EXPLORATION AND DEVELOPMENT
OF GROUND WATER
NORTHUMBERLAND PROJECT
CRUSHER SITE

Project No. 81-105

Prepared for

CYPRUS MINES CORPORATION

February 27, 1981

Prepared by:

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WILLIAM E. NORK, Inc.

Reno, Nevada 89503

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1.0 SUMMARY AND CONCLUSIONS

1. A 757.2 feet deep 8-5/8-inch O.D. water-supply well was constructed approximately 1,000 feet southeast of the crusher site, Northumberland Project. The well was completed so as to derive ground water from highly fractured limestone rocks below approximately 690 feet depth.

2. The well was test-pumped at a rate of 49 gallons per minute for three days (72 hours). Test data indicate the limestone aquifer is theoretically capable of pumping up to several thousand gallons per minute. However, the 8-5/8-inch O.D. casing and relatively high pumping lift limits the well to a maximum of about 300 gallons per minute.

3. Test pumping equipment purchased by CMC will deliver 49 gallons per minute at the well head and approximately 25 gallons per minute at the 4,000-gallon storage tank located above the equipment shop facility.

4. Water quality does not meet state or federal drinking water standards. Total dissolved solids (TDS) exceeds the 1,000 mg/l maximum level.

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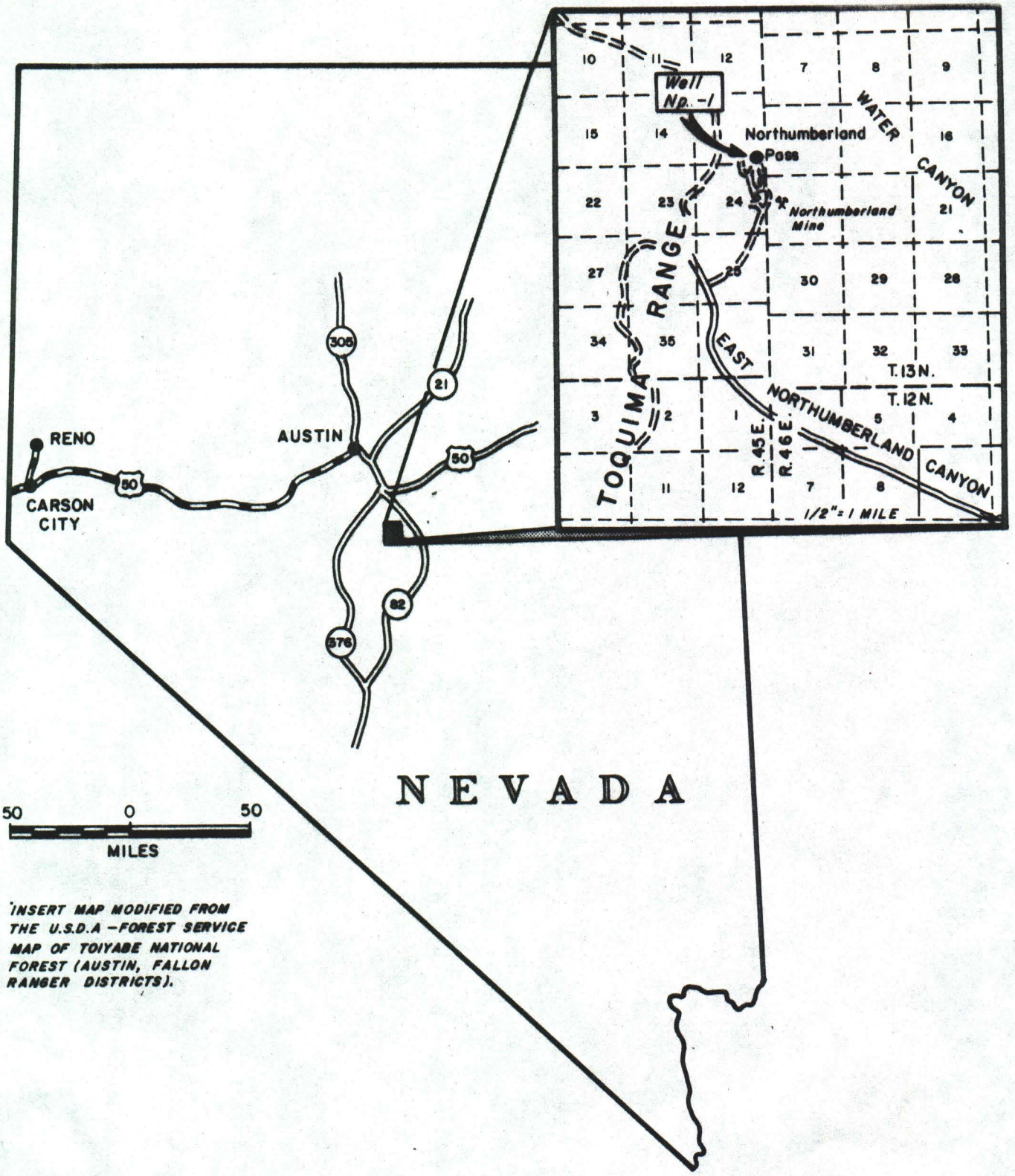
2.0 INTRODUCTION

In the fall of 1980, CYPRUS MINES CORPORATION requested that WILLIAM E. NORK, INC., formally expand the program of ground-water development at the Northumberland Project to include the vicinity of the pit and crusher sites. CYPRUS had previously obtained Permits to Appropriate ... Water ... from Idaho Mining Corporation for the purpose of providing water supply to the pit and crusher operations. These permits, Serial Numbers 27971, 27992, and 27993, are for two existing wells and a spring-fed pond located near the old Northumberland Mine workings situated in Northumberland Canyon (east), Nye County, Nevada (Figure 1). Previous reconnaissance by WILLIAM E. NORK, INC., suggested that the existing wells, which apparently tapped a shallow alluvial aquifer of limited extent, and spring were not a reliable source of a long-term water supply.

On the basis of information contributed by CMC and additional reconnaissance by WEN, INC., it was postulated that moderate amounts of ground water could be derived from highly fractured Paleozoic carbonate rock units which were encountered in numerous mineral exploration holes drilled within the CYPRUS claims boundaries. A 757.2 feet deep test well was constructed east of Northumberland Pass at drill hole site Nu-20. The well was test-pumped and the aquifer found to be capable of yielding several hundred gallons per minute. The test well was completed as a water well. Test-pumping equipment supplied by Nevada Pump and Drilling, capable of pumping 49 gallons per minute (gpm) at the well head and 25 gpm at the 4,000-gallon water storage tank, was purchased by CMC.



INSERT MAP MODIFIED FROM THE U.S.D.A -FOREST SERVICE MAP OF TOIYABE NATIONAL FOREST (AUSTIN, FALLON RANGER DISTRICTS).

FIG. 1 NORTHUMBERLAND CANYON PROJECT REFERENCE MAP

3.0 HYDROGEOLOGY

3.1 HYDROLOGY

The Toquima Range in the vicinity of the Northumberland Project rises to elevations exceeding 8,000 feet above mean sea level (m.s.l.). Precipitation is estimated at about 20 inches per year of which up to 25 per cent is available as recharge to the ground-water system. The large amount of precipitation and a general lack of surface water and springs in the region suggest downward infiltration of precipitation into relatively deep bedrock aquifers. Reconnaissance data indicated that ground water would be rather deep, although moderate amounts of "perched" ground water had been encountered at relatively shallow depths in numerous mineral exploration holes. It was expected that water wells near the crusher site at Northumberland Pass would be approximately 600 to 700 feet deep. At this depth the recharge area of the aquifer would be sufficiently large to provide a long-term water supply.

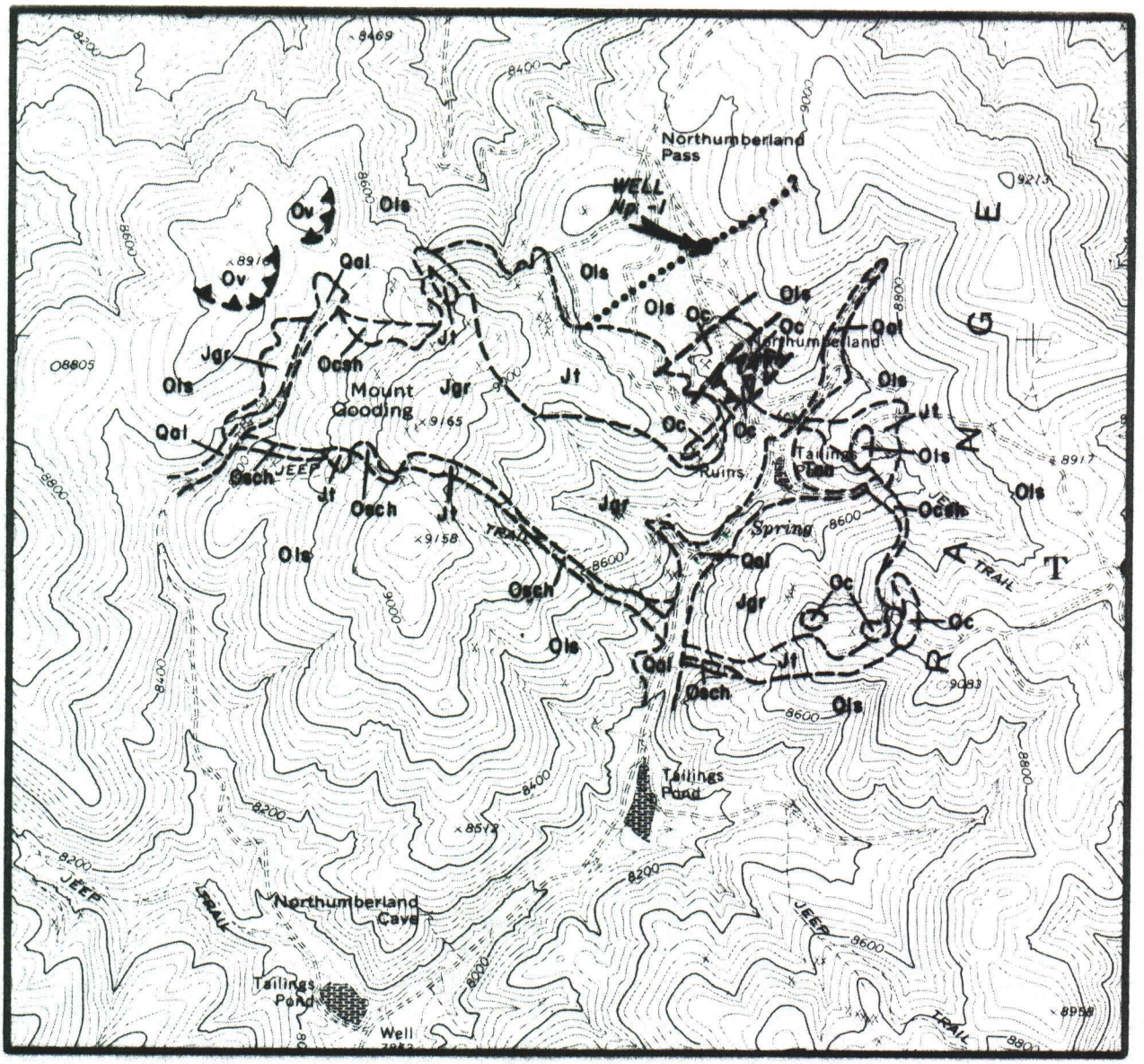
Small amounts of ground water for previous mining operations, exploration drilling, and mine development were derived from springs and existing wells in shallow alluvial aquifers of limited aerial extent within Northumberland Canyon (east). Previous investigations indicated that water supplies from these sources would not be very reliable due to their limited recharge area, limited areal extent and consequent susceptibility to yearly and cyclical climatic changes.

3.2 GEOLOGY

The primary geologic materials in the vicinity of Northumberland Pass are lower Paleozoic carbonate and siliceous sedimentary rocks. The sedimentary rocks were intruded by granitic rocks of Jurassic Age. Minor amounts of alluvial deposits cover the valley floor in upper Northumberland Canyon.

Numerous exploration holes drilled for CYPRUS reportedly terminated in highly fractured or "cavernous" limestone. In most cases no attempt was made to drill through these zones with air-rotary exploration drilling rigs, although a few were cased off and core-drilled. Little hydrogeologic information was derived other than a suggestion of the presence of aerially extensive, potentially highly productive limestone aquifer at depths below 250-400 feet.

A large number of exploration holes encountered moderate (up to 50 gpm) amounts of ground water during drilling. However, the yield of these holes generally was reported to diminish within a few hours, suggesting that small amounts of "perched" ground water could be expected at shallow depth.



1000 0 1000 2000 3000
FEET
0 1/2 1
KILOMETER

N

BASE FROM USGS TOPOGRAPIC QUADRANGLE NORTHUMBERLAND PASS, NEV., 7 1/2'. GEOLOGY IS MODIFIED FROM WORK DONE BY P.E. CHAPMAN, E.SCHMIDT OF CYPRUS EXPLORATION COMPANY.

EXPLANATION

ORDOVICIAN JURASSIC TERTIARY QUATERNARY

Qal — ALLUVIUM

Tan — HORNBLENDE ANDESITE OR DACITE DIKE

Jt / Jgr — MEDIUM GRAINED GRANODIORITE (Jgr) AND TONALITE OR ALASKITE INTRUSIVE ROCKS

CONTACT

FAULT, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED

LOW ANGLE OR THRUST FAULT, SAWTEETH ON UPPER PLATE.

WESTERN ASSEMBLAGE

Ov — VINNI FORMATION, CHERTS AND SHALES

EASTERN ASSEMBLAGE

Ols | Oc | Ocsh — POGONIP GROUP: MASSIVE TO THIN BEDDED LIMESTOME AND DOLOMITES (Ols) AND SILTY LIMESTONES WITH CHERTS AND SILICIC LIMESTONES (Oc) NEAR THE CONTACT WITH THE INTRUSIVE ROCK. THE POGONIP HAS BEEN METAMORPHOSED TO CALCIFIED SILCATE HORNFELS ROCK (Ocsh)

Fig. 2 GEOLOGIC MAP NORTHUMBERLAND CANYON PROJECT PIT AND CRUSHER SITE AND VICINITY

the site.

Exploration of surface geology revealed a series of northeast-southwest-trending enechelon faults southeast of the crusher site. The presence of these tension-type faults suggested that a well-developed secondary permeability could be present at depth in these geologic materials. A well site was selected near the location of a previously drilled exploration hole, designated Nu-20.

3.3 WELL CONSTRUCTION

Two primary test well sites were chosen southeast of the crusher site at Northumberland Pass. The sites, designated Npx-1 and -2 were located approximately 1,000 and 2,000 feet from the crusher site. Site selection was a compromise of access proximity to place of use, alignment with known or suspected faults, and location outside of the margins of the proposed pit.

Test hole Npx-1a was drilled by Toler-Harris Drilling. Primary purpose of the hole was to determine the existence of fractured carbonate rock beneath the site.

The nominal 5-inch diameter hole, drilled by the air-rotary method, terminated in fractured limestone at 430 feet depth. However, no ground water was encountered in the hole. With the existence of the highly fractured rock beneath the site confirmed, it was decided to contract a Nevada licensed water-well driller to construct an 8-inch diameter test well 600 to 700 feet deep at the site. A brief lithologic log of Npx-1a is as follows:

Depth interval (feet)	Lithologic description	Formation
0 to 40	light to medium grey limestone; highly fractured and weathered.	Pogonip Group.
40 to 170	medium to dark grey carbonaceous limestone.	
170 to 400	light grey to white limestone.	
400 to 430	grey limestone highly silicified, iron-stained euhedral calcite crystals and highly fractured.	

Nevada Pump and Drilling, Carson City, Nevada, was contracted to drill and test the well after the initial contractor indicated he was unable to drill the well as scheduled. Drilling by the air-rotary method commenced November 4, 1980. Total depth (T.D.) of 757.2 feet was reached November 18, 1980. A brief lithologic log of Exploration Hole Npx-1b is as follows:

Depth interval (feet)	Lithologic description	Formation
0 to 40	Light to medium grey limestone, highly fractured and weathered.	Pogonip Group.
40 to 175	medium to dark grey carbonaceous limestone; fractured.	
175 to 389	light grey to white limestone with some dark grey shaley limestone beds; fractured.	
389 to 443	black to brown fissile, shaley limestone; fractured — large fractures at 415' to 430'.	
443 to 557	black limestone, occasionally silicified; igneous dike at 460 feet, highly fractured 540 - 550 feet.	
557 to 758	black limestone, highly fractured throughout, intermittent loss of circulation due to significant fractures; "perched" water table at 581 feet; significant water at 730 feet. Total loss of circulation at 750 feet.	

The hole was cased with 758.2 feet of 8-5/8-inch O.D. steel well casing from one foot above ground level to T.D. which was supplied by CMC, November 20-25, 1980. Casing operations were interrupted somewhat when the first 430.5 feet of casing were dropped by the driller during installation. The remainder of the casing was installed in the hole and coupled to the casing already in the hole by means of a casing overshot, after inspection indicated no damage occurred to the dropped casing. Figure 3 shows final well construction. Upon completion of well construction, an attempt was made to develop the well with the drill-rig mounted air compressor. Due to the extremely fractured nature of the formation, depth to water of 625 feet, low per cent of submergence (18 per cent), no water was blown from the hole. An auxiliary air compressor was mobilized to the site December 4, 1980, and the hole blown with the drill-rig mounted and auxiliary compressors connected in tandem. Still no water was blown from the hole. Considering the cost of additional auxiliary air packages capable of developing the well, it was decided to develop the well with the test pumping equipment.

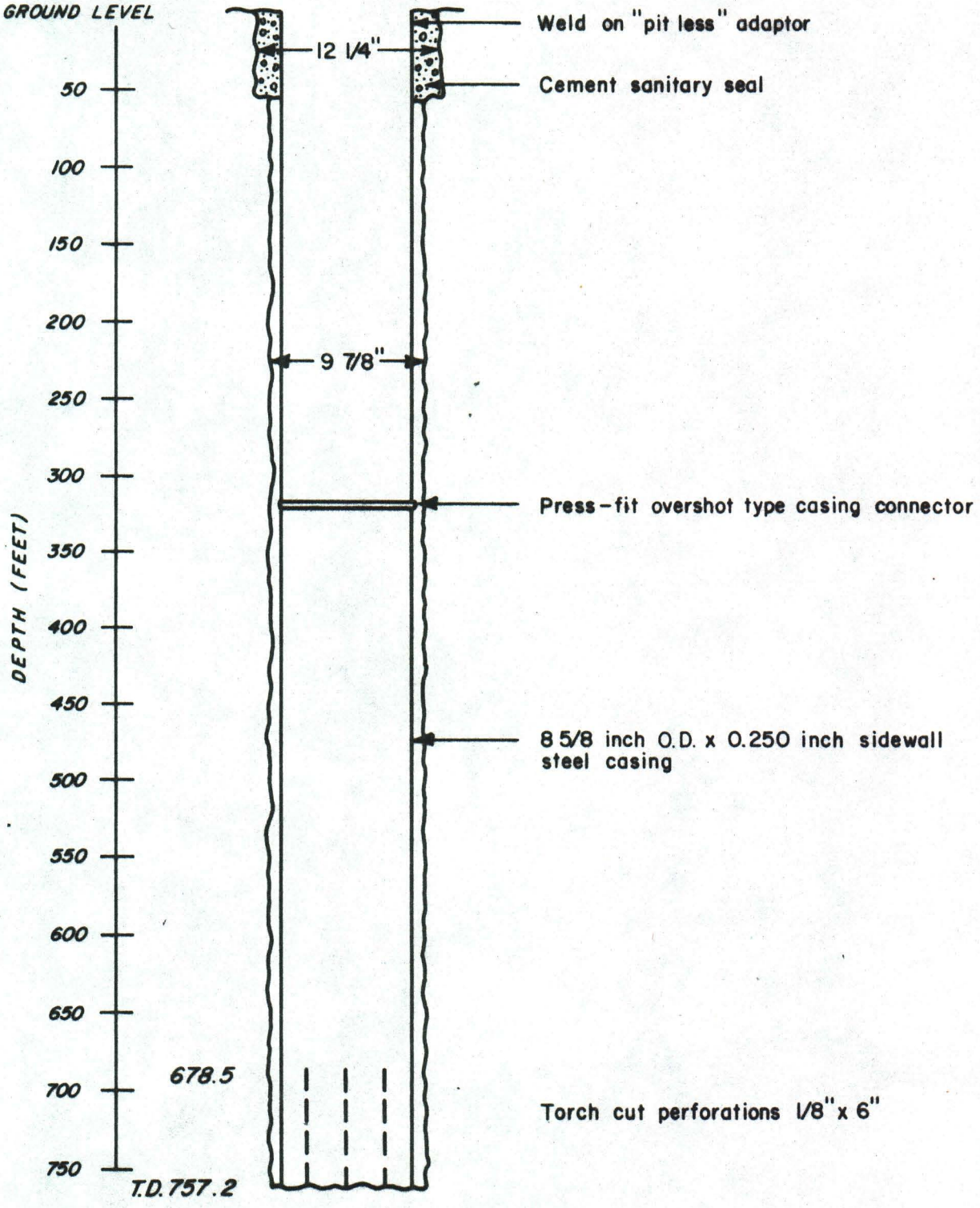


FIG. 3 WELL CONSTRUCTION, WELL NP-1.

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3.4 WELL TESTING

Upon completion of well construction, a 15 HP, 17-stage Valley pump equipped with a Franklin submersible electric motor was installed in the well by Nevada Pump and Drilling December 10, 1980. The pump was installed to a depth of about 730 feet (pump intake). Pump installation included a 3/4 inch diameter stilling well for accurate measurement of water levels in the well. Selection of pump capacity was based on a crusher and equipment shop estimated water-supply requirement of 10 gpm. Test pump was selected to yield approximately 25 gpm from a depth of 680 feet.

Test pumping sequence was originally designed to include both a 24-hour step-drawdown and 48-hour constant-discharge pumping tests. However, permeability of the formation was sufficiently high that a step-drawdown test could not be performed with existing equipment. Results of testing are summarized below and illustrated in Figures 4 and 5.

> Static water level prior to testing was 628.15 feet below top of stilling well (M.P.). Testing commenced 1520 hrs. 12/10/80. Pumped for 72 hrs. (4320 minutes) at 49 gpm. Water level at end of testing was 628.53 feet, a drawdown of 0.38 feet (specific capacity of 129 gpm/ft. drawdown). Testing was terminated at 1520 hrs. 12/13/80. Recovery was rapid. 84 per cent within 2 hours.

Retesting of the well at pumping rates of several hundred gallons per minute would have allowed for more precise determination of aquifer characteristics. However, test data collected to date was adequate to rate the well.

3.5 WELL RATING

On the basis of test pumping data, the limestone aquifer appears capable of yielding up to several thousand gallons per minute. However, test pumping equipment was not capable of sufficiently stressing the aquifer for precise determination of aquifer characteristics. Consequently, the aquifer transmissivity and ultimately well yield could be significantly different than the projections given below.

Maximum well yield is highly dependent upon casing size and the pumping equipment which will operate within these quarters. The 8-5/8-inch O.D. ($8\frac{1}{4}$-inch I.D.) casing and pumping lift of greater than 626 feet will limit well yield to less than 300 gpm.

Test pumping equipment purchased by CMC and left in the well is capable of yielding 49 gpm at the well head and 25 gpm at the 4,000-gallon storage tank located above the security guard's residence.

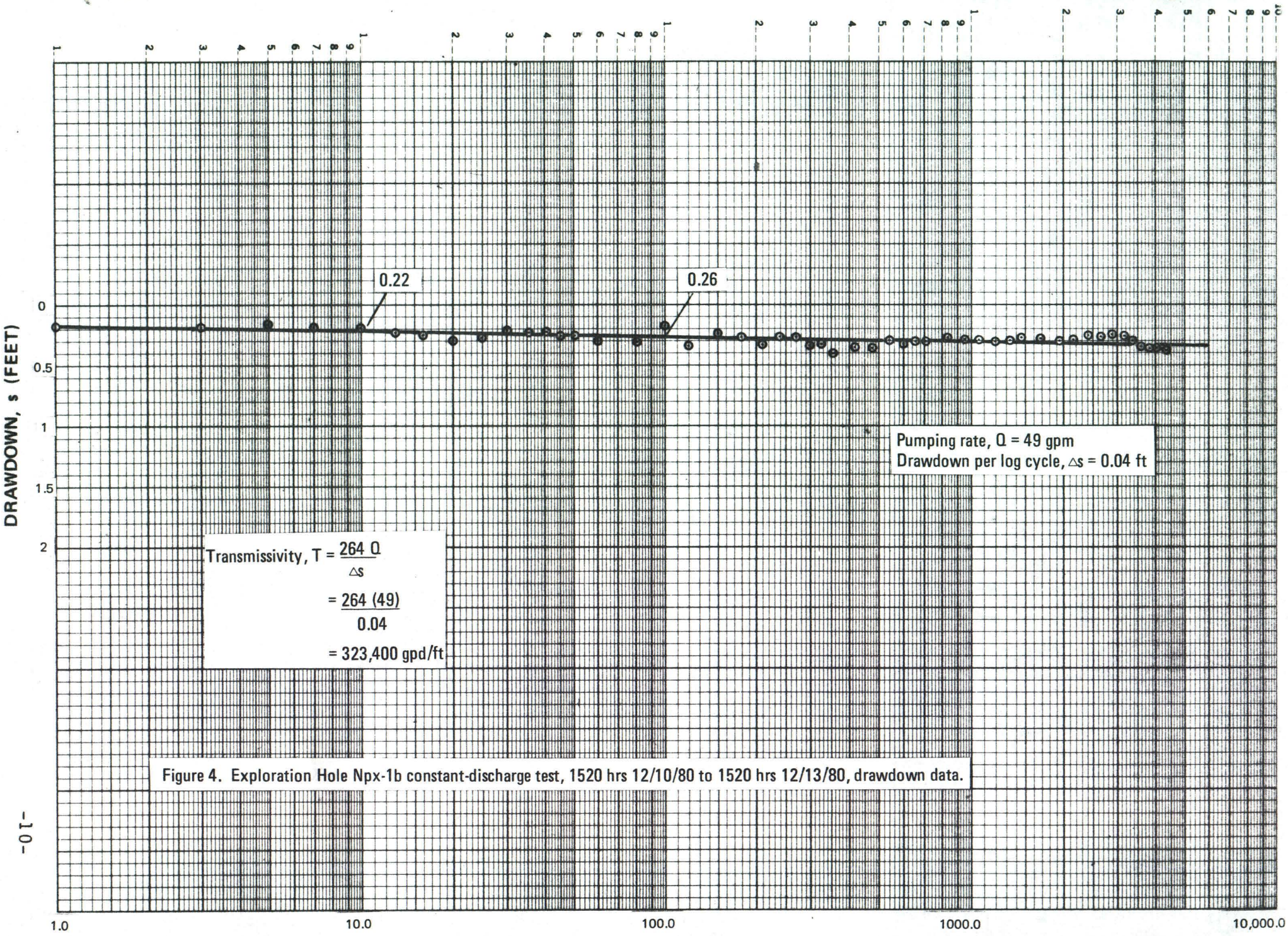


Figure 4. Exploration Hole Npx-1b constant-discharge test, 1520 hrs 12/10/80 to 1520 hrs 12/13/80, drawdown data.

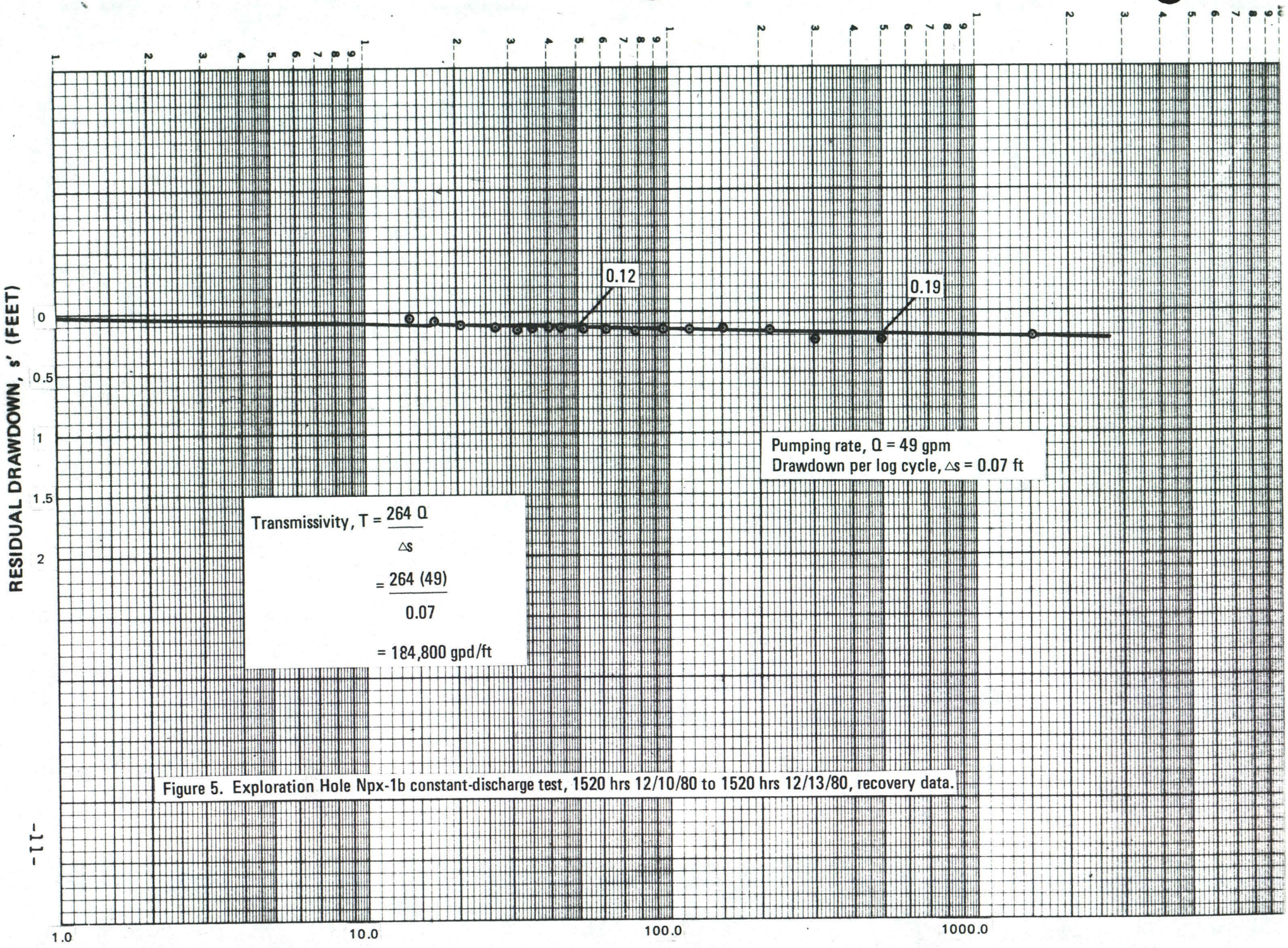


Figure 5. Exploration Hole Npx-1b constant-discharge test, 1520 hrs 12/10/80 to 1520 hrs 12/13/80, recovery data.

4.0 WATER QUALITY

A water sample for chemical analysis was collected December 13, 1980, prior to termination of testing. Results of the analysis are summarized in Table 1.

Table 1. Water Chemistry, Well No. Np-1

ph	7.0	6.5 - 8.5[2]
Total Dissolved Solids (TDS)	1,163	1,000[2]
Ca	189	-
Na	19	-
Mg	108	150[2]
Mn	0.06	0.10[2]
Fe	0.33	0.6[2]
As	<0.003	0.05[1]
Cl	18	400[2]
F	<0.1	-
SO_4	370	500[2]
NO_3	0.1	10[1]
Bicarbonate Alkalinity	108	-
Total Hardness as $CaCO_3$	1,010	-

1. USEPA primary drinking water standard.
2. Nevada Division of Health secondary drinking water standard.

Water quality does not meet State and Federal Drinking Water Standards. No individual constituent exceeds the standard; however, total dissolve solids (TDS) exceeds the 1,000 mg/l limit.

5.0 WATER RIGHTS

Proofs of Beneficial Use for Idaho Mining Corporation Permits Nos. 27971, 27972, and 27973 have all been filed prior to the February 15, 1981, deadline. Combined total water rights from the three permits are 94 gpm or 148.8 AF/year: an average 15 gpm or 449 gpm maximum from the spring (Permit No. 27973), 30 gpm from Well Np-5 (Permit No. 27971) and 49 gpm from the new crusher water-supply well, Np-1 (Permit No. 27972).

A change in the Point of Diversion for Permit No. 27971 will be filed in March, 1981, to the new well Np-1 and the original well abandoned, as per State of Nevada Rules and Regulations for Well Construction.

SOURCES OF INFORMATION

Bugenig, D. C., Exploration and Development of Ground Water, Northumberland Project Mill Site: private report prepared for CYPRUS MINES CORPORATION.

Chapman, P. E. and Schmidt, E. A., Geological Summary Report, Northumberland Project, Nye County, Nevada: private report prepared for CYPRUS MINES CORP., 1979.

Ferris, J. E., et al., Theory of Aquifer Tests, U.S.G.S. Water-Supply Paper 1536 E., 1962.

Hem, John D., Study and Interpretation of the Chemical Characteristics of Natural Water, U.S.G.S. Water-Supply Paper 1475, 1970.

USGS Northumberland Pass 7.5 minute Topographic Quadrangle.

APPENDIX A

LOG OF BOREHOLE

BOREHOLE Npx-1b

PAGE 1 OF 3

LOC. OF COORDS. _____

GROUND ELEV. ~8700

TOTAL DEPTH 757.2'

BOREHOLE DIAM 12" to 55'; 9 3/4" to

DRILLER Nevada Pump & Drilling (Buck Stracner) Carson City, NV

RIG CP-7000

BIT(S) 7 7/8" rock bit (used); 9 3/4"

FLUID Air Mist

	START	FINISH
DATE	11/4/80	11/8/80
TIME	0938	2300

GEOPHYS LOG — YES X NO

HOW LEFT _____

LOCATION Northumberland Canyon, Monitor Valley DCB

LOGGED BY _____

PROJECT 79-105 Northumberland Mine

DEPTH	PENE RATE ft/min	CIRC. LOSS	AIRLIFT Q (gpm)	MATERIAL	SYMBOL	DESCRIPTION and COMMENTS
25	2.0			weathered limestone		med. grey highly fractured limestone weathered brown (soil at the site has been bladed away)
50	1.5			carbonaceous limestone		black carbonaceous limestone (drills to powder)
75	1.8					~80' cuttings are less powdery - more chips
100	1.5					small fractures ~ 118'
125	1.5, 0.2, 0.3					@132' harder 132-135 green-grey very carbonaceous
150	0.3			silty, carbonaceous limestone		lost circulation 139-140' in fracture circulation came back on its' own silty green-grey limestone - interbeds slightly silicified
175	0.2					
200	0.5			light grey limestone		light grey limestone pulverized by the bit - samples are mud - very poor
225	0.6					circulation is very poor. ∠ ½ cuttings return. may be coating the wall.
250						Returns resumed w/ larger amounts of foam.
275						Some dark grey shaley limestone carbonaceous beds 260-270'
300						GOOD CUTTINGS - Finally w/ large amounts of foam
325						
350						

LOG OF BOREHOLE

BOREHOLE Npx-16

LOC. OR COORDS. _____ DRILLER _____ START FINISH

_____ _____ DATE _____

GROUND ELEV. _____ _____ TIME _____ _____

TOTAL DEPTH _____ RIG _____ GEOPHYS LOG — YES — NO

BOREHOLE DIAM. _____ BIT(S) _____ HOW LEFT _____

_____ FLUID _____ _____

LOCATION _____

LOGGED BY _____

PROJECT _____

DEPTH	PENE. RATE	CIRC. (col. loss)	AIRLIFT Q (gpm)	MATERIAL	SYMBOL	DESCRIPTION and COMMENTS
350			0	grey limestone black siliceous limestone		
375	0.5					
389						limestone is fissile, breaks to flat chips; effervesces freely. Color varies from black to brown to red-brown.
400				black shaley limestone		
425	1.0					Lost circulation at 415'; brought back w/ lots of foam. Fractures beginning @ 415; 430'→ fast drilling lost circulation, scattered fractures
448						
450	0.5					scattered fractures, circulation must be re-established @ each new joint. Occassional aphanitic dike w/ some small Fe Mg minerals. Rock is medium to dark grey limestone, silicified at times
475						
500	0.25			black limestone grey calc. mud stone		Black limestone interbedded w/ medium grey calcareous 5' mudstone. Small fractures Calcite veins Significant fractures 540-550
525						
550	0.4					
557						some brown-orange (altered?) limestone
575				black limestone		581' FIRST WATER-Trace
581			trace			harder w/ some large fractures 590-593; blew soapy water from hole for 10 minutes after injection was shut off (back pressure up to 75 psi)
600	0.2					sporadic circulation
625	0.3					regained circulation w/ copious foam
650	0.3					appears to have encountered a small "perched water table" which was dewatered while drilling
675	0.2					
700						

LOG OF BOREHOLE

BOREHOLE Npx-16

LOC. OF COORDS. _____

GROUND ELEV. ≈ 8700'

TOTAL DEPTH 820'

BOREHOLE DIAM. 12" to 55', 9¾ to T.D.

DRILLER Nevada Pump & Drilling (Buck Stracher) Carson City, NV

RIG CP-7000

BIT(S) _____

FLUID Air-Mist / Foam

	START	FINISH
DATE		
TIME		

GEOPHYS LOG ✓ YES — NO

HOW LEFT _____

LOCATION Northumberland Canyon, Monitor Valley

LOGGED BY HWS

PROJECT 80-105 Northumberland Mine

DEPTH	PENE. RATE ft/min	CIRC. ret. loss	AIRLIFT Q (gpm)	MATERIAL	SYMBOL	DESCRIPTION and COMMENTS
700	0.33		trace	limestone		Black limestone w/ some brown to light grey limestone some xtalline calcite incr. in back pressure to 95 psi about 710' fluid level in hole 11/14/80 628.85 below T.O.C. NOTE: fluid level 11/18/80 @ 625 below T.O.C. miscount by 20' over to this point. Samples 720-730 will overlap. From 730' down, depth is correct 723 to 755' dark grey to black fine xtalline l.s. minor light brown calc. shaley partings 5% white xline Calcite chips interspersed throughout. Heavily fractured zone 740-745' From 745' down, drilling is very slow due to fractures, drill hanging up. Drillers estimate 40-50 gpm at 750', back pressure @ 100 psi. TD HOLE @ 757.2 ft.
725	0.25					
	0.33					
750	0.15					
775						
800						

WELL Npx-16

WELL CONSTRUCTION SUMMARY

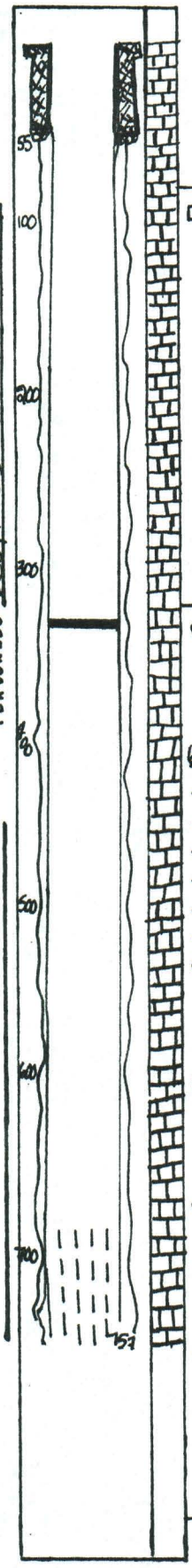
LOCATION or COORDS: _____

ELEVATION: GROUND LEVEL ~8700

TOP OF CASING _____

PROJECT 79-105 Northumberland Mine LOCATION Northumberland Canyon, Monitor Valley

PERSONNEL DCB, HWS



DRILLING SUMMARY:

TOTAL DEPTH 760' T.D.

BOREHOLE DIAMETER 12 1/4" to 54'
9 7/8" to 760'

DRILLER Nevada Pump & Drilling (Buck Stracner) Carson City, NV

RIG CP 7000

BIT(S) 7 7/8" rockbit (used); 12 3/4" button 9 3/4" button

DRILLING FLUID Air - Foam Mist

SURFACE CASING 10' 10 3/4 inch O.D. x 0.250"

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0 TO	678.55	C1			
678.55 to	757.20	S1			
AT	326.75	C2			

CASING: C1 8 5/8" O.D. 1/4" wall. steel.

C2 overshot: 3/16" flair, last 1" press fit

C4 _____

SCREEN: S1 8 5/8" O.D. casing, 1/8" to 3/16" torch cut

S2 _____

S3 _____

S4 _____

CENTRALIZERS none

FILTER MATERIAL none

CEMENT From 50' to 6' below G.L. (frostline) outside 8 5/8" O.D. casing

OTHER 4' of 1" + gravel pack from 54' to 50' as packers, outside 8 5/8" casing

CONSTRUCTION TIME LOG:

TASK	START DATE	START TIME	FINISH DATE	FINISH TIME
DRILLING: 7 7/8" to 143'	11/4/80	0943	11/4/80	1500
9 7/8" 143' to T.D.	11/6/80	0900	11/8/80	2300
GEOPHYS. LOGGING:				
CASING: 8 5/8" O.D.	11/30/80	1130	11/25/80	1200
FILTER PLACEMENT				
CEMENTING:				
DEVELOPMENT:				
OTHER:				
REAM 12 3/4 to 50'	11/6	0826	11/6/80	0856
Set 10" casing	11/6	1030	11/6/80	1130
REAM 9 7/8" to 143	11/6	1150	11/6/80	1350

WELL DEVELOPMENT

Test pumped constant discharge at 49 gpm from 1520 hrs. 12/10/80 to 1520 hrs 12/13/80; Drawdown was negligible at 0.375' at lowest point. Recovery was 98.4% in 2 hrs. Final pH=6.79, EC=1450

COMMENTS:

Drilled into heavily fractured zone at 755' and lost all circulation. After casing to 757' and adding 2ND 1600 cfm compressor, could not clean out bottom 15' of cutting or blow water.

Dropped 430.45' of casing down hole. Welded overshot to casing & continued to case. Overshot & fit snugly over top of casing in hole.

APPENDIX B

Data for Well Npx - 1b Page 1 of 2

Distance, r, to pumping well ⊖ ft. Date 12/10/80

Pumping well Same Other observation wells None

Location Northumberland Mine (Pit) Observers B.B. & H.W.S.

DATE	time in hours	time, t, since pump started--mins.	time, t', since pump stopped--mins.	ratio t/t'	WATER: depth -- ft.	WATER: drawdown, s -- ft.	WATER: residual DD, s' -- ft.	WATER: distance to well (r)^2 -- ft^2	WATER: r^2/t -- ft^2/min	PUMPING: motor - RPM	PUMPING: flow -- GPM	temp. -- ° C	REMARKS
													Flow meter reading at start: 3920 gal.
12/10/80	15:20	⊖			628.15	⊖					50		clean H_2O
	15:205	0.5			628.30	0.15							But foam
	15:21	1			628.30	0.15							No Wind
	15:23	3			628.325	0.175							
	15:25	5			628.30	0.15							
	15:27	7			628.35	0.175							
	15:30	10			628.35	0.175							
	15:33	13			628.375	0.225							
	15:36	16			628.40	0.250							
	15:40	20			628.45	0.30							
	15:45	25			628.425	0.275							
	15:50	32			628.36	0.210							wind picks up slightly
	15:55	35			628.375	0.225							
	16:00	40			628.37	0.220					48		still foam
	16:05	45			628.40	0.250						13.75	
	16:10	50			628.42	0.252					48		AIR TEMP. 2.5°C
	16:20	60			628.45	0.30							COND. 1600 µm
	16:40	80			628.45	0.30						14.0	AIR TEMP. 0°C
	17:00	100			628.325	0.175				STILL FOAM ON DISCHARGE- SLIGHTLY	ABOUT 6000 gal. pumped	48	14.0	AIR TEMP. 0°C
	17:20	120			628.475	0.325						48	14.0	
	17:50	150			628.37	0.220				STILL SOAPY	8400 gal. pumped		14.0	AIR TEMP.-2° SPC = 1000 µ
	18:20	180			628.41	0.260						48	14.0°	
	18:50	210			628.46	0.310						48	14.0	SPC=1500 µ
	19:20	240			628.415	0.265				-3°C very slightly foamy			14.0	
	19:50	270			628.41	0.260								
	20:20	300			628.48	0.33				AIR TEMP. @-3°C	16,000 gal. pumped	48	14.0	
W.S.	20:50	330			628.46	0.31								
	21:20	360			628.55	0.40								
	22:20	420			628.50	0.35				AIR TEMP. @-3°C		48	14.0	SPC=1400 µ

William 2. Nak

Data for Well Npx-1b

Distance, r, to pumping well 0 ft.

Date 12/10, 11/80

Pumping well Same as above

Other observation wells None

Location Northumberland Canyon Project, Cyprus Mines Corp.

Observers HWS. & B.B.

DATE	time in hours	time, t, since pump started--mins.	time, t', since pump stopped--mins.	ratio t/t'	WATER: depth -- ft.	WATER: drawdown, s -- ft.	WATER: residual DD, s' -- ft.	WATER: distance to well (r) 2 -- ft2	WATER: r2/t -- ft2/min	PUMPING: motor - RPM	PUMPING: flow -- GPM	temp. -- o C	REMARKS
12/10/80	23:20	480			628.495	0.345							
12/11/80	00:20	540			628.45	0.300							
	01:20	600			628.46	0.310			Air Temp @ 4°C			14°C	
	02:20	660			628.45	0.30			33,000 gal.		48	14°C	slight wind/ Air T.= -2°C
	03:20	720			628.45	0.30							
	05:20	840			628.43	0.28							
	07:20	960			628.44	0.29			48,100 gal.			14°C	SPC=1400 AIR T= 1°C
	09:20	1080			628.44	0.29						14.5°C	AIR TEMP = 10°C
WS	11:20	1200			628.45	0.30			TOTAL 58,900 gal		50	14.5°C	SPC= 1300 AIR T=10°C
	13:20	1320			628.45	0.30			TOTAL 65,000 gal		48	14.5	SPC= 1250 pH= 7.76
	15:20	1440			628.43	0.28					69	14.5	SPC=1300
	19:20	1680			628.44	0.29						14.0	
	23:20	1920			628.45	0.30			TOTAL 94,100 gal.		49	14.0	
12/12/80	03:20	2160			628.44	0.29							
	07:20	2400			628.40	0.25			AIR TEMP=4.0°C SPC=1450			14.0	water level fluctuating ±1" pH=6.75
	11:20	2640			628.42	0.27						14.5	AIR TEMP 12° SPC=1350
	15:20	2880			628.39	0.24							
	19:20	3120			628.415	0.265			150,100 gal		50	14.0	AIR T=10°C
	23:20	3360			628.45	0.30							
12/13/80	03:20	3600			628.495	0.345					49	14.0	AIR TEMP= 1°C
	07:20	3840			628.50	0.35							
	11:20	4080			628.495	0.345			AIR TEMP=10°C 194,900 gal.		48	14.0	SPC= 1450 pH= 6.72
	15:20	4320			628.525	0.375			AIR TEMP=10°		50	14.0	PH=6.74 SPC=1450

206,250 gallons total

William 2. Nak

(RECOVERY)

Data for Well Npx-1b

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Distance, r, to pumping well 0 ft.

Date 12/13/80

Pumping well same as above

Other observation wells None

Location Northumberland Canyon Project, Cyprus Mines Corp.

Observers HWS

DATE	time in hours	time, t, since pump started--mins.	time, t', since pump stopped--mins.	ratio t/t'	WATER: depth -- ft.	WATER: drawdown, s -- ft.	WATER: residual DD, s' -- ft.	WATER: distance to well (r)^2 -- ft^2	WATER: r^2/t -- ft^2/min	PUMPING: motor - RPM	PUMPING: flow -- GPM	temp. -- °C	REMARKS
10/13/80		1520	0				628.525		0.375				
		15205	0.5				628.405		0.255				
		1521	1	1520			628.355		0.205				seems to be rising steadily
		1523	3	507.7			628.360		0.21				
		1525	5	305			628.375		0.225				
		1527	7	218.1			628.300		0.15				
		1530	10	153			628.295		0.145				
		1533	13	117.9			628.285		0.135				
		1536	16	96			628.275		0.125				
		1540	20	77			628.29		0.14				
		1545	25	61.8			628.28		0.13				
		1550	30	51.7			628.28		0.13				
		1555	35	44.4			628.27		0.12				
		1600	40	40.0			628.27		0.12				
		1605	45	35.7			628.27		0.12				
		1610	50	32.2			628.29		0.14				
		1620	60	27			628.275		0.125				
		1640	80	20.5			628.26		0.11				
		1700	100	17			628.24		0.09				
		1720	120	14.3			628.21		0.06				