Zone of quartz veining and flooding, with limestone.
577-582			Gray, siliceous limestone breccia.

Project 4618
2/23/79

Log M&M No. 4

Interval	Drilled	Core	Remarks
0-11	11.5	9	Oxidized, vuggy, silicified rock; originally limestone(?), fine-grained, cherty; core broken 4-5, 6-7.5, 8.5-9.5, 11-11.5, mostly tan.
11.3-21.4	10.1	?Broken	Grayish-tan to olive; silicified massive limestone, locally bleached and broken, few narrow calcareous stringers.
21.4-29.6	8.2	?Broken	Mostly gray massive limestone, much broken, calcareous in thin stringers and large masses and breccia cement + FeO_x.
29.6-38	8.4	≈8 Broken	Gray-tan, mostly massive limestone, thin banded 36-38; broken zones with and without clay and FeO_x.
38-47	9	≈ 8 Broken	Gray thinly banded limestone to 45; 45-47 becoming tan, banding more prominent, much broken with considerable clay in broken zones; stringer clay alternations 45-47.5.
47-57	10	9.5	47.5-51.5 altered and oxidized limestone (cherty) with calcareous stringers and FeO_x. Sharp contact 51.5 to gray massive gray limestone becoming partly cherty and darker 54-56; few calcareous stringers; insignificant FeO_x.
57-65	8	8	57-61.6 gray limestone, massive to 59.5, then conglomeratic (slump breccia). 61.6-62.7 reddish cherty limestone; gouge 61.6-61.9. 62.7-64.6 gray limestone with calcareous stringers and breccia cementing. 64.6-66.4 limestone, tan bleached and broken.
65-75.3	10.3	10	66.4-75.3 gray limestone, few calcareous stringers, becoming cherty with minor FeO_x stringers and small blebs and masses, few thin quartz stringers.
75.3-84.6	9.3	≈9	Altered and cherty limestone; brecciated with some FeO_x, sugar quartz in fractures, and as breccia cement; ≈1/2 in. fluorite at 81.2. 81.9-85 cherty limestone with abundant 1-2 mm "eyes" of dolomite to 85.
84.6-93 (93.5)	8.4	9.2	85-89 brecciated cherty limestone, quartz veinlets and breccia cement. 89-90.6 quartz veins with minor fluorite in small masses and late stage vug fillings in the quartz vein and other quartz stringers. 90.6-94 chloritized limestone, strongly silicified, brecciated with late quartz and FeO_x, few fluorite crystals.
93(93.5)-102	8.5	8.5	94-96 cherty gray limestone. 96-101 gray limestone with birdseye texture 97-99. 101 gray cherty limestone with drusy quartz in small cavities.
102-112	10	10	Gray limestone with birdseye texture, primary depositional character. 107.6-108 fractured-bleached and FeO_x minor calcareous stringers.
112-121.6	9.4	9.4	112-117 gray limestone as above; generally massive with some calcareous-healed breccia and calcareous stringers. 117-121.6 dark gray limestone becoming limey shale 119.7-120.6. 120.6-121.6 massive birdseye dark gray limestone, clasts irregular and up to 1/4 x 1/2-in.
121.6-131	9.4	9.4	121.6-123.6 massive dark gray limestone. 123.6-131 massive light gray limestone, few stylolites and few thin calcareous stringers.
131-137	6	6	131-135 as above. 135-137 massive dark gray limestone with large (3/4 x 1-1/2-in.) light gray clasts.

Log M&M No. 5

Interval	Drilled	Core	Remarks
0-4	-	-	Overburden.
4-15	11	9.1	Light gray massive limestone, vague banding.
15-25.4	10.4	9.1	15-25.4 as above, weak FeO_x 22.5-24.
25.4-33.9	8.4	9.2	As above with weak FeO_x blush 30-32.5; few calcareous stringers at 32.5, 33.5.
33.9-43	9.1	9.4	As above, 36-38.2 pinkish from FeO_x, otherwise light gray massive, one thin calcareous stringer to 44.
43-52 (52.6)	9 (9.4)	9.3	44-45.6 altered tan limestone, broken and brecciated with clay in fractures. 45.6-52 massive light gray limestone, one calcareous stringer.
52 (52.6)-62	9.4	9.3	52.6-58.6 massive gray limestone as above. 58-58.5 altered and bleached zone. 58.5-62 massive gray limestone.
62-71	9	9.1	62-65 gray limestone as above. 65-69 tan limestone, bleached and altered zone, slight FeO_x with calcareous seam. 69-71 gray limestone with slight bleaching 70-71 plus slight FeO_x blush.
71-81	10	≈9.5	71-72 bleached limestone as above, becoming strongly altered to tan clay, claystone to 76.5, soft. 76.5-81 pinkish (FeO_x) alteration added to alteration to clays. Locally 50 ft looks agatey and cherty, alteration has not destroyed chert appearance. 80-81 altered to clay with few rocky fragments.
81-91	10	≈9	Much as above, badly broken 82-86.5 and strongly altered. 86.5-91 strongly altered, not so broken. Mostly bleached to light tan, some FeO_x 87-88.
91-101	10	8.9	Light tan to 92. 92-97 mostly gray limestone, locally mottled by bleaching of brecciated areas. Stringers of fluorite at 95 and 96.7. 97-98 brecciated chert with vuggy quartz. 98-101 strongly altered (pink) limestone and limestone breccia.
101-110 (110.5)	9	9.1	101-104 gray limestone becoming bleached pinkish 102.5-104; fluorite stringers 103.5, 104. 104-110 mostly massive quartz with fluorite in vugs and irregular veinlets.
110(110.5)-118(118.3)	8	8.5	110.5(?)-111.5, two-in. of core, quartz plus some calcite with some fluorite. 111.5-113.5 dark gray chert. 113.5-117 quartz plus minor calcite and fluorite at 115, 116, 117.
118-127	9	9	117-120 dark gray chert. 120-127 well marbleized limestone with fluorite as stringers, druse, blebs.
127-132 Bottom			127.2 bottom of marble. 127.2-132 gray limestone with abundant calcareous stringers to 131. 131-132 massive gray limestone.

Log M&M No. 6

Interval	Drilled	Core	Remarks
0-10	-	-	Overburden.
10-21	11	10	Gray limestone, massive, some FeO_x.
21-30	9	9	Gray limestone, mottled olive, calcareous veinlets abundant.
30-38 (38.5)	9	9	Gray limestone, mottled and veined as above to 34.3, then thin-banded with some calcareous veins.
38-47	9	9	38-41 as above. 41-47 gray and tan limestone (tan color from FeO_x), broken at 41 ft, 42-43, 44-45. 46-47, 1-1.5 in. buttons caused by clay and alteration, FeO_x.
47-56.2	9.8	9	47-54 much as above with broken, gougey rock 48-49. 51-54 broken with plentiful FeO_x, broken and clay 53-54; probable fault zone. 54-56 massive gray limestone with calcareous vein, shaly partings.
56.2-66	9.8	9	Tan/gray limestone with dark gray streaks and masses, calcareous stringers, broken at 59, 63-64, 65.
66-75	9	9	Tan/gray limestone as above; broken at 66, 68, 71, 73; local decomposition to some clay at and adjacent to broken zones.
75-84.6	9.4	9	Gray/tan limestone as above with dark gray streaks and masses giving mottled appearance. 82.7-83.6 limestone decomposed to gray-green clay, originally shaly limestone? 83.6 massive gray limestone.
84.6-93.7	9.1	8.5	88.6 massive gray limestone, clay at 85-86. 88.6-91.5 tan (FeO_x) limestone, strongly altered. 91.5-93.7 silicified limestone, cherty with reddish mottling by FeO_x.
93.7-109	15.3	≈8	91.5-98 cherty reddish limestone as above; broken, locally vuggy. 98-99, 0.2 ft core; altered limestone. 99-103, 0.2 ft core; black chert. 103-104 black chert and quartz, broken. 104-104.5, 0.2 ft black chert. 104.5-105.5 black chert with 0.3 ft quartz vug. 105.5-108.2 black chert. 108.2-109 black chert with 0.8 ft vein vuggy quartz with few vugs to 0.03 ft filled with fluorite.
109-118	9	9	109-112 vuggy, vesicular black chert, quartz-calcareous veinlets at 110. 112-113 tan vuggy chert. 113-115 soft, tan altered limestone. 115-116 mottled gray-tan limestone with FeO_x streaks, transition to 116-118; dense gray limestone with pinkish band 117-117.5; broken and altered at 118 through 120; tan, soft.
118-127	9	≈8.5	120-127 gray limestone, sharp contact at tan-gray. 120-125 broken to thin (0.02-0.2-ft) buttons. 121-122 more altered and clay. 124-125 all small fragments, also 125.5-126.5.
127-129 Bottom	2	1.5	127-129 broken gray limestone.

be encountered at a shallow depth. In the nearest exposure, I measured a strike of N55E and a dip of 32NW. Judging by the report summary (p. 11), from 0 to 10 ft is Quaternary alluvium, from 10 to 318 ft is Colina Limestone, from 318 to 328 ft is a fault zone, from 328 to 336 ft is a quartz vein, and from 336 to 412 ft is Earp Formation.

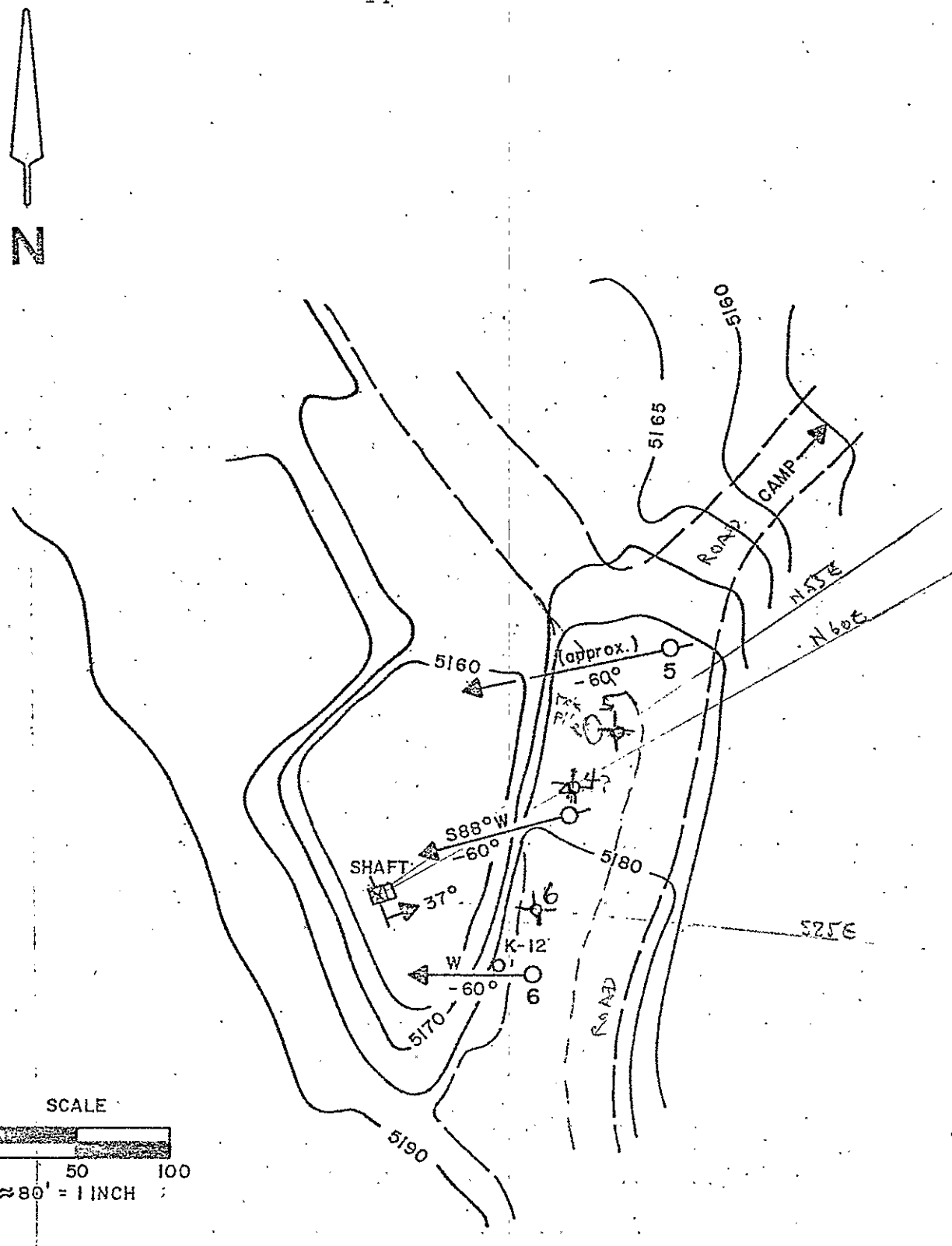
No. 2 Not drilled

No. 3 Approximate location is 1600 ft from the north line and 1100 ft from the east line of Sec. 4, T31S, R18W. A calcareous soil is present on the surface, but the lower part of the U-Bar Limestone (Lower Cretaceous) is the bedrock, and the strike/dip of the beds exposed nearby is N50E/35NW. The summary (p. 10) indicates: from 0 to 9 ft is Quaternary, from 9 to 313.5 ft is lower U-Bar, from 313.5 to 564.3 ft is a Tertiary intrusive body of quartz latite porphyry, from 564.3 to 567 ft is a quartz vein, from 567 to 645.7 ft possible Colina, and from 645.7 to 647 ft is a fault zone.

Nos. 4, 5, 6 Approximate location is 500 ft from the north line, and 1500 ft from the east line of Sec. 3, T31S, R18W. The locations of the individual holes would have to be surveyed to give a more precise description. Thin Quaternary deposits and mine tailings are present on the surface but the bedrock is definitely the lower part of the Earp Formation. The strike/dip of the beds is N20W/25E. Based on the summaries (p. 15-16), the fault contact with the Horquilla is encountered at depths of 75.3 ft (No. 4), 117 ft (No. 5), and 54 or 88.6 ft (No. 6).

Later I plan to describe these cores in some detail, and to select samples for petrographic, paleontologic, and other analyses. Formation boundaries will be determined more accurately at that time.

cc: George S. Austin, Deputy Director
Open-file Report

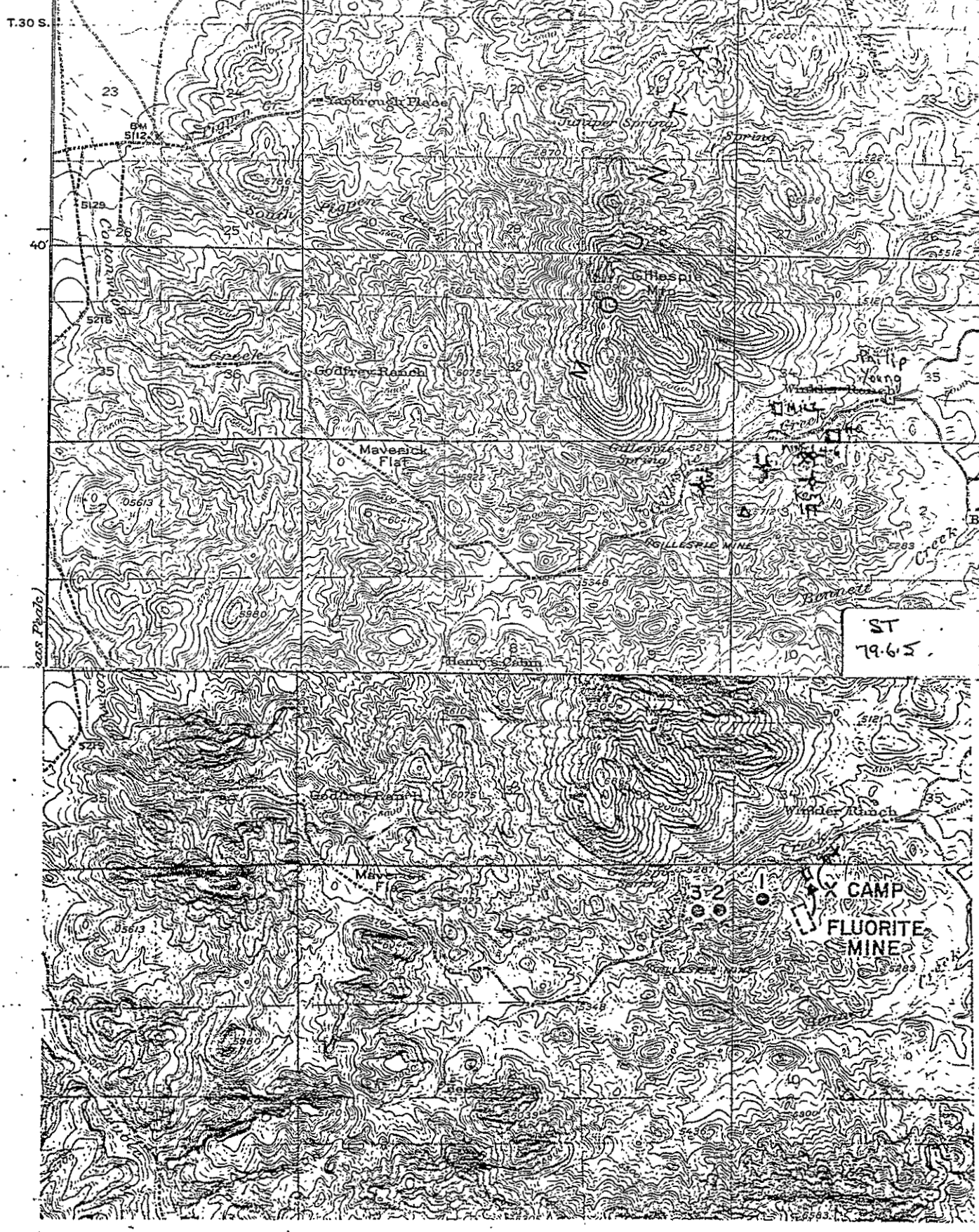


DRILL HOLES-FLUORITE PIT

Revised ST 79.6.5

BASE FROM MAP BY L.W. KRUMREY JR., 4/7/75

Figure 2 (Hazen Research)



DRILL HOLE LOCATIONS

PORTION OF WALNUT WELLS QUADRANGLE, N.M.

SCALE 1: 62,500

Figure 1 (Hazen Research)

New Mexico Bureau of Mines & Mineral Resources
Socorro, NM 87801

A DIVISION OF
NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

Information: 505/835-5420
Publications: 505/835-5410
After hours: 505/835-5011

June 8, 1979

M E M O

TO: Dr. Frank E. Kottlowski, Director

FROM: Sam Thompson, III, Petroleum Geologist

SUBJECT: Location of Core Holes on Winkler Anticline, Hidalgo Co., N. M.

On May 10, I submitted the report by Hamling and Holland (1979) to be placed in the Bureau open file. That report describes the core holes drilled by Hazen Research, Inc. for the Mining and Milling Corporation of America in the Winkler Anticline area, Animas Mountains, Hidalgo Co., N. M.

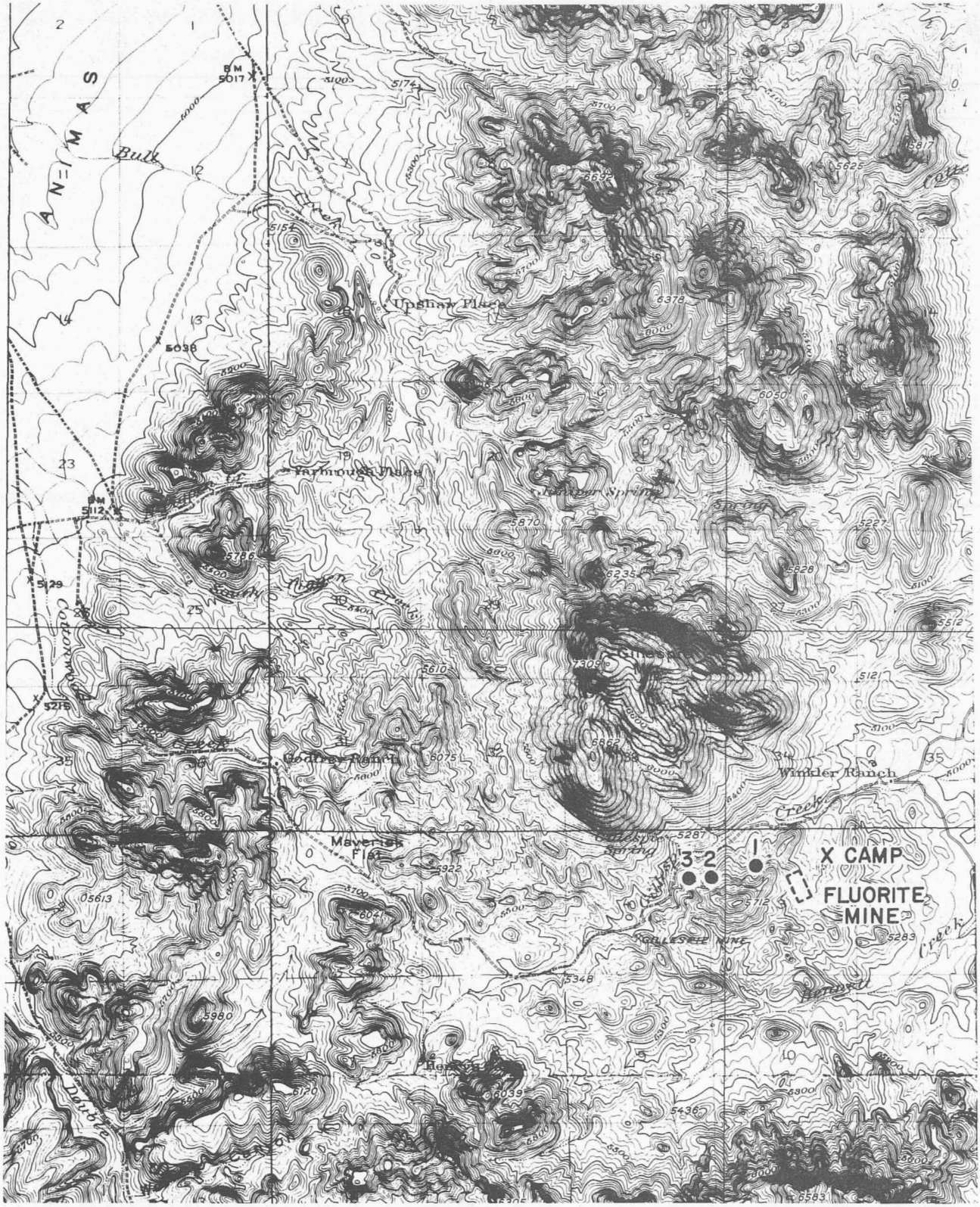
On June 5, Dave Schoderbek and I loaded up the rest of the cores from these holes. The cores are about 2 in. in diameter and are generally in good shape. Dave took them back to Socorro for storage in the Bureau's core building.

I stayed in the field to check the locations of the holes, and to see how they tied to the surface geology. The locations were shown on the maps in the report, but they were not described by Section-Township-Range. A. J. Curtis said the Hazen Research crew did not survey the locations (with plane table or transit), but that they used some "unusual compasses" and tied to section corners.

As shown on the attached maps, I found core holes No. 1 and 3 to be well located on Fig. 1 of the Hazen report, but the mine area (core holes No. 4, 5, 6) and the headquarters camp are located about 0.3 mi farther north than they show. On their Fig. 2, I show the bearings to the core holes from the mine, and my estimate of the distances. According to A. J. Curtis and Philip Young, the last hole was drilled at the position I show for No. 6, and the most northerly hole was just east of the pile of rocks where I show No. 5. These two holes have casing at the surface. A deep hole is present at the location I show for No. 4, but the casing is gone. The terrain is too rugged to make an accurate measurement by pacing the distance from the mine shaft to core holes No. 4, 5, and 6, but a plane table may be used.

The following is a summary of my field observations of these core holes:

No. 1 Approximate location is about 900 ft from the north line and 1600 ft from the west line of Sec. 3, T31S, R18W. Quaternary alluvium is on the surface, but the Colina (Permian) should



DRILL HOLE LOCATIONS

PORTION OF WALNUT WELLS QUADRANGLE, N.M.

SCALE 1: 62,500

Figure 1